# Chinook and Coho Salmon Escapements and Coded-Wire Tag Returns to the Cowichan-Koksilah River System 1976-1979



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# CHINOOK AND COHO SALMON ESCAPEMENTS AND CODED-WIRE TAG RETURNS TO THE COWICHAN-KOKSILAH RIVER SYSTEM 1976 - 1979[1]

by

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Chinook (Oncorhynchus tshawytscha) and coho (O. kisutch) salmon escapements were studied during 1976 to 1979 to estimate adult returns and incidence of marked fish for coho (1973 and 1974 brood years) and chinook (1974 and 1975 brood years) coded-wire tagged as wild juveniles. Escapements were estimated by 4 methods: (1) tagging and recovery of tags by purse seine in the estuary; (2) tagging in the estuary with recovery of tags on the spawning grounds; (3) tower counts of adult migrants; and (4) swim survey counts of spawners. The results obtained by each method are compared and discussed. Salmon migration timing, spawning distribution and timing, age and size composition are described. Ocean survival of marked chinook from tagging to adult return was significantly lower than unmarked chinook, 0.3% versus 1.6% (1974 brood) and 0.4% versus 5.5% (1975 brood). Marked coho smolts survived to adult return at rates of 1.7% (1973 brood) and 3.6% (1974 brood), compared to 4.4% for unmarked 1974 brood coho. Post-release loss of coded-wire tags was calculated at 9-13% among coho and 10% among chinook. A majority of coded-wire tagged adult coho salmon returned to spawn in locations which differed from the smolt tagging sites. It was postulated that adult coho return to spawn in the area from which they emerged as fry rather than the area utilized for summer rearing or over-wintering.

KEY WORDS: salmon, chinook, coho, population estimates, coded-wire tagging, ocean survival, marking mortality, tag loss, homing.

## RESUME

Lister, D.B., L.M. Thorson and I. Wallace. 1981. Chinook and coho salmon escapements and coded-wire tag returns to the Cowichan-Koksilah River system, 1976 to 1979. Can. MS Rep. Fish. Aquat. Sci. 1608: xiii + 78 p.

Echappement et retours de saumons chinook (Oncorhynchus tshawytscha) et coho (O. kisutch) marques a l'aide de fils codés dans l'ensemble de rivières Cowichan-Koksilah de 1976 à 1979. Les échappements de saumons chinook et coho ont été étudies de 1976 à 1979 afin d'estimer les retours d'adultes et la presence de poissons marqués (pour les fraies de coho des années 1973 et 1974 et les fraies de chinooks des années 1974 et 1975) qui avaient été marqués à l'aide de fils codés. Les échappements ont été estimés par differentes méthodes: (1) marquage et récupération de poissons marqués à l'aide de seines tournantes, dans l'estuaire; (2) marquage dans l'estuaire et récupération des marques sur les frayères; (3) comptages des adultes migrants vers les frayères, à l'aide d'une tour batie sur la berge; (4) comptage des reproducteurs sur les frayères par des nageurs equipés de masques et de combinaisons de plongée. Les resultats obtenus par chaque methode sont comparés et discutés. Les dates des migrations de saumons, la distribution, et le temps des fraies ainsi que les classes d'age et de tailles des reproducteurs sont décrites. Le taux de survie dans l'océan des chinooks margués, depuis le marquage jusqu'au retour des adultes à été bien plus faible que celui des poissons non marqués, 0.3% versus 1.6% pour la fraie de 1974 et 0.4% versus 5.5% pour la fraie de 1975. La survie des coho marqués ayant survécu pour retourner frayer s'est effectuée a un taux de 1.7% pour la fraie de 1973 et 3.6% pour la fraie de 1974, comparés à 4.4% pour les poissons non marqués de la fraie de 1974. Le pertes de marques aprés que les poissons aient été relachés a été calculé à 9 - 13% pour les cohos et 10% pour les chinooks. La majorité des saumons coho marqués est retournée frayer a des locations differentes des lieux de marquage. Il à été considéré que les saumons coho adultes retournent frayer sur les frayères d'ou ils sont issus plutot que les lieux de chasse utilisés l'été ou les zones abritées ou ils passent l'hiver en tant que juvéniles.

## INTRODUCTION

Wild chinook (Oncorhynchus tshawytscha) and coho (O. kisutch) salmon juveniles migrating from the Cowichan-Koksilah system were marked with coded-wire nose tags in 1975 (Armstrong and Argue, 1977) and 1976 (Argue et al., 1979) to provide information on ocean migration and exploitation through tag returns from the commercial and sport fisheries. During 1976 to 1979 the returns of tagged adult salmon were assessed to estimate, for each brood year and species, the total adult return to the Cowichan-Koksilah system and the incidence of coded-wire tagged fish in that return. Additional information was obtained on chinook and coho salmon migration timing, spawning distribution and timing, age and size composition, and the spawning distribution of fish tagged at various sites in the two river systems.

The chinook and coho salmon juvenile tagging projects were described in earlier reports (Armstrong and Argue, 1977; Argue et al., 1979). A listing of coded-wire tagging information is presented in Table 1.

This report presents the results of the adult salmon study, which involved investigations in the Cowichan estuary and on the spawning grounds of the Cowichan and Koksilah River systems. Information on adult returns was collected to provide the data needed to estimate fishery contributions and exploitation rates of chinook and coho salmon stocks of the river systems. The study focused on coho salmon returns from the 1973 and 1974 brood years and chinook salmon returns from the 1974 and 1975 brood years. Incidental data were obtained on other salmonid species.

## STUDY AREA

The study area included the Cowichan and Koksilah River systems which flow into Cowichan Bay on the east coast of Vancouver Island, British Columbia, approximately 40 km north of Victoria (Fig. 1). The principal study streams and tributaries surveyed during this study are briefly described as follows.

### COWICHAN RIVER

The Cowichan River flows from Cowichan Lake eastward for 50 km to enter Cowichan Bay in the Strait of Georgia. Skutz Falls, 18 km downstream from Cowichan Lake, presented a partial obstruction to salmon migration which was alleviated by the construction of fishways in 1956. The Cowichan drains an area of 840 $km^2$ and carries a mean annual discharge of 55 $m^3$/sec (Inland Waters Directorate, 1977). Mean monthly discharges range from 117 $m^3$/sec in December to 8.3 $m^3$/sec in August. A low-level flow control dam at the outlet of Cowichan Lake provides a minimum river discharge of 7 $m^3$/sec. A fishway in the dam permits fish passage to Cowichan Lake.

TABLE 1. Releases of coded-wire tagged (CWT) chinook and coho salmon juveniles in the Cowichan-Koksilah River system during 1975 and 1976.

| Tagging Year | Species and Life Stage | Brood Year | Tagging Location | No. of Tagged Fish Released[a] | CWT $D_1$ | Ag | $D_2$ |
|---|---|---|---|---|---|---|---|
| 1975 | Coho Smolt | 1973[b] | Rotary Park Pools | 10,540 | 10 | 2 | 5 |
| | | | | 7,631 | 9 | 2 | 5 |
| | | | | 757 | 8 | 2 | 5 |
| | | | Pastuch Creek | 4,110 | 6 | 2 | 5 |
| | | | Cowichan River Side Channel | 3,097 | 14 | 2 | 5 |
| | | | Total | 26,135 | | | |
| | Chinook Fingerling | 1974 | Cowichan Estuary | 18,332 | 7 | 2 | 5 |
| 1976 | Coho Smolt | 1974[b] | Rotary Park Pools | 4,665 | 5 | 2 | 7 |
| | | | | 5,435 | 6 | 2 | 7 |
| | | | Pastuch Creek | 3,332 | 9 | 2 | 7 |
| | | | Cowichan River Side Channel | 3,787 | 10 | 2 | 7 |
| | | | Mesachie Creek | 4,023 | 7 | 2 | 7 |
| | | | | 15,128 | 8 | 2 | 7 |
| | | | | 10,135 | 13 | 2 | 7 |
| | | | | 12,269 | 11 | 2 | 5 |
| | | | Kelvin Creek | 6,614 | 3 | 2 | 7 |
| | | | | 6,764 | 4 | 2 | 7 |
| | | | Total | 72,152 | | | |
| | Chinook Fingerling | 1975 | Cowichan Estuary | 16,673 | 1 | 2 | 7 |

[a] 1976 release statistics are corrected for preliberation tag loss, whereas 1975 releases are not so corrected and may contain adipose-marked fish without CWT.

[b] The 1975 and 1976 tagged smolt releases included small proportions, 2.4% and 6.3% respectively, of 1972 and 1973 brood smolts which were age 2 at time of tagging (Argue et al., 1979).

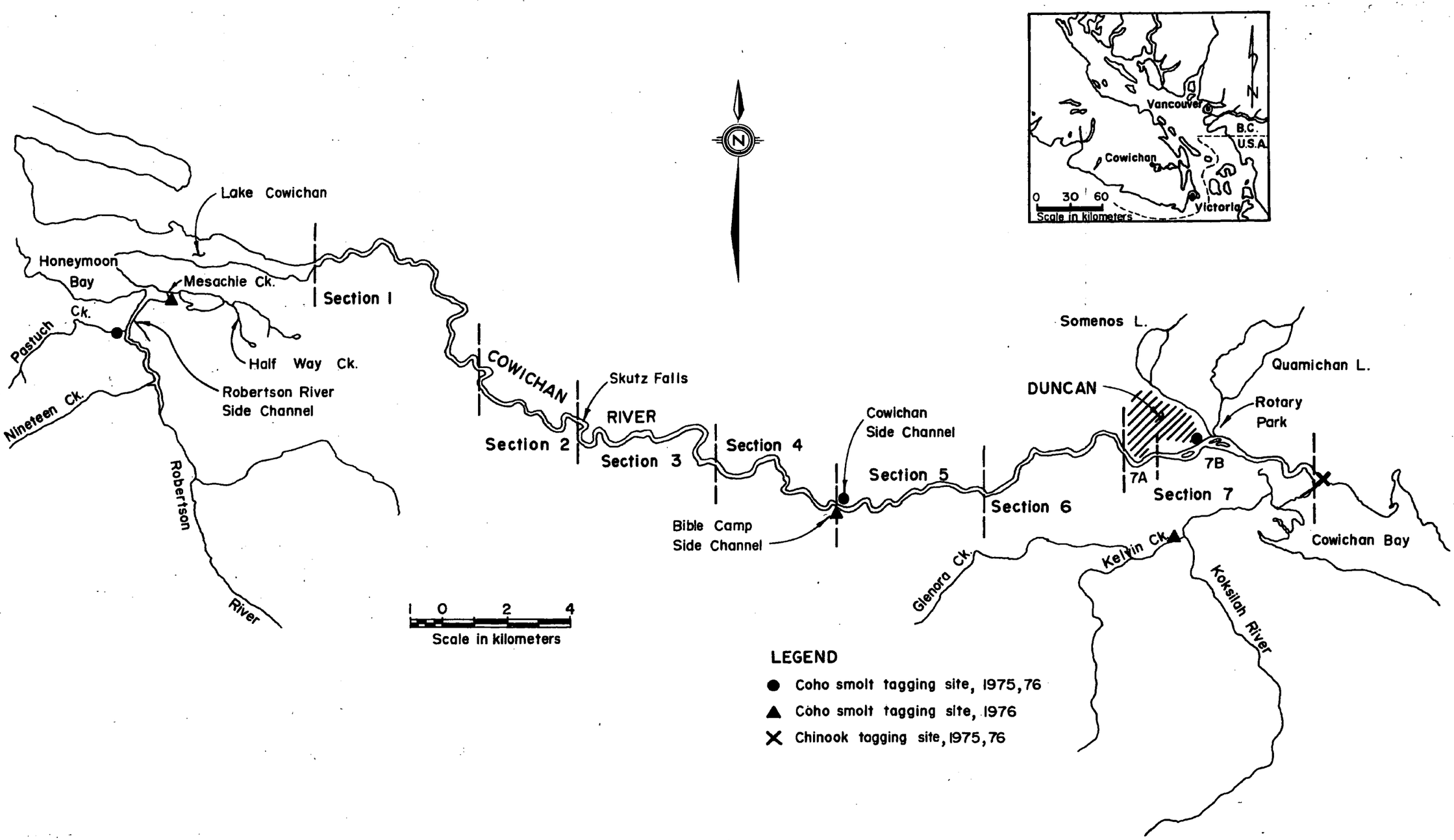



FIG. 1. Location map of the Cowichan-Koksilah River system showing river swim survey sections and juvenile chinook and coho tagging sites.

The Cowichan River system supports chinook, coho and chum (Oncorhynchus keta) salmon populations. Chinook salmon spawn in the main Cowichan River, principally upstream of Skutz Falls. Coho salmon spawn heavily in that area, but also utilize tributaries to the main river and Cowichan Lake. Chum salmon tend to spawn in the lower main river and adjacent side channels. In the decade preceding this study (1966–1975) estimated escapements of chinook, coho and chum salmon averaged 6,700, 46,400 and 66,500 fish respectively (Marshall et al., 1976). The system also supports populations of steelhead and rainbow trout (Salmo gairdneri), coastal cutthroat trout (Salmo clarki clarki) and brown trout (Salmo trutta).

## KOKSILAH RIVER

The Koksilah River enters Cowichan Bay immediately south of the Cowichan River (Fig. 1). It drains a 209 $km^2$ area which produces a mean annual discharge of 10 $m^3$/sec. Mean monthly discharges range from 23 $m^3$/sec in December to 0.5 $m^3$/sec in August (Inland Waters Directorate, 1977).

The river is accessible to anadromous salmonids for a distance of 21 km. It supports spawning populations of chinook, coho and chum salmon and steelhead trout. In the decade preceding this study escapements are estimated to have averaged 300 chinook, 5,200 coho and 4,000 chum salmon (Marshall et al., 1976).

## TRIBUTARY STREAMS

This section briefly describes the tributary spawning areas where carcass recovery and spawner counts were conducted in 1976 and 1977. As some sites were also the locations of coho smolt tagging in 1975 and 1976, detailed descriptions have been presented by Armstrong and Argue (1977) and Argue et al.(1979).

### Robertson River

The Robertson River flows into Bear Lake, a southeastern arm of Cowichan Lake near Honeymoon Bay (Fig. 1). It originates in the nearby mountains and provides excellent spawning area when the water level is relatively high during fall and winter (Fig. 3). However, the stream dries completely during summer. Only the lower section of Robertson River, a distance of 3020 m between the mouth at Bear Lake to a logging road bridge, was surveyed consistently (Fig. 2). Coho spawning was concentrated in the section from the mouth to the South Shore Road bridge (340 m) and the middle section adjacent to the dikes (370 m). Few coho were observed in other parts of the Robertson River.

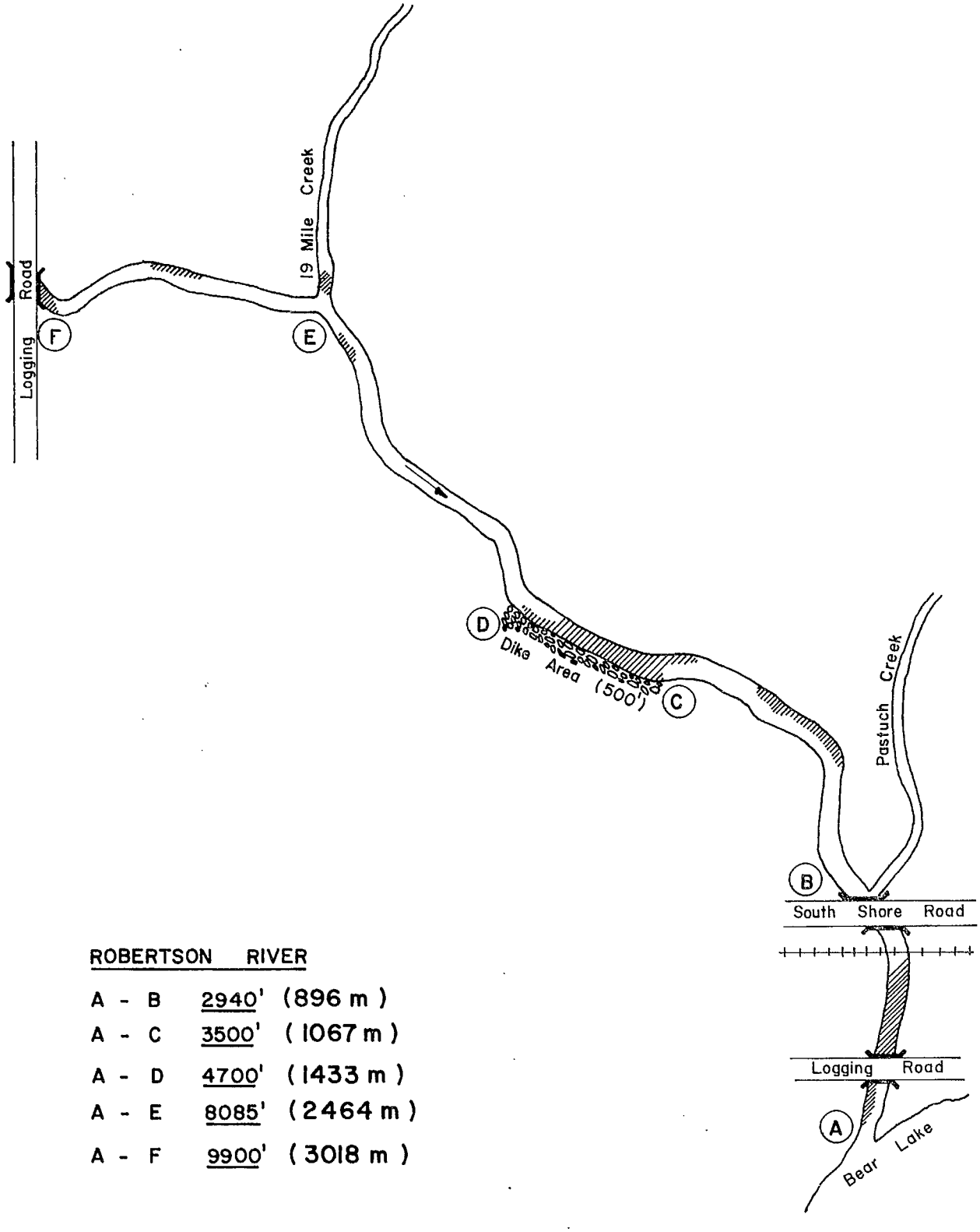



FIG. 2. Sketch map of Robertson River showing coho spawning areas (shaded).

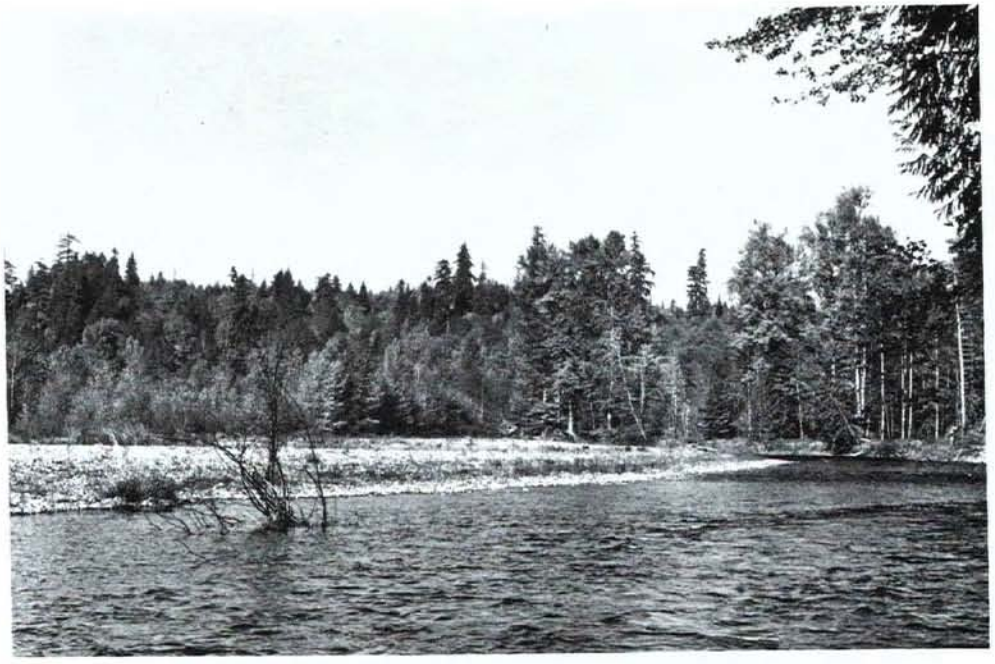


FIG. 3. The Cowichan River (above) in the Riverbottom Road area (Sections 4-5) and Robertson River (below) upstream of the logging road bridge.

Nineteen-Mile Creek enters the Robertson River 2400 m upstream from the river mouth. The lower section of this creek is generally a poor spawning area, with large boulders and few pools. The creek was surveyed occasionally, but coho were only observed in the lower 180 m.

## Robertson River Side Channel

This channel is an unnamed tributary of the Robertson River which enters 180 m downstream from the South Shore Road Bridge (Fig. 4). Before the dikes were constructed, this creek was a side channel open to the Robertson River. The channel is groundwater-fed except during heavy rainfall and snow melt runoff; it dries completely in the summer. Water depth averages 0.3 m at normal flow levels. The channel measures 820 m from the mouth to the spring at the head. Heavy coho spawning occurred along the entire channel.

## Pastuch Creek

Pastuch Creek (Armstrong and Argue, 1977) enters Robertson River immediately upstream from the South Shore Road Bridge (Fig. 5). The lower 320 m of the creek, from its confluence with the Robertson River to a swamp, has excellent spawning gravel. At times this area was densely populated by spawning coho. The swamp, which was impossible to survey, extends a considerable distance upstream. Above the swamp Pastuch Creek has excellent spawning area, well sheltered by alder trees. Coho were seen spawning on the single occasion this upper area was surveyed.

## Half Way Creek

This stream flows into Mesachie Lake (Fig. 1). Coho spawning occurs in the lower 390 m of stream and in a small, unnamed tributary which enters on the left bank (Fig. 6). A small, groundwater-fed tributary of the unnamed creek supported very dense coho spawning despite its small size (average 1.2 m wide and 9.3 m deep).

## Mesachie Creek

Mesachie Creek is a short stream which drains from Mesachie Lake to Bear Lake (Fig. 1). Though the stream mouth is partially obstructed by logs and debris fish passage is not impeded. The creek has a consistent gravel size which is excellent for spawning. No coho spawned in the lower 140 m below the Forestry Road Bridge (Fig. 7). Coho spawned heavily in the 370 m section from the bridge upstream to Mesachie Lake.

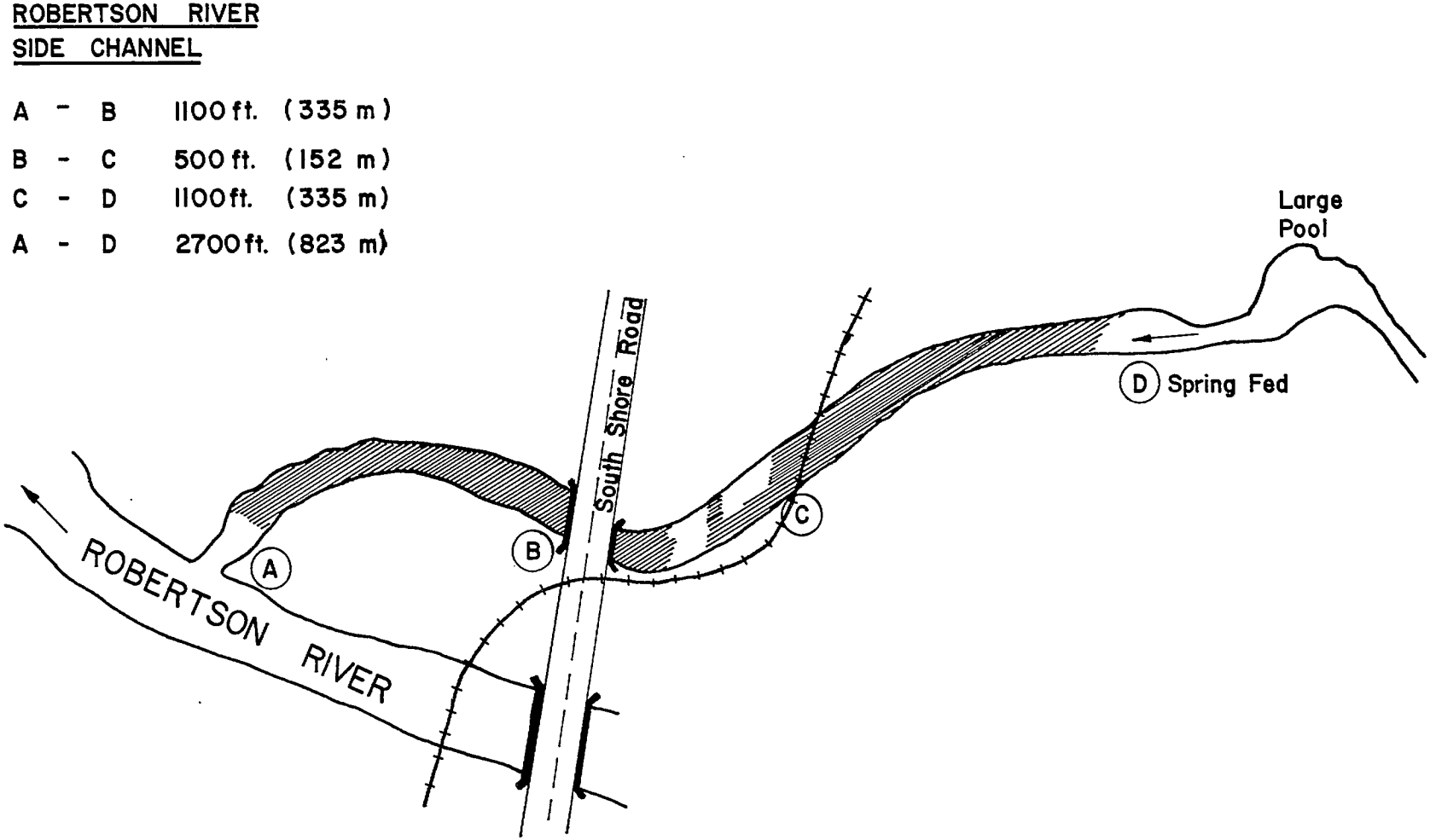



FIG. 4. Sketch map of Robertson River Side Channel showing coho spawning areas (shaded).

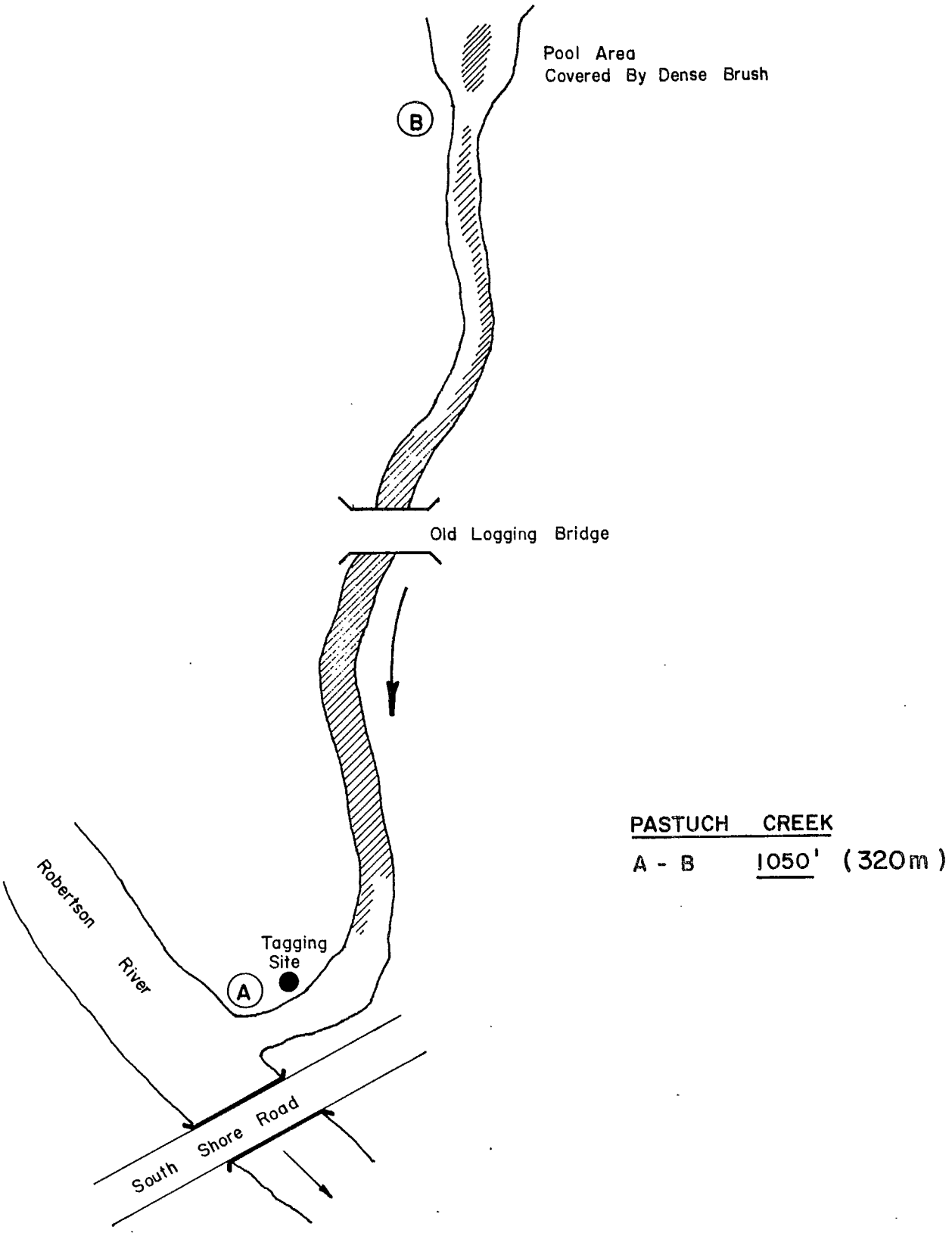



FIG. 5. Sketch map of Pastuch Creek showing coho spawning areas (shaded) and smolt tagging site.

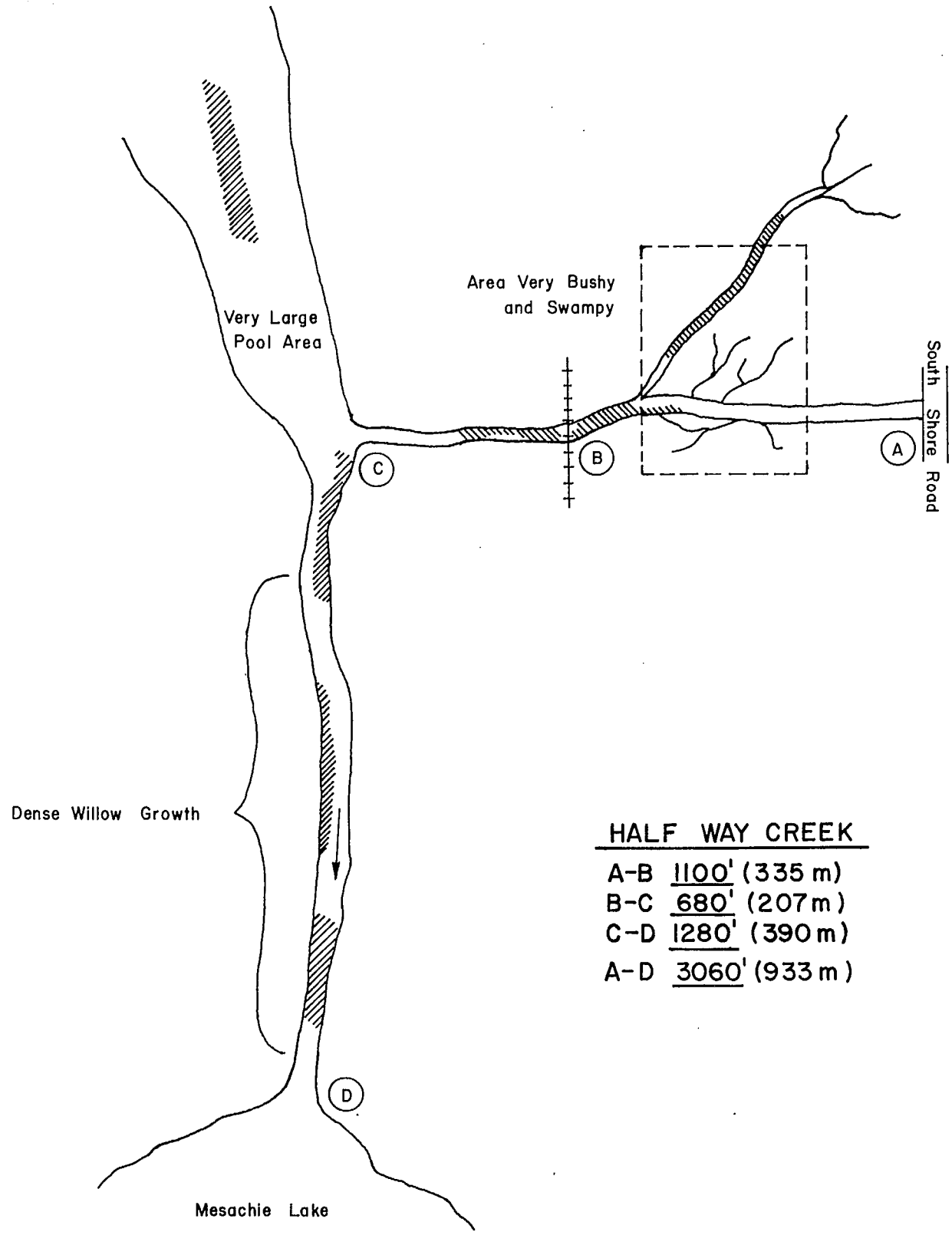



FIG. 6. Sketch map of Half Way Creek showing coho spawning areas (shaded).

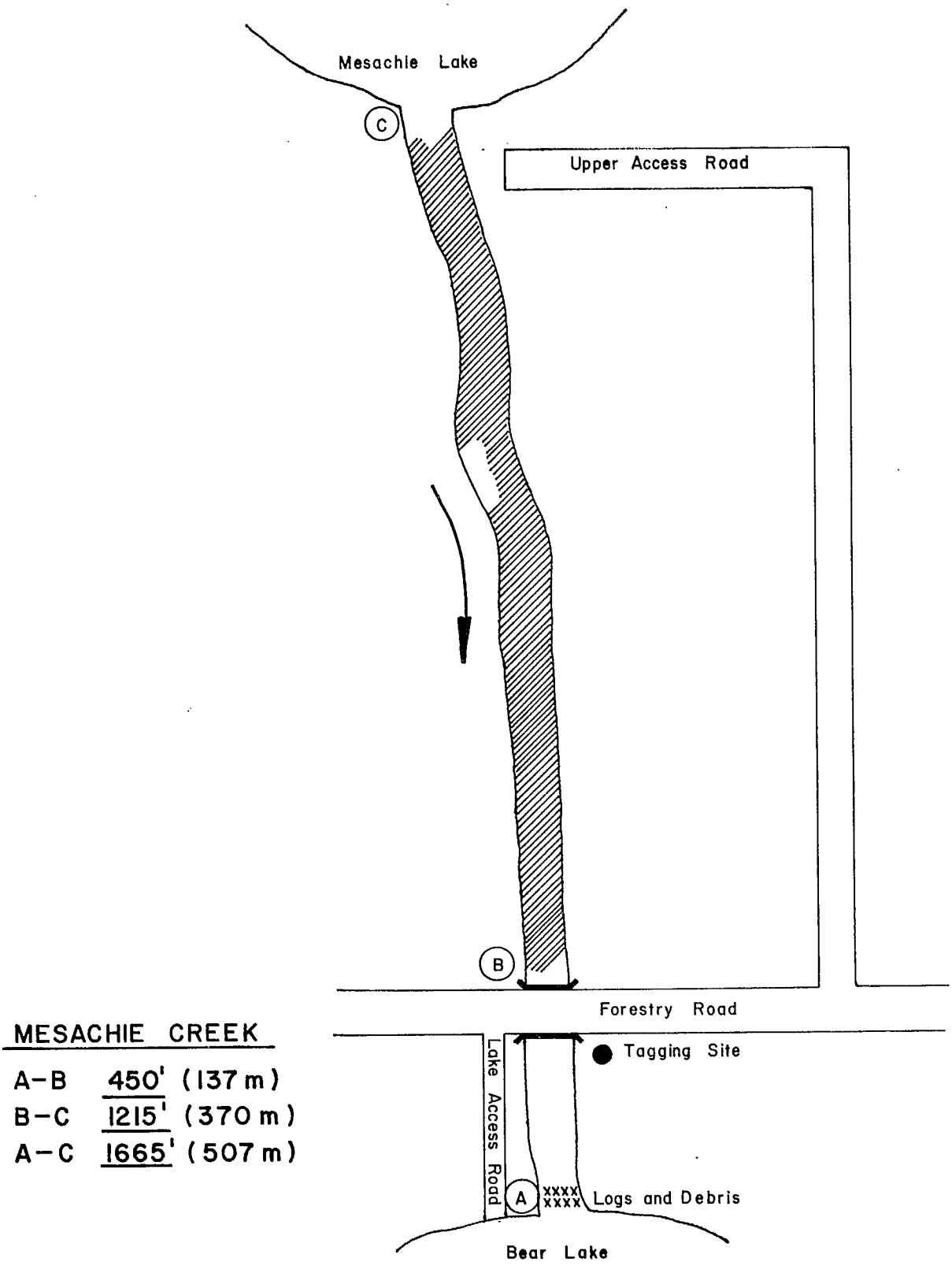



FIG. 7. Sketch map of Mesachie Creek showing coho spawning area (shaded) and smolt tagging site.

## Cowichan Side Channel

This north bank side channel of the Cowichan River (Armstrong and Argue, 1977) is located along Riverbottom Road approximately 4.8 km south of the old Lake Cowichan Highway intersection (Figs. 1 and 8). Even during high water levels in the Cowichan River there is little flow in the channel and the outlet is shallow. Few coho spawners were able to traverse this shallow outlet to utilize the channel. A short, wide channel, dry during normal river levels, links the head of the side channel to the Cowichan River during flood conditions. Heavy coho spawning occurred in this latter channel.

## Bible Camp Side Channel

This side channel, located on the north bank of the Cowichan River 270 m upstream from Cowichan Side Channel (Figs. 1 and 9), was utilized for spawning almost exclusively by chum salmon. Very few coho spawners were observed or recovered as carcasses at this site.

## Rotary Park Pools

The Rotary Park pool and channel complex (Figs. 1 and 10) begins at McKinstry Street on the southern outskirts of Duncan (Armstrong and Argue, 1977). In the upper 90 m coho spawning occurred in all shallow pools and channels connecting the pools.

A ground water-fed channel which starts at the downstream end of the upper channel (at Tagging Site #1 in Fig. 10), and known as Fish Gut Alley, flows for 840 m to join Somenos Creek (Fig. 1). This channel is , in turn, joined by another groundwater-fed channel off the main Cowichan River. The majority of coho spawning in this area occurred in the upper third of Fish Gut Alley and in the upper half of the tributary channel. Coho spawning took place in December and followed heavy utilization of the area by chum salmon.

## Kelvin Creek

This stream is the principal tributary of the Koksilah River (Fig. 1). It enters the Koksilah approximately 4 km upstream from the mouth. Upstream from the powerline crossing the stream is occasionally obstructed by log jams which are passable to coho salmon (Fig. 11). Kelvin Creek Falls, approximately 6500 m above the mouth, forms a barrier to coho migration.

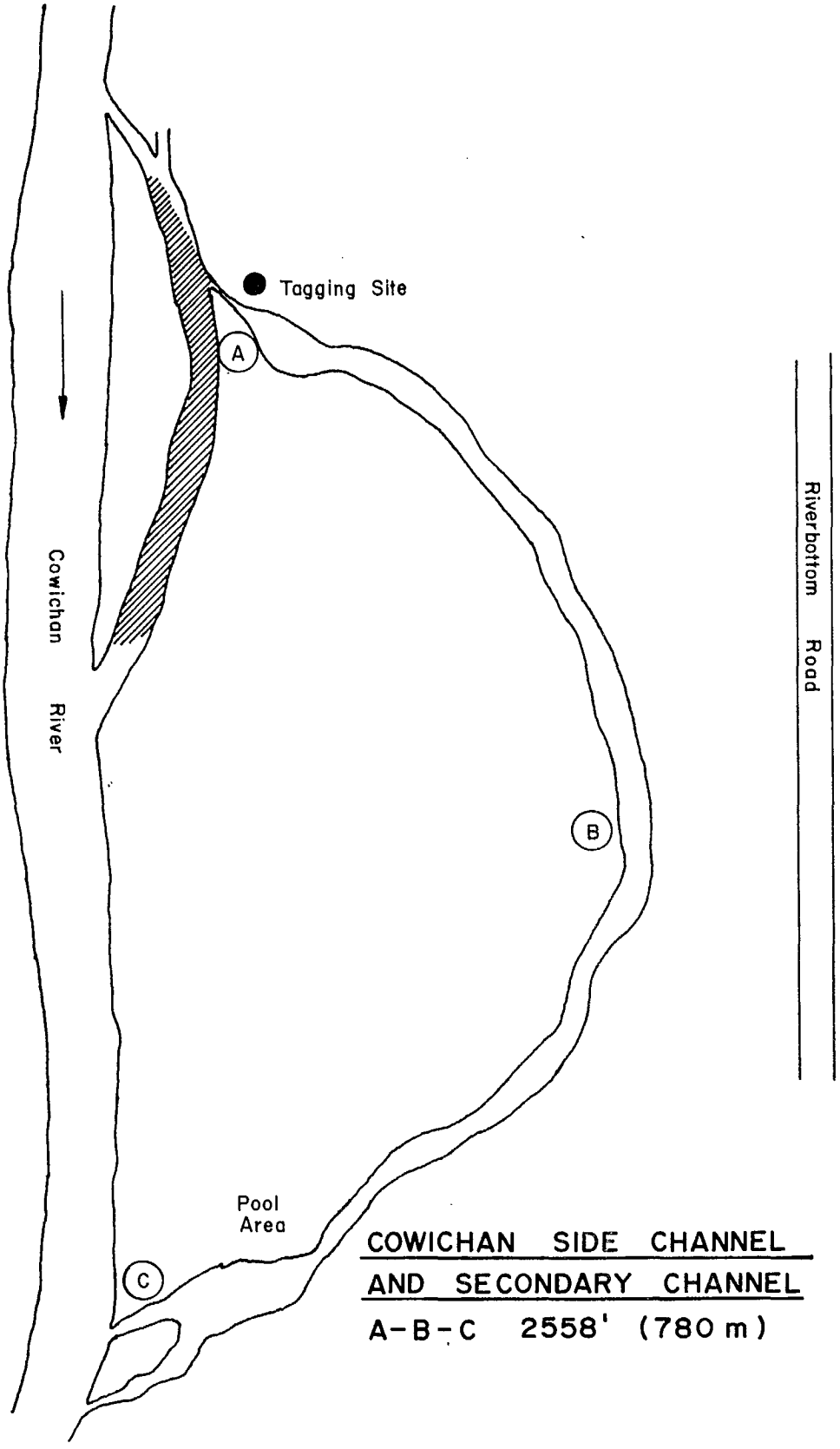



FIG. 8. Sketch map of Cowichan Side Channel and secondary channel, showing coho spawning area(shaded) and smolt tagging site.

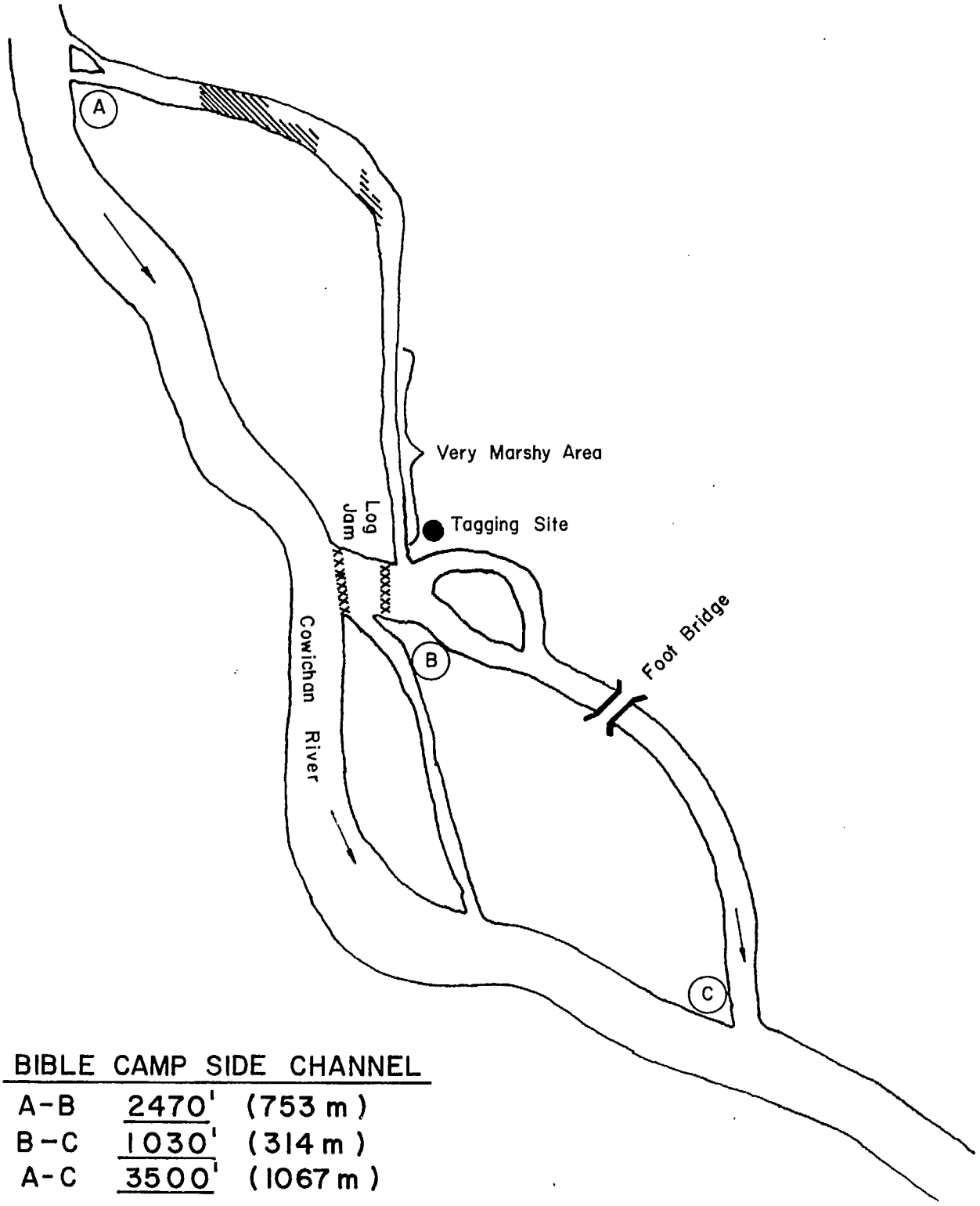



FIG. 9. Sketch map of Bible Camp Side Channel showing coho spawning area (shaded) and smolt tagging site.

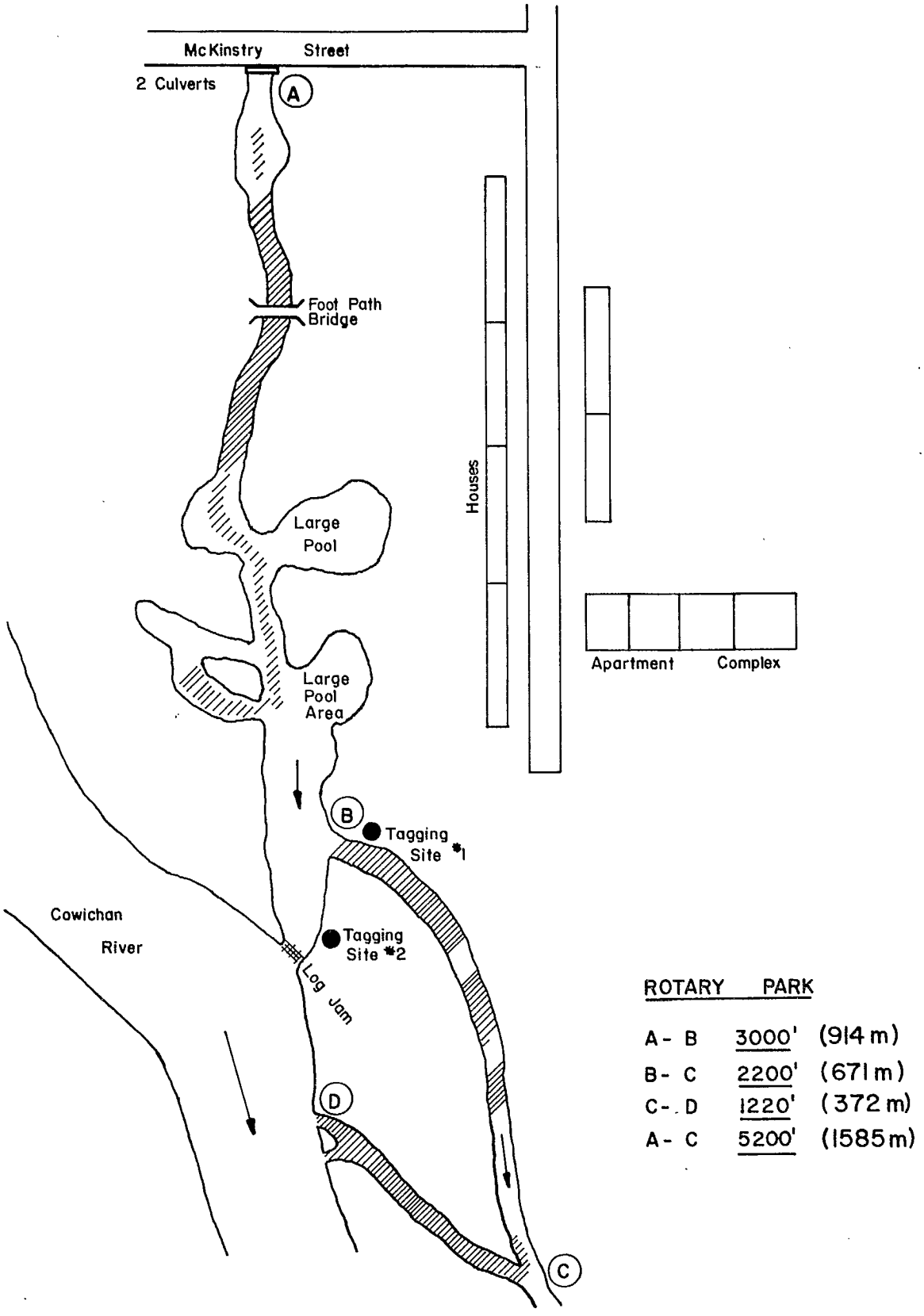



FIG. 10. Sketch map of Rotary Park Pools showing coho spawning areas (shaded) and smolt tagging sites.

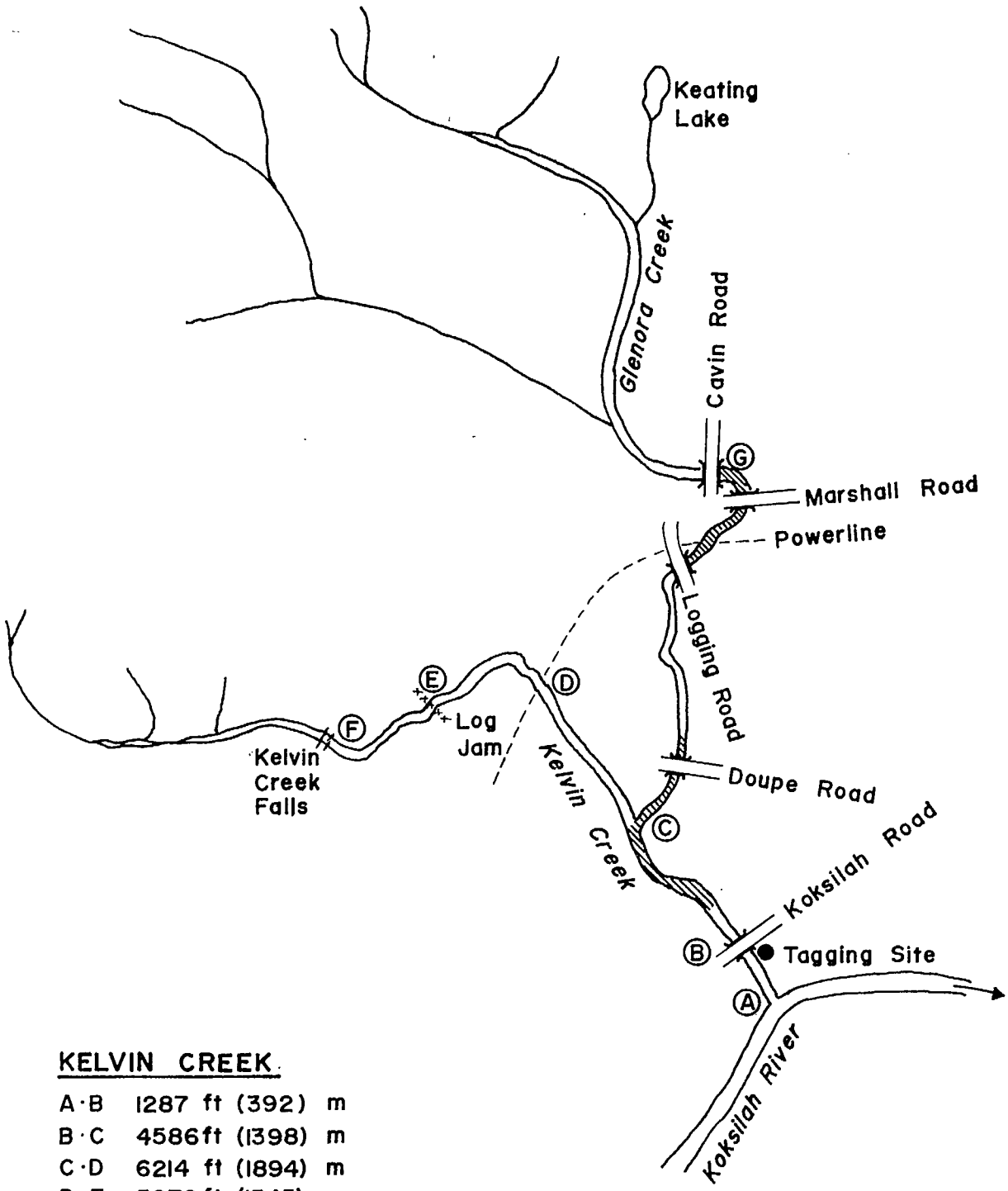



FIG. 11. Sketch map of Glenora and Kelvin creeks showing coho spawning areas (shaded) and smolt tagging site near confluence with Koksilah River.

Kelvin Creek was surveyed regularly from its mouth to the confluence with Glenora Creek, a distance of 1790 m. The majority of coho spawning took place in the upper half of this section, near Glenora Creek. Several chinook carcasses were also recovered.

Glenora Creek

Glenora Creek flows into Kelvin Creek approximately 1970 m upstream from the Koksilah River. The stream consists of gravel with patches of boulders and rocks. There are few pools.

Glenora Creek was surveyed regularly from Kelvin Creek to Cavin Road, a distance of approximately 4.8 km (Fig. 12). Coho were observed spawning and carcasses were recovered along the section surveyed. Chinook carcasses were recovered in the lower reaches of Glenora Creek.

## METHODS

Adult chinook and coho salmon escapements to the Cowichan-Koksilah River system were assessed during the years 1976 to 1979 to provide information on returns of marked and unmarked adults from the smolt migrations in 1975 and 1976. The following approaches were used to estimate salmon escapements;

(i) tagging and recovery of tags by purse seine in Cowichan Bay;

(ii) tagging in Cowichan Bay with recovery of tags on the spawning grounds;

(iii) tower counts of adult migrants in the Cowichan River; and

(iv) swim survey counts of spawners in the Cowichan River.

Methods of data collection and treatment are outlined in the following sections.

## ESTUARY PURSE SEINING AND TAGGING

Purse seining was conducted in Cowichan Bay to obtain chinook and coho salmon for marking with external tags, to determine the tagged: untagged ratio for population estimates, and to examine samples of adult salmon for coded-wire tags and the incidence of coded-wire tagged fish. Seining was carried out during the following periods:

| | |
|---|---|
| 1976 | September 30 to October 28 |
| 1977 | September 22 to October 28 |
| 1978 | September 21 to October 6 |
| 1979 | September 21 to October 12 |

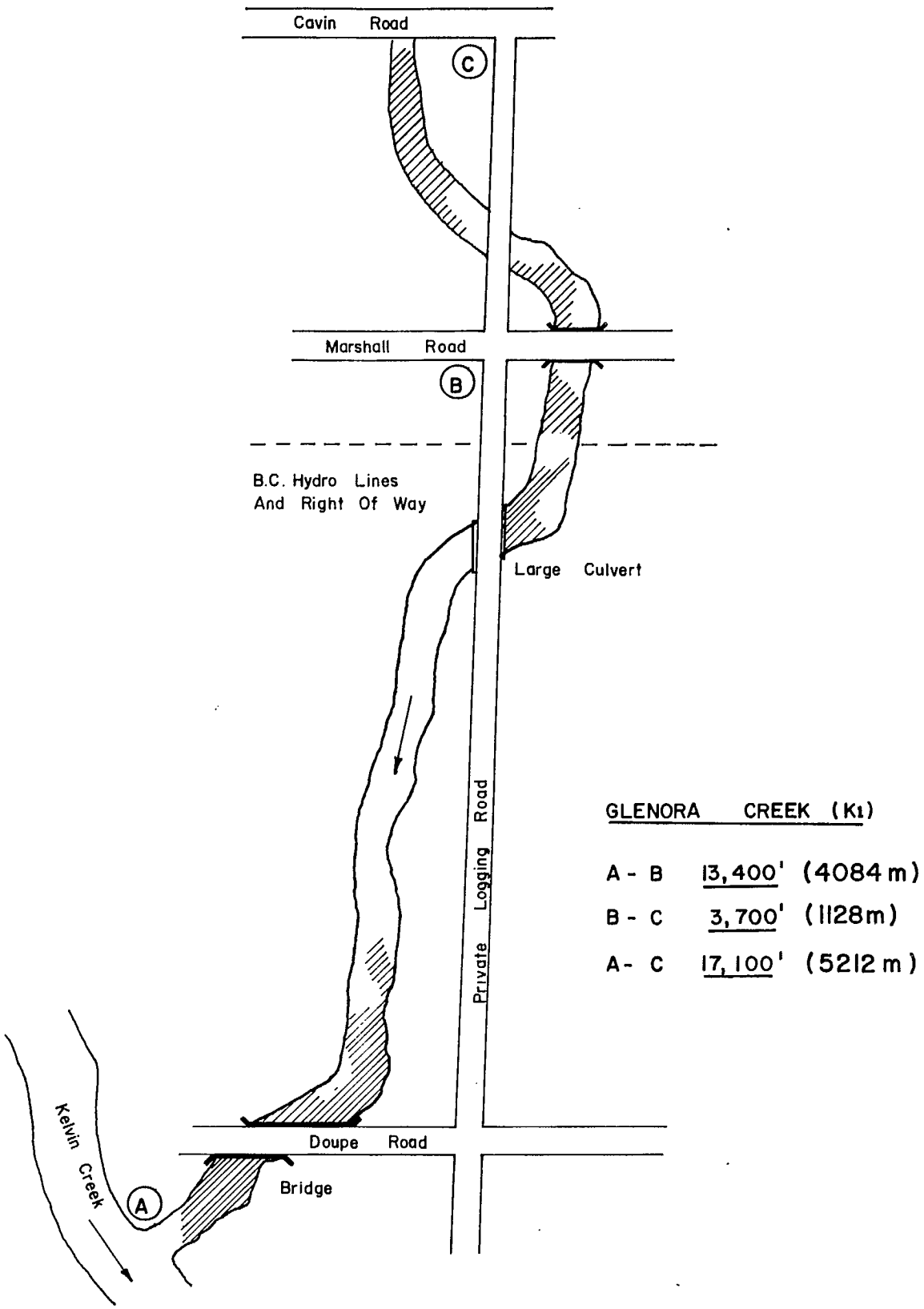



FIG. 12. Sketch map of Glenora Creek showing coho spawning areas (shaded).

## Equipment

A 12 m purse seiner, the M V Walker Rock, and a 5.5 m seine skiff were used for the seine operation (Fig. 13). The seine net measured 274 m long and 37 m deep. The net material was made of knotless nylon, with 25 mm mesh body web and 6 mm mesh bunt to reduce scaling and entanglement of the salmon. When the bunt was altered to 25 mm mesh knotless web in 1978, scaling and entanglement did not noticeably increase.

## Seining

Purse seine sets were made in the vicinity of jumping or finning fish sightings on the edge of the main school of salmon at the mouth of the Cowichan River. Large schools were avoided. To minimize stress, catches were generally limited to 150 coho or 50 chinook. Larger catches were released.

Seining was restricted to within 0.8 km of the estuary drop-off to reduce catches of transient salmon. The principal seining areas are shown in Fig. 14 and the locations of individual sets are listed in Appendix 1. Seining was conducted only during daylight to prevent excessive catches of juvenile herring which could suffocate or stress salmon held in the bunt for tagging.

## Tagging

Salmon were retained for tagging by using the seine bunt as a holding pen (Fig. 13). Individual fish were dipnetted by 2 crew members on the M V Walker Rock and then passed to the other 2 crew members in the skiff alongside. In 1976, the coho were removed from the water and placed in a plastic cradle for tagging and biological sampling. To prevent injury, chinook were held in the water while being tagged, and only removed to the cradle when biological samples were taken. In 1977, a larger crew sped up the tagging process, permitting coho and chinook to be held out of water while being tagged. Only chinook were tagged in 1978 and 1979.

External Floy spaghetti and Petersen disk tags were used for tagging (Fig. 15). Coho were tagged with disk tags in 1976 and spaghetti tags in 1977. In addition, 878 coho were double-tagged with disk and spaghetti tags in 1977 to measure the rate of tag shedding. Chinook were tagged only with spaghetti tags to reduce tagging time and therefore minimize stress. Detailed information on tagging dates and tag numbers applied is given in Appendix 2. The total numbers of fish tagged by species and year were as follows:

FIG. 13. The purse seiner Walker Rock (above) and holding salmon for tagging in the seine bunt (below) in Cowichan Bay.

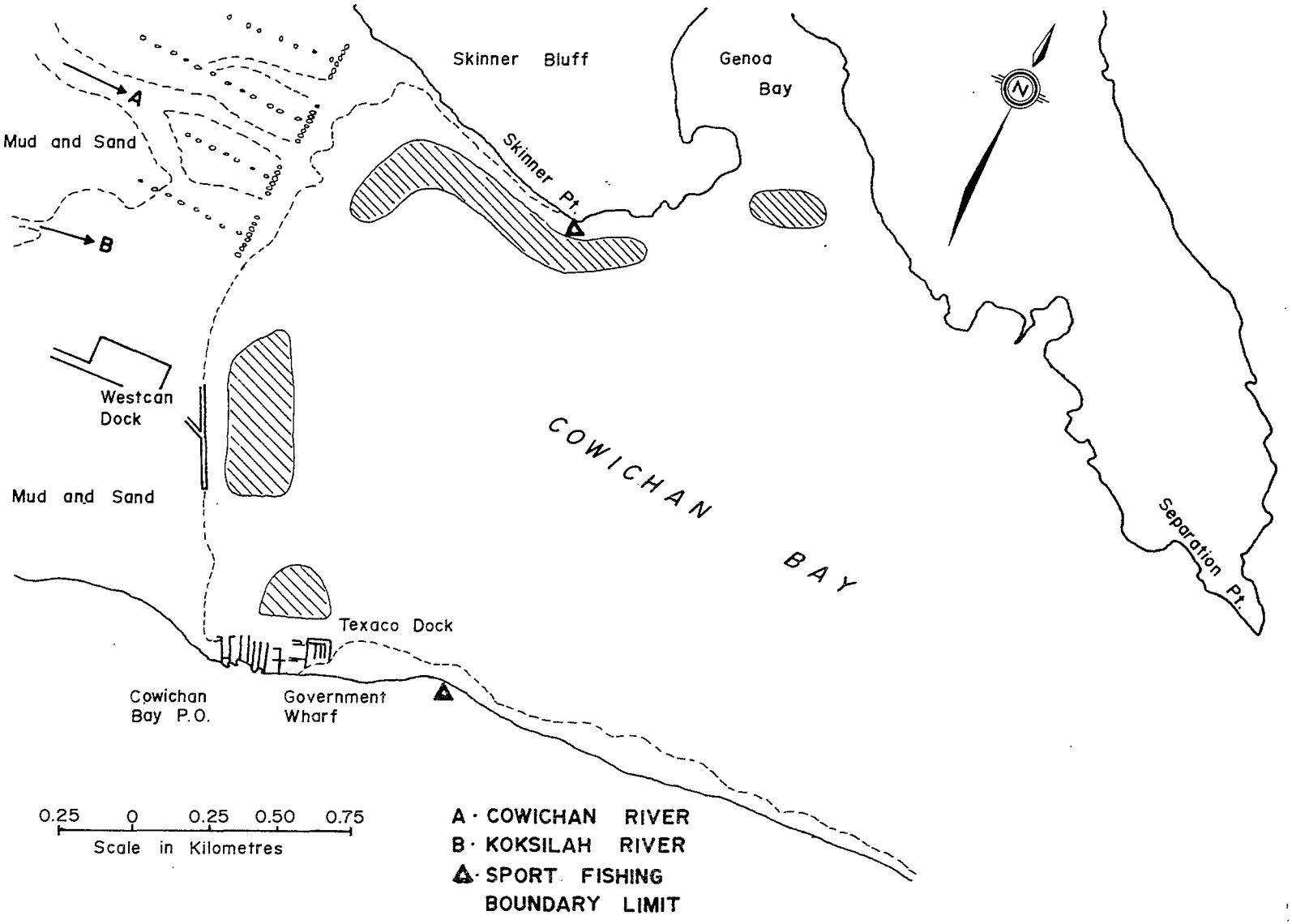



FIG. 14. Map of Cowichan Bay showing main locations of purse seining (shaded areas) for adult chinook and coho salmon.

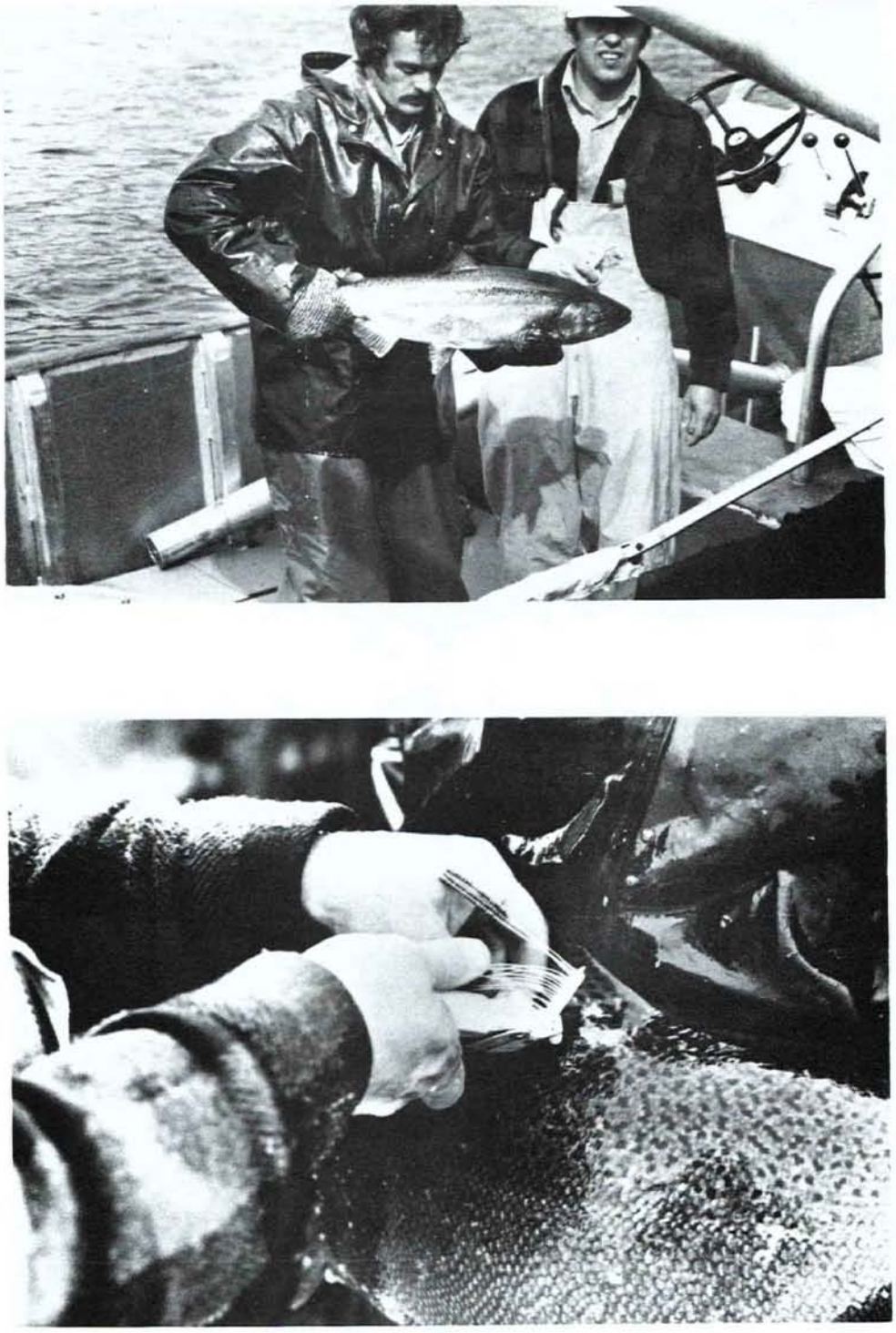


FIG. 15. A Floy spaghetti tag being applied to a chinook salmon captured by seining in Cowichan Bay.

| | Chinook | Coho |
|---|---|---|
| 1976 | 794 | 1103 |
| 1977 | 1092 | 5111 |
| 1978 | 48 | |
| 1979 | 239 | |

Tagged salmon recaptured in the estuary by purse seine were all released alive following the recording of the tag number.

## SPAWNING GROUND DEAD RECOVERY

Chinook and coho salmon carcasses were examined on the spawning grounds to determine the tagged:untagged ratio for population estimation, to recover coded-wire tags and to determine the incidence of coded-wire tagged fish in the escapement.

Carcass recovery surveys were conducted on the Cowichan River, Robertson River, Pastuch Creek, Mesachie Creek, Bible Camp Side Channel, Cowichan Side Channel, Rotary Park Channel, and on two Koksilah River tributaries, Kelvin and Glenora creeks (Fig. 1). Glenora Creek was only surveyed in the 1977-1978 season. The surveys spanned the following periods: November 5, 1976 to February 7, 1977; November 8, 1977 to February 3, 1978; November 1 to November 21, 1978; and November 14 to December 3, 1979. The shorter periods in 1978 and 1979 reflect the fact that surveys were concerned only with chinook salmon in those years.

A consistent weekly recovery effort was maintained on all study and nearby areas except during high water conditions and heavy snowfall. Areas of spawning concentration were noted. The length of each recovery area was measured with a "Top-O-Fill" chain. On the Cowichan River an outboard-powered inflatable boat was used (Fig. 16), whereas other study areas were covered on foot.

All carcass recoveries were counted, checked for external tags and missing fins, and cut in half to prevent double counts. Carcass and tag recoveries were recorded by stream and by river section in the main Cowichan River (Fig. 17).

## PROCESSING OF CODED-WIRE TAGGED FISH

When an adipose-clipped fish from the 1975 and 1976 coded-wire tagging operations was recovered, length measurements and scale samples were taken. The head was removed behind the eye sockets and placed in a plastic bag with waterproof paper recording the date, location, scale book and number, length, sex and condition of adipose clip (clean or partial clip). All 1976 samples were placed in formaldehyde, whereas

FIG. 16. Salmon carcass recovery in the Cowichan River near Cowichan Lake (upper), and (lower) taking length measures and scale samples from chinook carcasses.

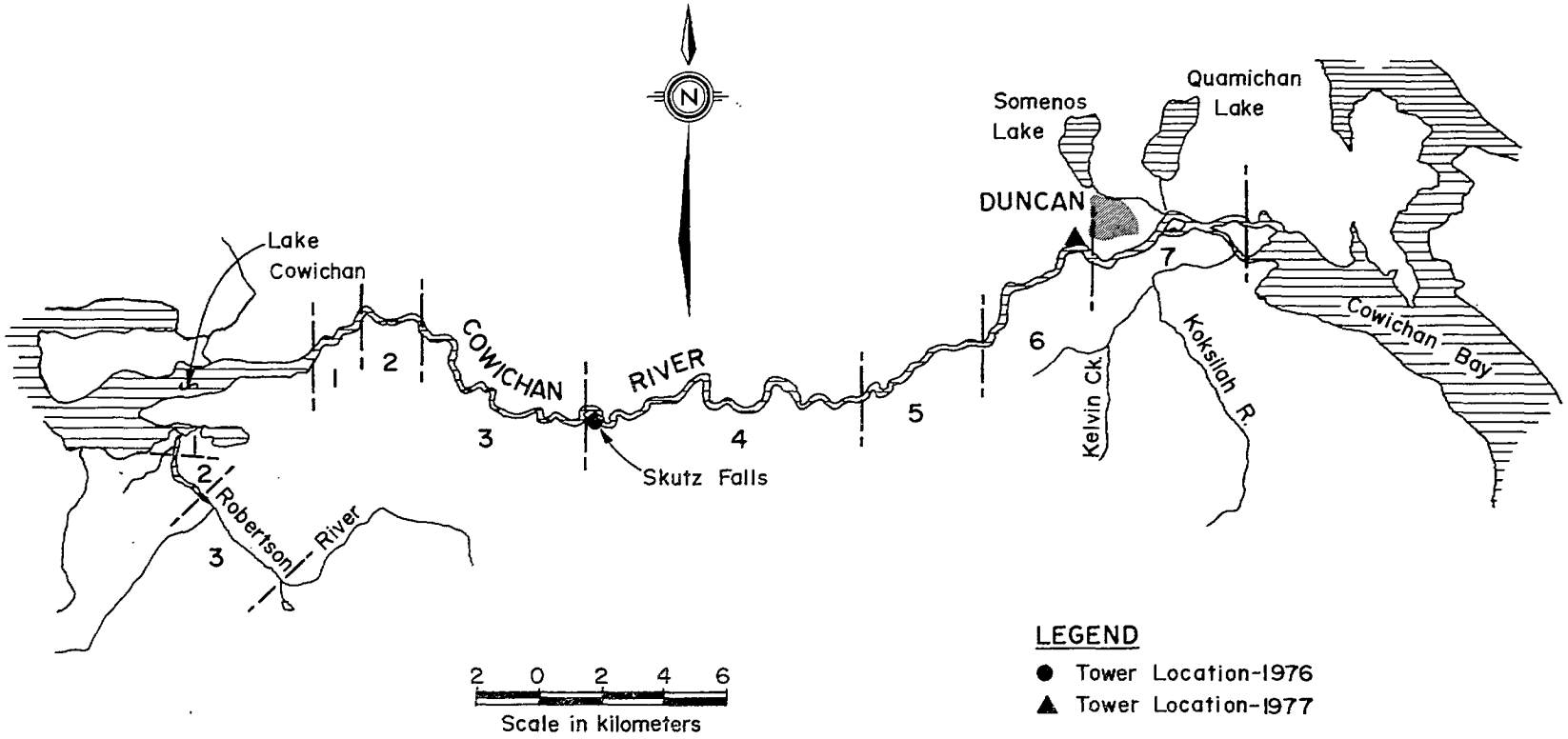



FIG. 17. Map of the Cowichan River showing carcass recovery sections and counting tower locations in 1976 and 1977.

in the following years samples were frozen. The heads were later transported to the Head Laboratory in Vancouver for tag extraction and decoding.

## TOWER COUNTS

Counting towers were used on the main Cowichan River to enumerate upstream migrating chinook and coho salmon in 1976 and 1977. The counting periods were September 19 to November 24, 1976 and September 20 to October 29, 1977.

In 1976 the counting tower was located on the south bank of the river approximately 600 m downstream of Skutz Falls (Fig. 17), the same site that had been used for tower counts in earlier chinook and coho salmon studies (Lister et al., 1971). At this site the counting background was 28 m long, water depth ranged from 0.5 m to 0.8 m, and water clarity was high (Fig. 18). However, the site provided only partial enumeration, as a portion of the chinook and coho spawning occurs downstream of the tower.

To include most of the chinook and coho spawning in the Cowichan River system, the tower was moved downstream in 1977 to a site on the north bank of the river near the Duncan Water Works auxiliary pumphouse (Figs. 17 and 19). The counting background was 31 m long and water depth measured 0.8 m to 1.2 m, 50% greater than at Skutz Falls. Though water clarity was relatively high, the visibility of fish was reduced somewhat by the greater water depth.

### Facilities

A counting background of aluminum, expanded metal screens was attached to the river bottom and to a cable anchored in the river (Fig. 18). The remainder of the stream was screened by a broomstick diversion fence. An observer in the counting tower on the river bank opposite the fence overlooked the counting background from a height of 5.5 m. Spotlights were suspended from a cable to provide illumination for night counting.

During the 1977 study period a field trial of electronic counting tunnels was also conducted. The electronic counters were installed in a fence just downstream of the counting background (Fig. 19).

### Counting Procedures

Previous studies of adult chinook and coho migrations in the Cowichan River (Lister et al., 1971) had indicated that prior to the peak of migration, upstream movement was greatest between dusk and early morning (1800 - 0800 hours), whereas at the peak of migration the greatest movement occurred during the afternoon (1200 - 1800 hours). On this basis,

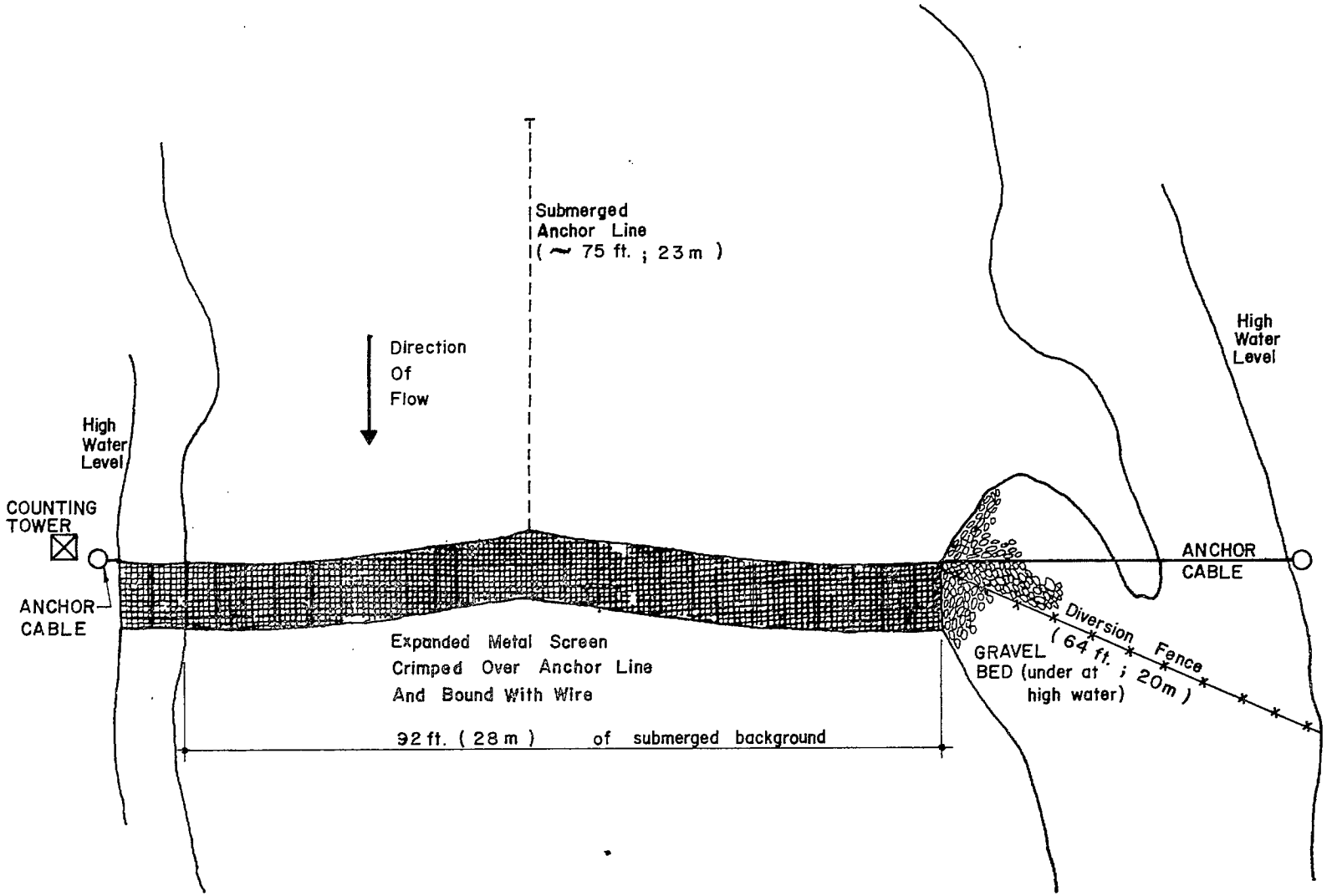
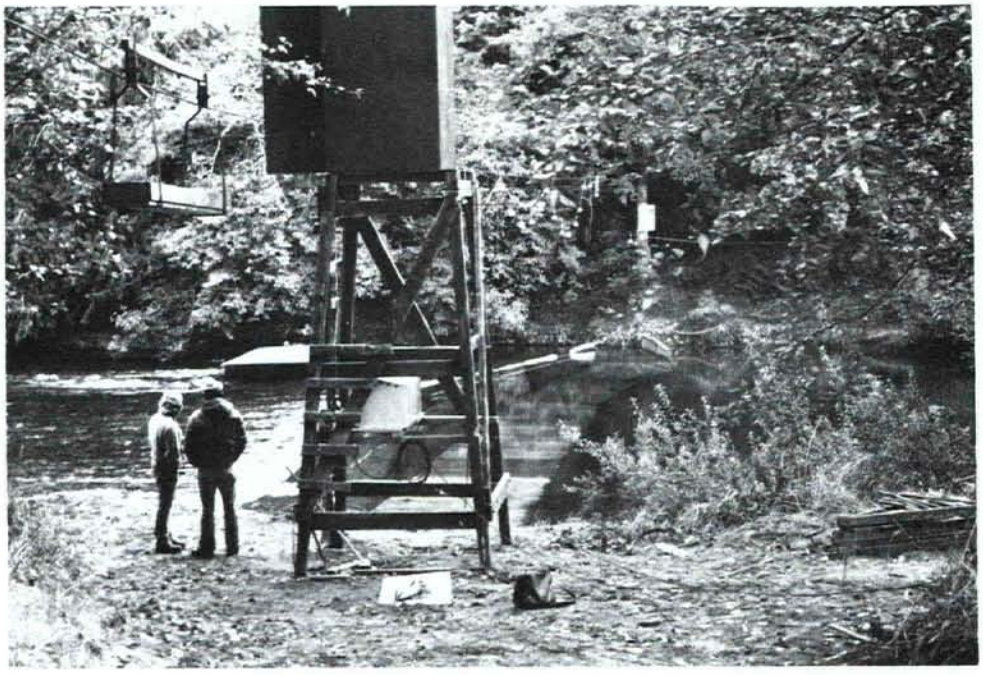



FIG. 18. Diagram of the Skutz Falls tower count site on the Cowichan River in 1976.



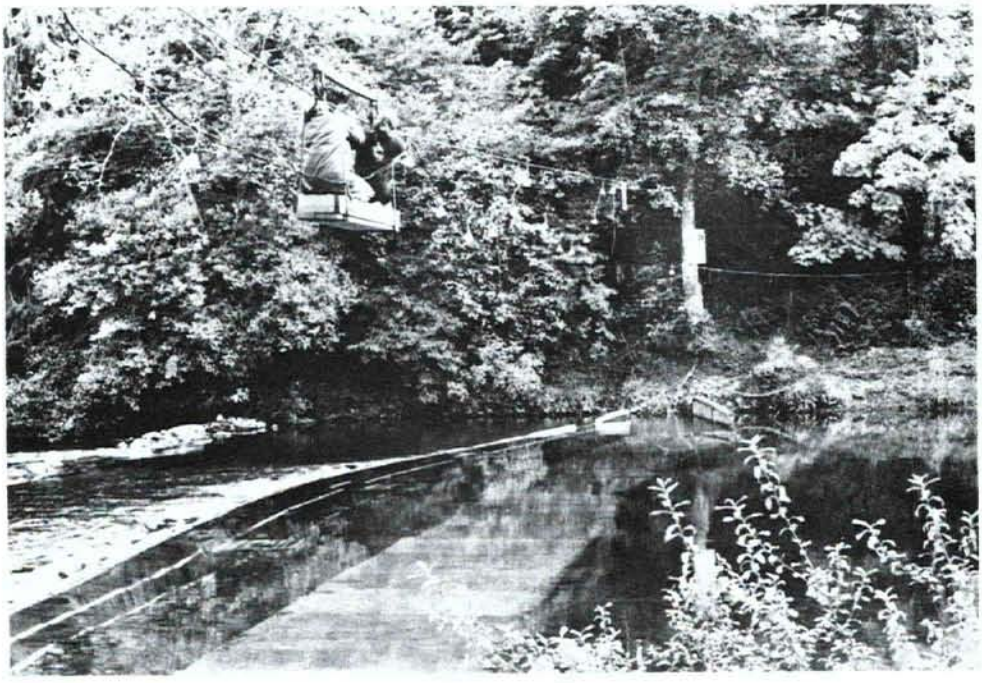


FIG. 19. The 1977 tower count site near the Duncan Water Works auxiliary pumphouse on the Cowichan River, showing counting fence installation for electronic counters immediately downstream.

daily tower counts were generally conducted during the period when the majority of fish were expected to migrate, most commonly for 4 hours at dawn and 4 hours at dusk. Throughout all counting schedules a regime of 15 minutes counting and 15 minutes rest was followed to prevent the observer from losing concentration. During the counting period all species were recorded. Fish which moved downstream past the tower were recorded as a negative count.

### 24-hour Counts

To estimate the proportion of the total fish migration actually being counted during each 4-hour period, 24-hour continuous counts were undertaken periodically throughout the migration. The percentage of the 24-hour count in each 2-hour interval was calculated. The counts during 4-hour periods were then expanded by the appropriate factor (based on the 24-hour total) to derive estimates of migration for each 24-hour period throughout the run. Since counting only took place half the time, the counts in each period were doubled before calculation of the daily migration.

In 1977, nine 24-hour counts were made during the period September 20 to October 27. In 1976, however, only three 24-hour counts were conducted over the period November 2 - 9. Extremely low river flow and a consequent low rate of upstream movement during the period preceding peak migration in 1976 precluded the conduct of 24-hour counts in that period.

### Effects of High River Flows

In 1977 high river discharge and turbid water reduced the visibility of salmon migrants and prevented counts during the later stages of the run. Tower counts were terminated on October 29, prior to conclusion of the coho migration, after high flows had washed the counting background from the river bottom.

## RIVER SWIM SURVEYS

Estimates of salmon and trout in the main Cowichan River were also developed from swim survey observations during each of the four study years (Appendix 15). The number and timing of the surveys in each year is summarized below:

| Year | No. of Surveys | Survey Dates |
|---|---|---|
| 1976 | 1 | October 25-28 |
| 1977 | 5 | August 23-26<br>September 6-9<br>September 20-21<br>October 3-6<br>October 17-20 |
| 1978 | 3 | September 26-28<br>October 16-18<br>November 15 |
| 1979 | 3 | September 21<br>October 11<br>November 6 |

## Equipment and Personnel

In 1976 and 1977 a 2.9 m outboard-powered inflatable boat, with a 1 or 2 person crew, was used to float the river with 2 snorkel-equipped swimmers in wet suits. In 1978 the river was surveyed by 3 swimmers accompanied by a boat. River swim surveys were conducted in 1979 by fishery officers and provincial Fish and Wildlife Branch technicians using a boat and 2 swimmers.

## River Sections

The river was divided into the following sections for recording of swim survey data (Fig. 1):

| | |
|---|---|
| Section 1 | Lake Cowichan to Block 51 |
| Section 2 | Block 51 to Skutz Falls |
| Section 3 | Skutz Falls to Stoltz Pool |
| Section 4 | Stoltz Pool to Cowichan Bible Camp |
| Section 5 | Cowichan Bible Camp to Cowichan Estates |
| Section 6 | Cowichan Estates to White Bridge (1976) and to Silver Bridge (1977-79), Sections 6 & 7A |
| Section 7 | White Bridge To Indian Reservation (1976) |

## Fish Counts

Each survey started at the head of a defined river section. The swimmers kept close together, each counting fish on one side of the river. Allowance was made for fish darting from one side of the river to the other. The numbers of fish were counted individually, where possible,

and estimated in large pools where fish tended to school and swim in circles. By watching the swimmer's position in the river the observer in the boat could estimate the number or proportion of fish not seen by the swimmers.

In 1976 several sections were covered per day with aid from provincial Fish and Wildlife Branch personnel. In 1977, 1978 and 1979 only one section was generally surveyed per day.

## AGE, SEX AND SIZE COMPOSITION

Length measurements and scale samples were taken from chinook and coho salmon (i) captured by purse seine in the estuary and (ii) recovered as carcasses on the spawning grounds. In the estuary, fork length measurements (tip of snout to fork of tail) to the nearest 1 cm were taken. On the spawning grounds, hypural length (posterior edge of eye socket to posterior edge of hypural plate) measurements were recorded to the nearest 0.5 cm.

All chinook and coho spawning ground dead recoveries and chinook catches in the estuary were identified as to sex. Although a portion of the coho catches in the estuary was also sexed, seine-caught coho were not sufficiently mature to ensure accurate identification of sex.

Scale analysis was carried out by personnel of the Vancouver scale laboratory of the Department of Fisheries & Oceans. Age designation in this report follows the system of Gilbert and Rich (1927) for anadromous fish, where a salmon in its 4th year, which migrated to sea in its 2nd year (ie. having 1 freshwater annulus and 2 ocean annuli), would be designated as $4_2$.

## MATURITY OF FISH CAUGHT IN THE ESTUARY

Chinook and coho salmon captured by seine in the estuary were classified as to stage of maturity according to the following criteria:

| | |
|---|---|
| Bright: | Silver. |
| Medium: | Beginning to turn grey. |
| Dark: | Reddish sides (nearly black in chinook). |

## ESTIMATION OF SPAWNING POPULATIONS

### Estuary Tagging and Recovery

Estimates of adult chinook and coho salmon populations in the Cowichan

estuary were developed from data on tagging and recovery within the estuary. Daily catch and tagging information is presented in Appendix 3 and summarized for each year in Table 2.

The Schnabel multiple-census method (Ricker, 1975) was used to estimate estuary populations of maturing chinook and coho in 1976 and 1977. The Schnabel formula, modified by Chapman, is expressed as follows:

$$N = \frac{(C_t M_t)}{R + 1}$$

where N = Population estimate.
$M_t$ = Total number of tagged fish at large at the start of the t th interval.
$C_t$ = Total sample examined during the t th interval.
R = Total number of tag recaptures during the study.

The input data for each Schnabel estimate are given in Appendix 4.

## Estuary Tagging and Spawning Ground Dead Recovery

Chinook and coho salmon population estimates were also developed from data on tagging in the Cowichan estuary and subsequent recovery and examination of carcasses for the tagged-to-untagged ratio on the spawning grounds. The tagging data are presented in Table 2, spawning ground recovery data are listed on a daily basis in Appendices 5 and 6, and tag recoveries by sport and native fisheries are listed in Appendices 7 and 8.

The following table summarizes spawning ground carcass and tag recoveries by year:

| Species | Year | Carcasses Examined | | No. of Tags Recovered | | |
|---|---|---|---|---|---|---|
| | | Large | Jack | Floy | Disk | Double |
| Coho | 1976-77 | 1420 | 57 | | 26 | |
| | 1977-78 | 5882 | 81 | 72 | | 12 |
| Chinook | 1976 | 998 | 612 | 14 | | |
| | 1977 | 719 | 54 | 11 | | |
| | 1978 | 1175 | 413 | 1 | | |
| | 1979 | 657 | 15 | 6 | | |

As all tag recoveries were from large, non-jack fish, spawning population estimates based on spawning ground dead recovery were not developed for either chinook or coho jack males, aged $2_1$ and $2_2$ respectively.

Spawning population estimates were developed using the formula for an adjusted Petersen estimate (Ricker, 1975):

$$N = \frac{(M + 1)\ (C + 1)}{R + 1}$$

N = Petersen estimate.
M = Number of fish tagged.
C = Number of carcasses examined.
R = Number of tagged fish recovered.

TABLE 2. Summary of tag application and recovery in the Cowichan estuary, 1976 to 1979.

| Species | Year | No. of Tags Applied | | | Total Number | | |
|---|---|---|---|---|---|---|---|
| | | Spaghetti | Disk | Double Tagged | Tagged | Examined for Tags | Recovered with Tags |
| Coho | 1976 | | 1103 | | 1103 | 1229 | 24 |
| | 1977 | 4233 | | 878 | 5111 | 5516 | 183 |
| Chinook | 1976 | 794 | | | 794 | 1237 | 61 |
| | 1977 | 1092 | | | 1092 | 1708 | 115 |
| | 1978 | 48 | | | 48 | 471 | 0 |
| | 1979 | 239 | | | 239 | 239 | 0 |

The number of tags available for recovery was estimated by subtracting sport, native and loose tag recoveries (which would not be available for recovery on the spawning grounds) from the number of tags applied in the estuary. A further reduction in tags available for recovery due to tag shedding was calculated from double-tagging experiments on coho in 1977. Appendix 9 shows the input data for each Petersen-type population estimate.

## Tag Loss

A total of 878 coho were double-tagged with Floy spaghetti and Petersen disk tags in the Cowichan estuary to estimate the rate of tag shedding. A tag loss of 25% for Floy spaghetti tags and 55% for Petersen disk tags was calculated for the period from estuary tagging to carcass recovery on the spawning grounds. These tag loss rates were applied in calculating the Petersen-type population estimates of chinook as well as coho (Appendix 9).

Only 18 of 53 double-tagged recoveries were used in estimating tag loss. Recoveries from estuary purse seining, sports and native fishermen were not included in tag loss calculations as they were recovered prior to spawning. As tag shedding is based on only 18 recoveries from a total of 878 double-tagged coho, it is considered that the tag loss estimates are rough approximations.

## 1976 Tower Counts

In 1976 24-hour counts on November 2 and 3, which indicated the numbers of fish moving in each 2-hour period, were used to establish the diel migration pattern for the peak migration period. The diel migration patterns used to estimate peak chinook and coho migration outside of the counting periods were obtained by averaging the November 2 and 3 counts for each 2-hour period (Appendix 11).

Estimates of daily migration during the period preceding the peak (September 19 to November 1) were based on counts during the known principal period of daily fish movement (1800 - 0600 hours). During the peak of migration (November 2 to 11) counts were made for 8 to 12 hours in each 12-hour period. Following the peak migration counts were conducted for 12 hours daily until the end of the run on November 24.

As some spawning occurred downstream of the Skutz Falls tower site, the total tower counts were adjusted to account for the estimated proportion spawning below the tower (Appendix 14). Carcass distribution indicated that 24% of the large chinook, 18% of the jack chinook and 19% of the coho spawned downstream of the tower. The coho population estimate was increased by a further 4500 to include arrivals observed by field technicians after the tower count was terminated.

### 1977 Tower Counts

In 1977 diel migration patterns, established from nine 24-hour counts throughout the migration period, were used to develop daily migration estimates from the numbers actually counted in 9 periods (Appendices 12 and 13). As the tower was located downstream of all chinook and most coho spawning in the Cowichan system, only adjustments for coho spawning in the Koksilah system (1.8%) and Rotary Park Pools on the lower Cowichan River (5%) were necessary in 1977.

### River Swim Surveys

Population estimates were also obtained from counts of adult salmon by swimmers. The numbers counted by swimmers were expanded to account for the percentage of fish not observed. Expansions were based on the estimated proportion in each stream section which the boat observer judged to have been accounted for in the swimmer's counts.

Swim survey counts closest to the peak spawning period were used to estimate the spawning population of chinook in 1976, 1978 and 1979 (Appendix 15). Swim surveys were concluded before the peak of coho spawning, and therefore only provided an estimate of the population present in the river at the time of the survey. Estimates of chum salmon and trout in the river at the time of the survey are also presented.

## ESTIMATION OF ADULT RETURNS BY BROOD YEAR

Returns of 1973 and 1974 brood year coho and 1974 and 1975 brood year chinook were estimated as a step in determining the proportion of returning coded-wire tagged fish from those brood years. The procedures used to estimate adult returns from each brood year are outlined below.

Chinook Salmon

Chinook age and sex composition in each year of return were determined as follows:

(i) Jack male chinook (age 2) returns were estimated separately from large chinook returns, based on the proportion of jacks observed in swim surveys in 1976 and 1978, at the counting tower in 1977, and in 1979 by the average proportion of large-to-jack chinook in 3 previous years. In 1979 jack chinook abundance was not recorded in the swim surveys. Due to the fact that jack chinook carcasses were probably less available to recovery than large chinook carcasses on the spawning grounds, it was considered that live count methods would provide the least biased estimate of proportion of jack chinook in each year.

(ii) The sex composition of large chinook was estimated from the average of samples collected in the estuary and on the spawning grounds.

(iii) For each sex separately, the age composition of large chinook (age 3,4 and 5) was estimated from the average of estuary and spawning ground samples in 1976 and 1977, and from spawning ground samples alone in 1978 and 1979.

The numbers of chinook of each age in each return year were calculated by applying the percent in each sex and age group sample to the estimated total adult return in each year. The numbers in each age group and each return year were then recombined to provide the total returns in the 1974 and 1975 brood years. As age 5 returns from the 1975 brood year were not available, the number of age 5 fish destined to return from that brood year was estimated by averaging the ratios of age 5-to-age 4 returns from the 1972, 1973 and 1974 brood years.

Coho Salmon

Age composition of the coho salmon escapement in 1976 and 1977 was essentially determined from spawning ground dead sampling. However, in 1977 scale sampling data from large coho taken in the estuary was combined with the spawning ground sampling data to estimate the percentage of age 3 and age 4 coho in the population as a whole.

The escapement estimates for 1976 and 1977 were then apportioned according to the percentages in the populations at ages 2, 3, and 4. This provided an estimate of the number of returns at ages 3 and 4 from the 1973 brood year. The adult return at age 2 from the 1973 brood year was estimated from the ratio of age 2-to-age 3 returns in the 1974 brood year.

Similarly, the adult return at age 4 from the 1974 brood year was estimated from the ratio of age 3-to-age 4 returns in the 1973 brood year. The estimated brood year returns at each age were then summed to arrive at the total return from each brood year.

## INCIDENCE OF CODED-WIRE TAGGED FISH

The escapements of coded-wire tagged (CWT) 1973 and 1974 brood year coho and 1974 and 1975 brood year chinook were estimated by the following steps:

(i) Chinook and coho recoveries from the Cowichan estuary and Cowichan-Koksilah river spawning grounds were organized by sex and age class.

(ii) The incidence of CWT fish in each age class of returning adults was calculated as: number of CWT returns (by age class) ÷ total number of fish examined (by age class) X 100 (Appendix 16).

(iii) The overall incidence of CWT fish by brood year was determined by averaging the incidence in each return year.

(iv) The number of CWT returns in each brood year was calculated as: estimated total adult returns (by age class) X overall CWT incidence in brood.

# RESULTS

## CHINOOK SALMON

### Spawning Population Estimates

Chinook escapements were estimated by several methods during the 4-year study period. The estimates by each method are compared in Table 3. We consider the most reliable escapement estimates to be those derived from tower counts in 1976 and 1977, and from swim surveys in 1978 and 1979. Escapement estimates obtained by these methods were as follows: 7,500 (1976), 8,600 (1977), 10,200 (1978) and 17,100 (1979). Each estimate included both large and jack chinook.

The results obtained by each estimating method are briefly described in the following sections.

Estuary Tagging and Recovery: Schnabel-type population estimates of 8,700 and 8,400 were determined from tagging and recovery of adult chinook in the Cowichan estuary in 1976 and 1977 (Appendix 4). As only 10 jack chinook were captured in the estuary seining during 1976, it appears likely that the tagging operation commenced after jacks had started to enter the Cowichan River. The 1976 Schnabel estimate would therefore not have accounted for jack chinook. In 1977 the tagging operation was initiated 8 days earlier than in 1976, before any major movement

TABLE 3. Estimated escapements of chinook salmon to the Cowichan-Koksilah system, 1976 - 1979.

| Method | Escapement Estimate | | |
|---|---|---|---|
| | Large | Jack | Rounded Total |
| 1976 | | | |
| Tag-and-Recovery(Estuary) | | | 8700 |
| Cowichan R. Swim Survey | 2643 | 4052 | 6700 |
| Tower Count | 2500 | 5000 | 7500 |
| Adjusted Tower Count[d] | 2960 | 4540 | 7500[a] |
| Tag-and-Recovery(Spawning Grounds) | | | 38200[b] |
| 1977 | | | |
| Tag-and-Recovery(Estuary) | 6654 | 1707 | 8400 |
| Cowichan R. Swim Survey | 1642 | 1184 | 2800 |
| Tower Count | 3700 | 4900 | 8600[a] |
| Tag-and-Recovery(Spawning Grounds) | | | 3900[b] |
| 1978 | | | |
| Cowichan R. Swim Survey | 4170 | 6001 | 10200[a] |
| Tag-and-Recovery(Spawning Grounds) | | | 21800[b] |
| 1979 | | | |
| Cowichan R. Swim Survey | 7000 | 10100[c] | 17100[a] |
| Tag-and-Recovery(Spawning Grounds) | | | 16500[b] |

[a]Estimate used to calculate total adult return.

[b]Jacks not included.

[c]Estimated from ratio of large-to-jack in 1976 - 1978.

[d]Proportions of large and jack chinook adjusted to reflect proportions observed in 1976 swim surveys.

of jack chinook into the Cowichan River. However, as only 12 tagged jacks were recovered in the estuary an independent estimate of the jack chinook population was not feasible in 1977.

Because no tagged chinook were recovered by purse seining in 1978 and 1979, Schnabel-type population estimates could not be developed in those years.

River Swim Surveys: Swim survey counts of adult chinook in the Cowichan River were conducted in each year of study. The 1978 and 1979 counts were used as best estimates of the chinook escapement (Table 3 and Appendix 15).

In 1976 a swim survey during October 25 - 28 produced an estimate of 6,700 adult chinook spawners. This count is considered to be a low estimate of the total population, as some chinook were still in the estuary when the swim survey was conducted (Appendix 3). The 1977 swim surveys were concluded before the peak upstream migration of chinook and therefore did not provide a population estimate.

In 1978, a total of 4,200 large and 6,000 jack chinook were counted in a river swim survey during October 16 - 18. This estimate of chinook escapement in 1978 did not account for fish which entered the river after October 18 and should therefore be treated as a minimum.

A spawning population of 7,000 large chinook was estimated from a swim survey count on November 6, 1979. A further 10,100 jack chinook, estimated by assuming the same jack-to-large chinook ratio as in 1976 - 1979, was included and resulted in a total escapement estimate of 17,100 adult chinook in 1979.

Tower Counts: In 1976 and 1977 tower counts were considered to provide the most reliable estimates of chinook escapement. In 1976 the tower count estimate of escapement totalled 7,500 (2,500 large and 5,000 jack) chinook. This estimate included an adjustment for an estimated 21% of chinook spawning which occurred downstream of the tower site at Skutz Falls (Appendix 14). The proportion of jack (age 2) chinook in this estimate may have been overestimated, however, due to a tendency to count some age 3 chinook as jacks. The estimates for large versus jack chinook in 1976 were therefore adjusted (Table 3) to reflect a higher proportion of large chinook (2960 large and 4540 jack), as indicated by the 1976 swim survey.

The 1977 tower count, which was conducted downstream of all chinook spawning, provided an escapement estimate totalling 8,600 (3,700 large and 4,900 jack) chinook.

Estuary Tagging with Spawning Ground Recovery: Tag recovery from spawning ground dead pitch produced Petersen-type population estimates of 38,200, 39,000, 21,800 and 16,500 in 1976 through 1979 respectively. These annual estimates were based on respective tag recoveries of 14, 11, 1 and 6 (Appendix 9). Because the numbers of tags recovered were not sufficient to produce a reasonably precise estimate, the Petersen-type estimates based on tag recovery on the spawning grounds were not used to estimate brood year returns.

## Chinook Maturity in the Estuary

In the last week of September, 1976, 65% of the adult chinook captured were a dark spawning colour, 30% were medium and 5% were bright. By the first two weeks of October chinook were predominantly a dark spawning colour(Fig. 20). This indicates that most adults matured while still in the estuary (1 male discharged milt while being tagged), and that very few fresh chinook were arriving. Despite their apparently advanced maturity, the majority of large chinook remained in the estuary until river levels increased in late October.

Chinook in the estuary appeared to mature later in 1977 than in 1976. Approximately 80% of the chinook were a medium colour in the last two weeks of September as compared to 23% at the same time in 1976. In the first week of October 73% were still medium, only 24% were dark and 3% were bright. Since the chinook population in the estuary was much larger in 1977 it is likely that new stocks were arriving at a later date than in 1976. Swim survey counts indicated that in 1977 chinook moved into the Cowichan River earlier and over a more protracted period than in 1976.

The majority of chinook (80%) were a medium spawning colour in estuary samples examined during the last week of September and the first week of October in 1978 and 1979.

## Upstream Migration Timing in 1976 and 1977

Chinook migration at the tower site in 1976 occurred over the period September 18 to November 12. Though the migration of both large and jack chinook peaked during the same period, October 26 to November 4 (Fig. 21), jacks tended to enter the river earlier. Dates of 50% migration for jack and large chinook were October 22 and October 30 respectively. During the 9-day peak period 73% of the large chinook and 39% of the jack chinook migrated past the counting tower. The peak migration coincided with the first significant increase in river discharge, from 9.8 to 22 $m^3$/sec.

In 1977 chinook migration took place earlier than in 1976, possibly due to an earlier increase in river discharge (Fig. 22). Jacks again migrated earlier than large chinook. Dates of 50% migration for jack and large chinook were October 1 and October 18 respectively. The jack chinook migration peaked during September 24 to October 4, whereas the large chinook migration occurred in 2 peaks, during September 25 to October 3 and October 16 to 27.

The diel migration pattern varied considerably over the migration period. During peak periods the migration was most active during mid-day, whereas during non-peak periods the greatest movement occurred at dusk and dawn (Appendices 11 and 12).

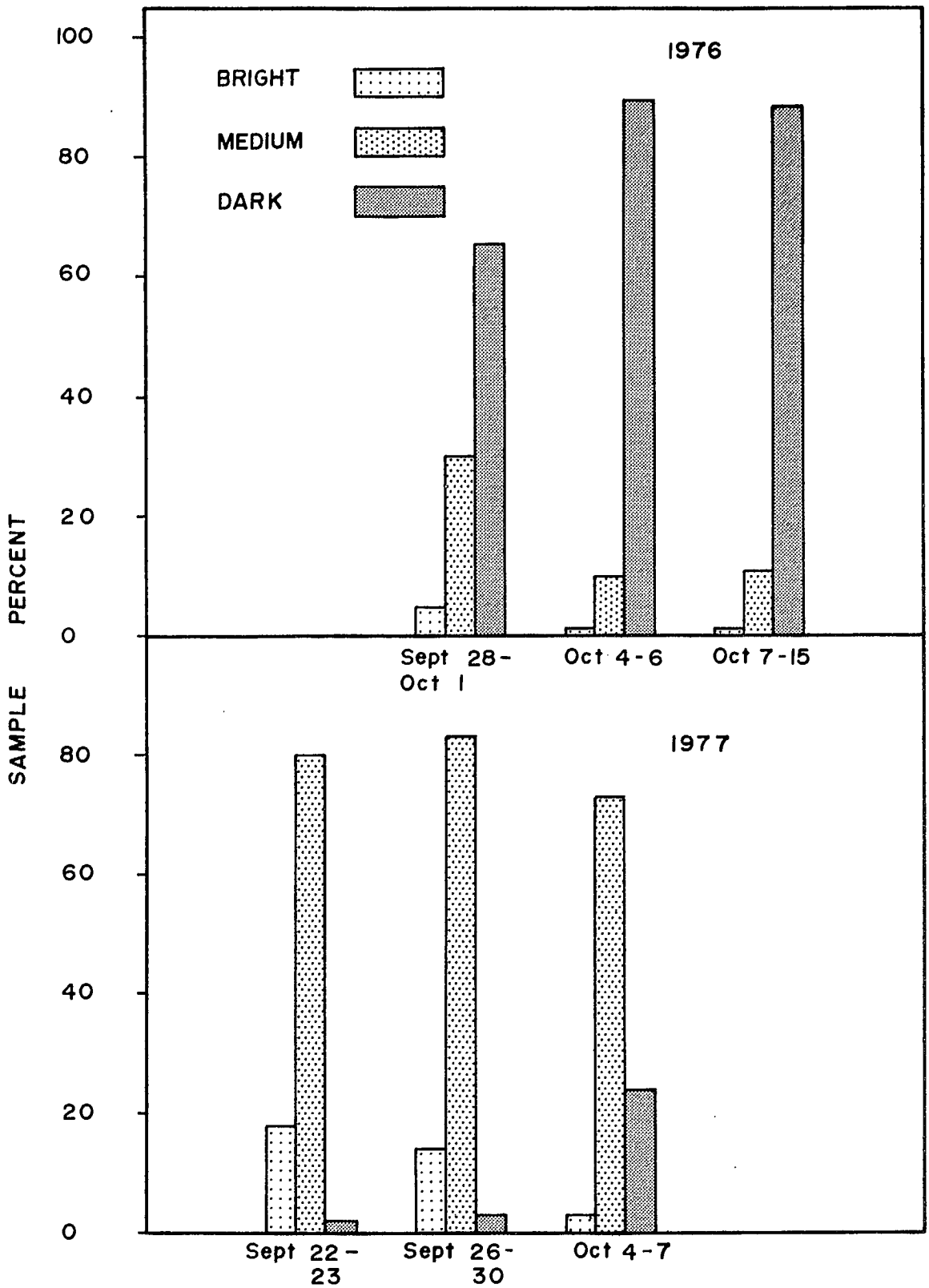



FIG. 20. Seasonal trend in maturity of chinook salmon in the Cowichan estuary during 1976 and 1977.

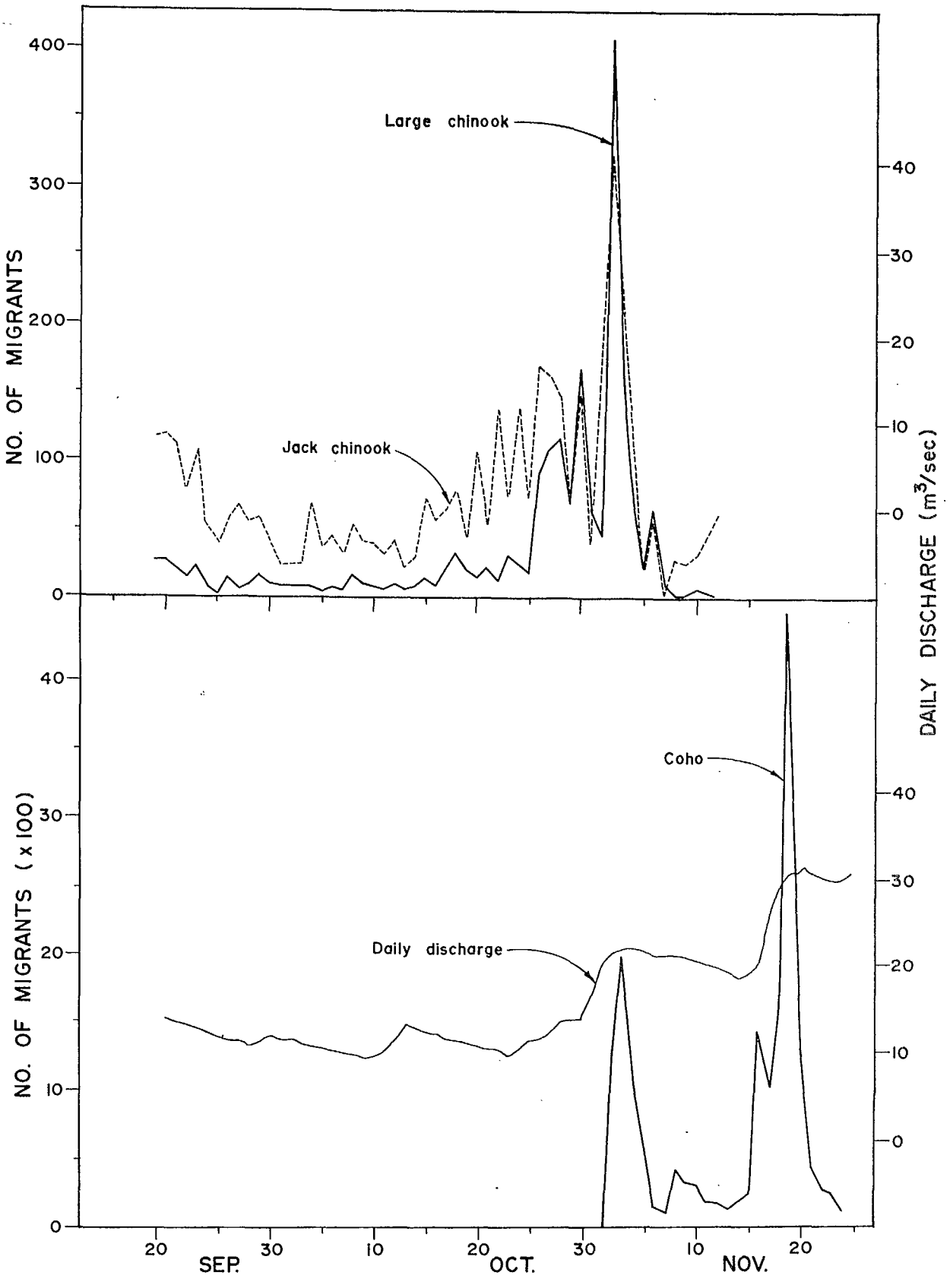



FIG. 21. Chinook and coho upstream migration timing at the Skutz Falls tower site in 1976 relative to discharge of the Cowichan River at Lake Cowichan.

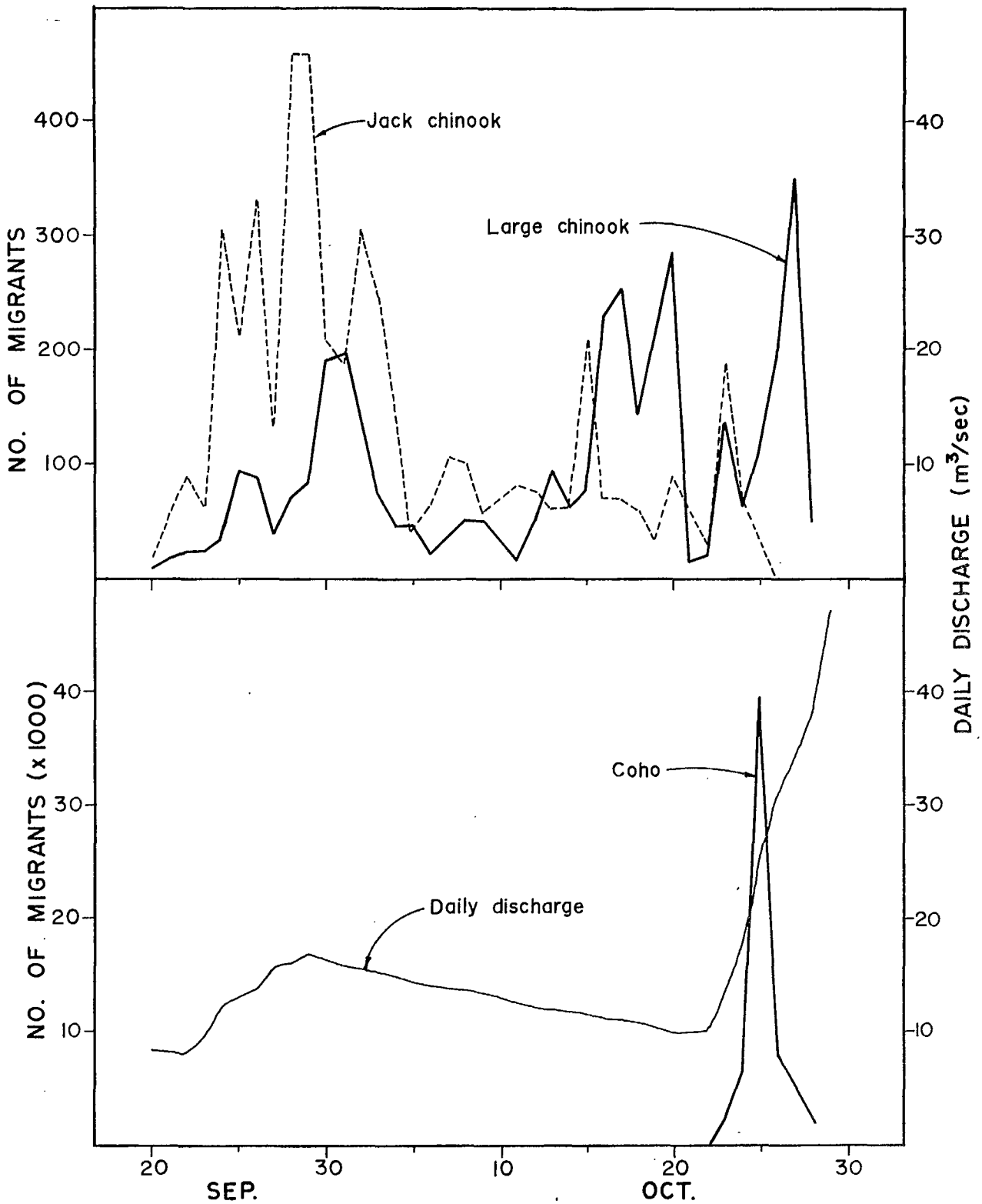



FIG. 22. Chinook and coho upstream migration timing past the counting tower at Duncan waterworks pumphouse in 1977 relative to daily discharge of the Cowichan River at Lake Cowichan.

## Spawning Timing

Estimated dates of peak spawning for the years 1977, 1978 and 1979 are shown in Table 4. Chinook spawning timing was inferred from the timing of carcass recovery which was carried out on a regular basis. Based on dates of 50% carcass recovery, and assuming an 11-day average life span on the spawning grounds (Hickey and Lister, MS 1981), peak spawning is estimated to have ranged from October 24 in 1978 to November 11 in 1977.

## Spawning Distribution

Live counts of chinook from swim surveys near peak spawning in 1976, 1977 and 1978 indicated that 37-51% of the large chinook and 45-84% of the jack chinook spawned in the upper 7 km (Section 1) of the Cowichan River (Fig. 23). In 1976 the remainder of spawning was scattered over sections 2 - 7. In 1977 and 1978 the remainder of spawning took place in sections 2 - 6, with the major portion in sections 2 and 3 immediately above and below Skutz Falls. Chinook spawning in the study area was almost solely restricted to the main Cowichan River. In 1977, 5 carcass recoveries were made outside the main Cowichan River: 1 in the Robertson River side channel and 4 in Kelvin and Glenora creeks in the Koksilah River system.

## Age Composition

The age composition of adult chinook returning to the Cowichan-Koksilah system in each of the 4 study years is shown in Table 5. Detailed age sampling data are given in Appendix 17.

In terms of freshwater age, Cowichan-Koksilah chinook were almost entirely sub-1 fish, i.e. migrating to sea in their first year of life. Only three sub-2 individuals (0.3%),which had reared for 1 year in freshwater as juveniles, were found among 943 estuary and spawning ground scale samples taken in the 4 years of study (Appendix 17).

Male chinook were ages 2, 3, 4 and 5, whereas female chinook returned at ages 3, 4 and 5.

Jack males (Age 2) dominated the adult returns in each year, comprising 76-80% of the males and 57-61% of the total return (Table 6). Among large males, the predominant group was age 3 in 1977 and 1979 and age 4 in 1976 and 1978. Age 4 fish predominated among females, including 61-80% of the female population in each year.

## Sex Ratio

Because of the predominance of jack males in each year of study, female chinook comprised only 23-27% of the total escapement (Table 6). Sex ratios of estuary and spawning ground samples are given in Appendices 18 and 19.

TABLE 4. Estimated peak spawning dates of chinook salmon in the Cowichan River, 1977 - 1979.[a]

| Year | Date 50% of Carcasses Recovered | Estimated Date of Peak Spawning |
|---|---|---|
| 1977 | November 22 | November 11 |
| 1978 | November 4 | October 24 |
| 1979 | November 17 | November 6 |

[a]In 1976 survey frequency was insufficient to define timing.

TABLE 5. Age composition of adult chinook returns to the Cowichan-Koksilah system, with breakdown by sex.

| Year | Male (%) | | | | Estimated Return | Female (%) | | | Estimated Return |
|---|---|---|---|---|---|---|---|---|---|
| | 2 | 3 | 4 | 5 | | 3 | 4 | 5 | |
| 1976 | 78.5 | 8.8 | 11.6 | 1.1 | 5783 | 11.0 | 85.0 | 4.0 | 1717 |
| 1977 | 76.8 | 13.2 | 10.0 | 0 | 6380 | 10.0 | 87.5 | 2.5 | 2221 |
| 1978 | 80.3 | 4.9 | 13.8 | 1.0 | 7471 | 7.0 | 79.0 | 14.0 | 2730 |
| 1979 | 76.2 | 14.0 | 9.8 | 0 | 13251 | 30.0 | 60.5 | 9.5 | 3850 |

TABLE 6. Sex composition of adult chinook returns to the Cowichan-Koksilah system.

| Year | Male(%) | | Female (%) | Estimated Return |
|---|---|---|---|---|
| | Large | Jack | | |
| 1976 | 16.6 | 60.5 | 22.9 | 7500 |
| 1977 | 17.2 | 57.0 | 25.8 | 8600 |
| 1978 | 14.4 | 58.8 | 26.8 | 10200 |
| 1979 | 18.4 | 59.1 | 22.5 | 17100 |

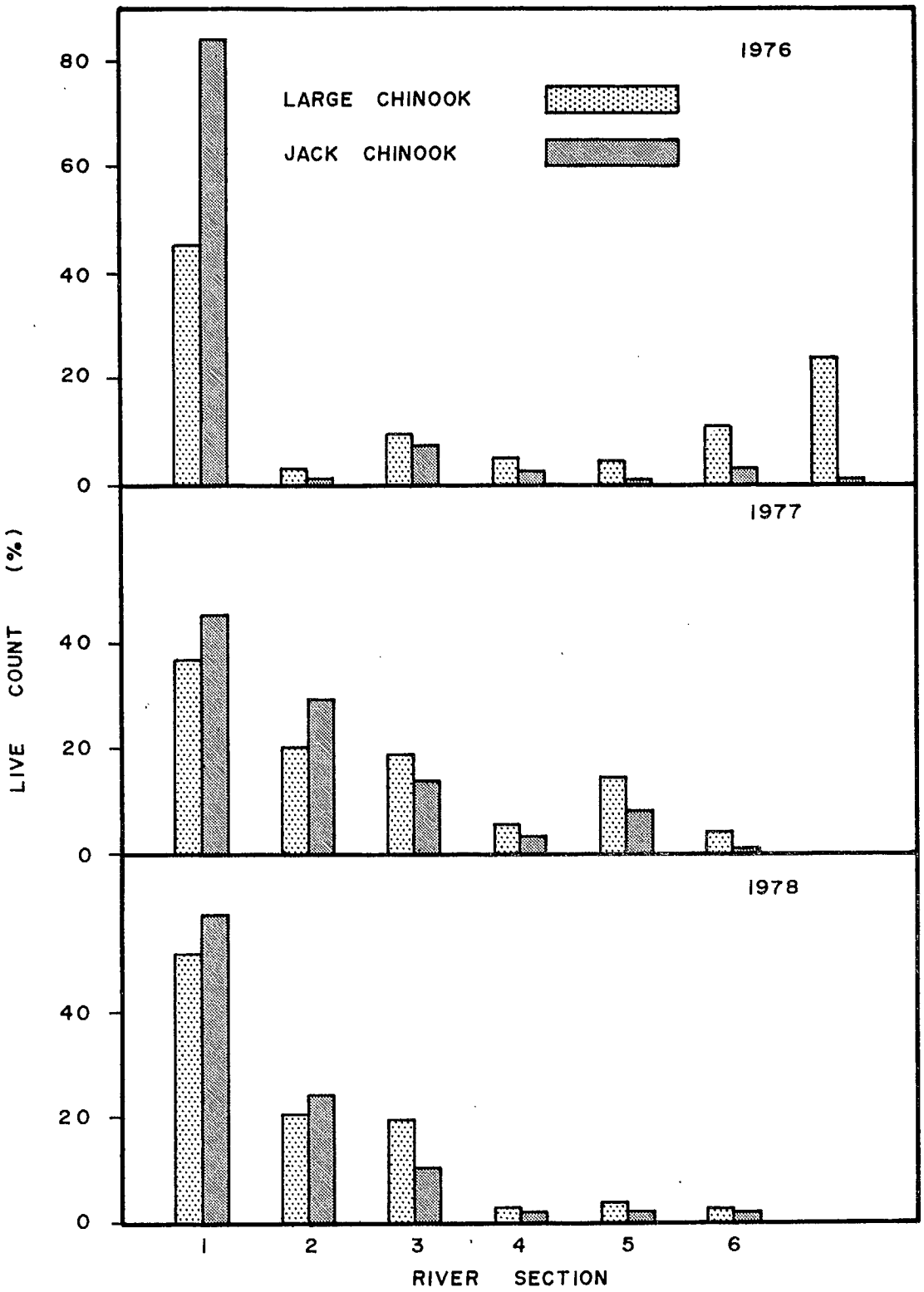



FIG. 23. Chinook spawning distribution in the Cowichan River, based on live counts near peak spawning in 1976 to 1978.

## Size Composition

To provide a basis for comparison with other chinook populations, mean lengths of Cowichan chinook by sex, age group and year of return are presented in Table 7. Length frequency distributions of estuary and spawning ground samples are listed by sex and age group in Appendices 20 and 21.

## Adult Returns from the 1974 and 1975 Brood Years

Estimated adult chinook returns to the study area are assigned to respective brood years as shown in Table 8. Total returns are given only for the 1974 and 1975 brood years, the 2 groups for which data are complete. The 1974 brood year produced a total return estimated at 9158 fish, consisting of 49.6% age 2, 11.6% age 3, 34.8% age 4 and 4% age 5. The 1975 brood year return is estimated at 9483 fish, with a similar age composition of 51.7% age 2, 5.9% age 3, 38.2% age 4 and 4.2% age 5.

## Incidence of Coded-Wire Tagged Fish

The incidence (%) of coded-wire tagged (CWT) chinook in adult returns to the study area is presented by brood and return year in Table 9. Due to the relatively small number of tag returns (17) the incidence varied considerably from year to year. For each brood year the CWT incidence was greater in estuary sampling than in the dead recovery. Wilson et al. (1977) concluded that decomposition of carcasses and removal of eyes and associated musculature (where some coded-wire tags were lodged) by scavengers tended to reduce the CWT incidence among coho salmon recovered on the spawning grounds. Blankenship (pers. comm.) came to the same conclusion in a recent Washington State study, based on comparison of CWT incidence in coho salmon sampled as they entered streams through counting fences and as carcasses on the spawning grounds. From these observations it appears that the CWT incidence in the dead recovery probably underestimates the incidence of CWT chinook in the escapement. We therefore conclude that the CWT incidence in estuary sampling, i.e. 0.53% (1974 brood) and 0.67% (1975 brood), best represents the CWT incidence in chinook returning to the Cowichan-Koksilah study area.

Recovery data pertaining to adipose-marked chinook returns to the Cowichan-Koksilah system are listed in Appendices 31 and 32. The number and incidence of chinook containing coded-wire nose tags are given by return year in Appendix 16.

## Coded-Wire Tag Loss

Preliberation tag loss in 1975 brood chinook juveniles tagged in the estuary was estimated at 5.9% (Argue et al., 1979). In estuary and spawning ground sampling of adult returns we found that 40% (1974 brood) and 11% (1975 brood) of the adipose-marked fish were without a CWT.

TABLE 7. A comparison of mean postorbital-hypural lengths (cm) of male and female chinook by age class, Cowichan-Koksilah dead recovery, 1977-1979.

| Year | Male | | | | | | Female | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $2_1$ | $3_1$ | $3_2$ | $4_1$ | $5_1$ | $5_2$ | $3_1$ | $3_2$ | $4_1$ | $5_1$ | $5_2$ |
| 1977 | 42.8 | 59.6 | | 72.5 | | | 64.6 | | 71.6 | | |
| 1978 | 40.1 | 58.9 | 44.0 | 68.0 | 70.7 | 71.6 | 58.7 | | 67.6 | 72.1 | 63.5 |
| 1979 | | 60.9 | | 71.9 | | | 62.3 | | 70.5 | 76.5 | |

TABLE 8. Estimated numbers of chinook salmon from each brood year contributing to 1976-1980 adult returns to the Cowichan-Koksilah system.

| Return Year | Brood Year | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | |
| 1976 | 131 | 2130 | 699 | 4540 | | | | 7500 |
| 1977 | | 56 | 2579 | 1066 | 4900 | | | 8601 |
| 1978 | | | 456 | 3186 | 559 | 6000 | | 10201 |
| 1979 | | | | 366 | 3621 | 3014 | 10100[b] | 17101 |
| 1980 | | | | | 403[a] | | | |
| TOTALS | | | | 9158 | 9483 | | | |

[a]Estimated from average ratio of age 4 to age 5 returns from 1972-74 brood years.

[b]Estimated by average proportion of jacks from return years 1976-78.

TABLE 9. Incidence of coded-wire tagged (CWT) fish in chinook samples from the Cowichan-Koksilah study area by brood year and year of return.

| Return Year | 1974 Brood Year Fish Examined | No. with CWT | CWT(%) | 1975 Brood Year Fish Examined | No. with CWT | CWT(%) |
|---|---|---|---|---|---|---|
| Estuary | | | | | | |
| 1976 | 16 | 0 | | | | |
| 1977 | 530 | 2 | .38 | 320 | 4 | 1.25 |
| 1978 | 357 | 2 | .56 | 62 | 0 | |
| 1979 | 32 | 1 | 3.1 | 360 | 1 | .28 |
| Totals | 935 | 5 | .53 | 742 | 5 | .67 |
| Dead Recovery | | | | | | |
| 1976 | 612 | 1 | .16 | | | |
| 1977 | 173 | 0 | | 54 | 0 | |
| 1978 | 887 | 2 | .23 | 147 | 1 | .68 |
| 1979 | 19 | 1 | 5.26 | 306 | 2 | .65 |
| Totals | 1691 | 4 | .24 | 507 | 3 | .59 |

Though this suggests that additional tag loss took place following release, the occurrence of naturally-missing adipose fins must also be taken into account. The incidence of naturally-missing adipose fins among Cowichan-Koksilah chinook, based on examination of returning adults from brood years which were not marked, is estimated at 1 in 1878 or 0.05% (Table 10). Correcting for natural adipose marks, the rate of tag loss among marked 1974 and 1975 brood chinook (from juvenile release to adult return) is estimated to have been 9.7%. The calculations used in deriving this estimate are shown in Table 10.

## Survival of Marked Fish

Total returns of marked chinook, including fish which had shed the CWT, are estimated at 54 (1974 brood) and 70 (1975 brood) fish (Table 11). The survival rates of marked fish from juvenile release to adult escapement (excluding fishery contributions) were 0.29% and 0.39% for the 1974 and 1975 broods respectively (Table 12). Based on the comparative incidence of marked and unmarked fish in the juvenile migrant populations and adult returns, marked fish survived at rates that were 18% (1974 brood) and 8%

TABLE 10. Calculation of coded-wire tag (CWT) loss rate for marked chinook returning to the study area.

| Brood Years | No. of Fish Examined | No. of Adipose-Marked Fish | Incidence of Marks |
|---|---|---|---|
| 1974 & 1975 | 1677[a] | 12 (with and without CWT) | 0.72% |
| 1974 & 1975 | 1677[a] | 2 (without CWT) | 0.12% |
| 1971-73 & 1976 | 3755 | 2 | 0.05%[b] |

Tag Loss Incidence = Incidence of Adipose Fin Marks in 1974 & 1975 Broods - Incidence of Naturally-Missing Adipose Fins

= 0.12% - 0.05%

= 0.07%

Tag Loss Rate = Tag Loss Incidence ÷ Overall Incidence of Marked Fish x 100

= 0.07% ÷ 0.72% x 100

= 9.7%

[a]Includes only fish captured in the estuary, to avoid the influence of additional tag loss from carcasses recovered on the spawning grounds.

[b]Incidence of missing adipose fins among broods which were not marked.

(1975 brood) of those experienced by unmarked fish.

Survival of Unmarked Fish

The survival of unmarked chinook, from estuary residence as juveniles to adult escapement (excluding fishery contributions), is estimated at 1.6% and 5.5% for the 1974 and 1975 broods respectively. These survival rates were calculated as follows, from juvenile population estimates presented by

TABLE 11. Estimated returns of CWT and fin-marked chinook to the Cowichan-Koksilah study area.

| Brood Year | Fish Examined | No. with CWT | CWT Incidence (%) | Estimated Adult Return | Estimated CWT Return | Total Mark Return[a] |
|---|---|---|---|---|---|---|
| 1974 | 935 | 5 | 0.53 | 9158 | 49 | 54 |
| 1975 | 742 | 5 | 0.67 | 9483 | 64 | 70 |

[a]Corrected to account for CWT loss (9.7%); includes all adipose fin-marked fish.

TABLE 12. Estimated survival of marked chinook from juvenile release to adult escapement and relative ocean survival of marked versus unmarked fish, Cowichan-Koksilah study area.

Ocean Survival of Marked Fish

| Brood Year | No. of Marks Released[a] | Mark Returns | Survival to Return[c] |
|---|---|---|---|
| 1974 | 18,332 | 54 | 0.29% |
| 1975 | 17,722 | 70 | 0.39% |

Survival of Marked Fish Relative to Unmarked Fish

| Brood Year | Incidence of Marks: Juvenile Population[a] | Incidence of Marks: Adult Return | Relative Survival[b] |
|---|---|---|---|
| 1974 | 3.2% | 0.59% | 0.18 |
| 1975 | 9.7% | 0.74% | 0.08 |

[a]From Armstrong and Argue (1977) and Argue et al. (1979).

[b]Relative Survival = Mark Incidence in Adult Return ÷ Mark Incidence in Juvenile Population.

[c]Excluding contributions to ocean fisheries.

Armstrong and Argue (1977) and Argue et al. (1979):

| Brood Year | Juvenile Population | Adult Escapement | Ocean Survival |
|---|---|---|---|
| 1974 | 581,000 | 9158 | 1.6% |
| 1975 | 172,300 | 9483 | 5.5% |

Evidence of Straying to the Study Area

One jack chinook recovery from purse seining in the Cowichan estuary in 1977 had the tag code 2/2/6, applied at Big Qualicum River in 1975. This recovery may indicate straying to the study area, but it may also have been an interception of an age 3 chinook on its feeding migration.

COHO SALMON

Spawning Population Estimates

Coho escapements in 1976 and 1977 were estimated by two tag-and-recovery methods and by tower counts. The estimates obtained by each method are compared in Table 13. The most reliable escapement estimates are considered to be those derived from tower counts. The escapement estimates by this method were 27,700 in 1976 and 69,400 in 1977.

The results obtained by each estimating method are briefly discussed in the following sections. Observations during river swim surveys, which were concluded prior to peak spawning and did not include tributary spawning areas, were not used to develop population estimates for coho salmon.

Estuary Tagging and Tag Recovery: Schnabel population estimates of 21,800 and 67,900 were determined from tagging and recovery of adult coho in the Cowichan estuary in 1976 and 1977. Detailed calculations and confidence limits are shown in Appendix 4. These population estimates were based on a total of 24 tag recoveries in 1976 and 181 tag recoveries in 1977. The low numbers of jack coho in estuary purse seine catches in the Cowichan estuary (1% in 1976) precluded estimating the jack coho population from the estuary tagging operation.

In both years of study the Schnabel method, based on tag recoveries in the estuary, produced population estimates which were comparable to those obtained from tower counts (Table 13).

TABLE 13. Estimated escapements of coho salmon to the Cowichan-Koksilah River system, 1976 and 1977.

| Method | Escapement Estimates | | |
|---|---|---|---|
| | Large | Jack | Rounded Total |
| 1976 | | | |
| Tag-and-Recovery (Estuary) | | | 21,800 |
| Cowichan R. Tower Count | 26,502 | 1,162[a] | 27,660[b] |
| Tag-and-Recovery (Spawning Grounds)[d] | | | 24,800[c] |
| 1977 | | | |
| Tag-and-Recovery (Estuary) | | | 67,900 |
| Cowichan R. Tower Count | 68,380 | 970[a] | 69,350[b] |
| Tag-and-Recovery (Spawning Grounds)[d] | | | 258,300[c] |

[a]Jacks not included.

[b]Estimate used to calculate total adult return. Includes adjustment for spawning downstream of tower and in Koksilah River.

[c]Minimum estimate of jacks from proportion of jack coho in the spawning ground dead recovery.

[d]Tags were applied in estuary and recovered on spawning grounds.

Tower Counts: Tower counts of coho salmon upstream migrations in the Cowichan River produced estimates of 27,700 in 1976 and 69,400 in 1977 (Table 13). The tower count estimates included the following adjustments:

(i) increased to account for an estimated 19% (1976) and 6.8% (1977) of coho populations spawning downstream of tower site and in Koksilah River, based on distribution of carcass recoveries (Appendix 14 and Table 15);

(ii) increased by 4,500 coho in 1976, based on field technician's estimates, to account for migration after counting was concluded on November 24; and

(iii) estimates of the jack coho population (4.2% [1976] and 1.4% [1977] as indicated by carcass recoveries) were added to tower counts, because jack coho were not consistently observed as they passed the tower.

As jack coho are not likely to have been as available for dead recovery as large coho, the jack escapement estimates shown in Table 13 are considered to be minimal. In 1977 high river discharge forced suspension of tower counts on October 29, before conclusion of the coho migration. The estimate of 69,400 is therefore considered to be a minimum estimate of the 1977 coho escapement.

Estuary Tagging and Spawning Ground Recovery: Tagging of coho in the estuary with carcass recovery on the spawning grounds resulted in Petersen-type population estimates of 24,800 in 1976 and 258,300 in 1977. These estimates were based on 26 and 84 tag recoveries in 1976 and 1977 respectively (Appendix 9).

The 1976 estimate was comparable to those obtained by estuary tag recovery and by tower counts, but the 1977 estimate was substantially higher than estimates by the other methods (Table 13). No explanation can be offered other than the possibility that tag loss was much higher than indicated by the double-tagging experiment.

## Coho Maturity in the Estuary

In both 1976 and 1977 approximately 80% of the coho captured in the estuary were classified as bright fish, compared to less than 20% in the case of chinook (Fig. 24). No seasonal trend in coloration was evident in either year. On the basis of coloration it is evident that adult coho arrive in Cowichan Bay and migrate into the rivers in a much less advanced state of maturity than chinook salmon.

## Migration Timing

In 1976 coho salmon migration past the Skutz Falls tower occurred in two peaks, from November 2 to 4 and again during November 16 to 20 (Fig. 21). The peak periods accounted for 14,000 fish or 78% of the coho migration. Both peaks coincided with an increase in river discharge. Only 3,900 coho (15%) migrated upstream during non-peak periods. River entry of coho appeared to be delayed by extremely low water conditions in 1976. Normally, the coho migration takes place 1-2 weeks earlier, during mid- to late October (Lister et al., 1971).

The coho migration in 1977 took place mainly during October 23 to October 28, with the peak count of 39,500 (58%) occurring on October 25 (Fig. 22). This peak migration accounted for 63,200 fish, 99% of the total run. It is suspected that the peak migration period extended beyond October 28.

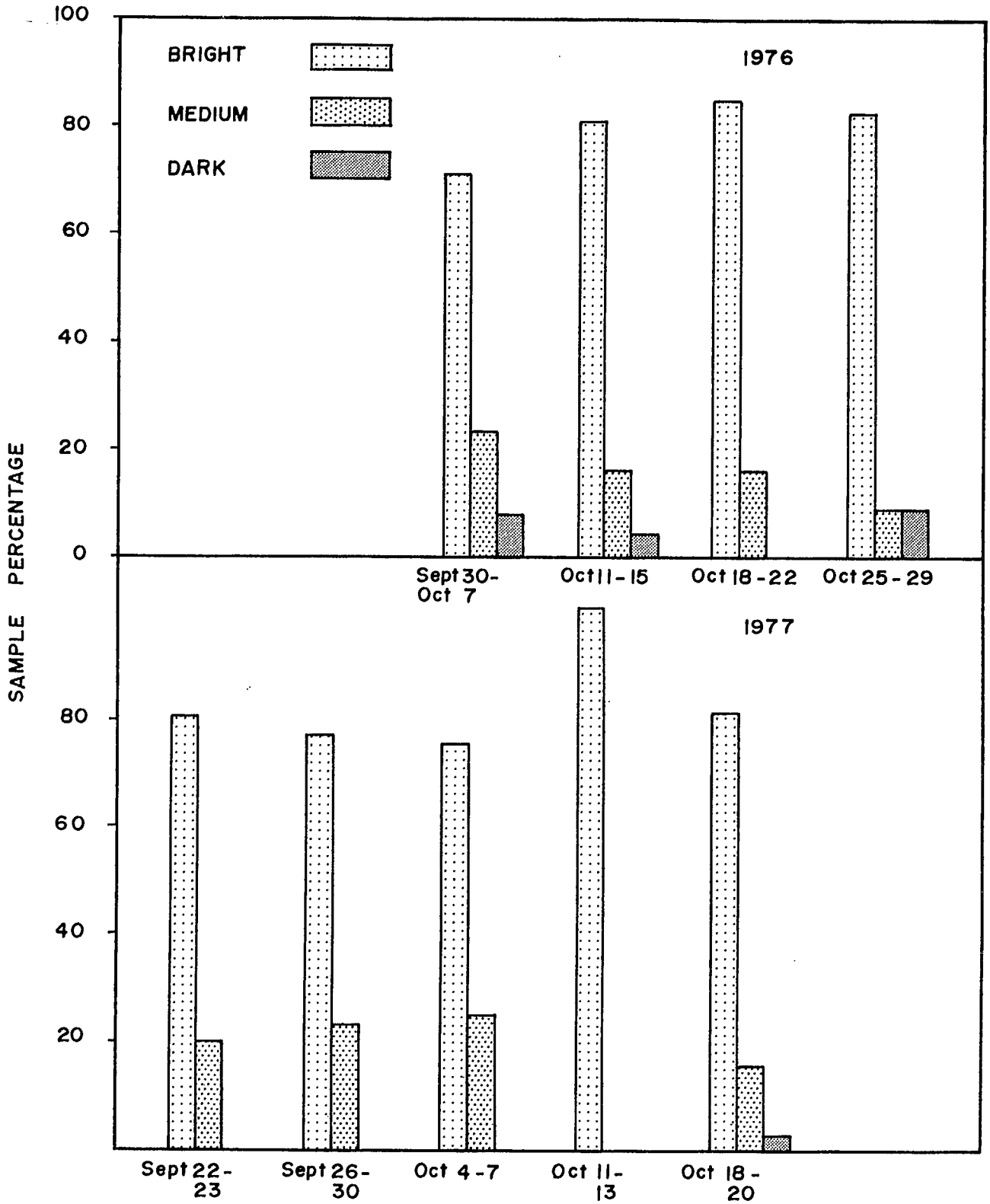



FIG. 24. Seasonal trend in maturity of coho salmon in the Cowichan estuary during 1976 and 1977.

High water levels and reduced visibility caused a premature halt to the counting tower operation on October 29, while the coho run was still in progress.

The peak migration periods in both years were initiated by an increase in river discharge. Throughout the peak migration period coho tended to move during mid-day (Appendices 11 and 12).

## Spawning Timing

Coho salmon spawning in study area streams took place from early November to early February (Fig. 25). Spawning timing varied between streams, occurring earliest in the Koksilah River tributaries, Kelvin and Glenora creeks, and latest in the main Cowichan River and Rotary Park Pools (Table 14). Dates of peak spawning in 1977-78 were significantly correlated ($r = 0.86$; $P < .05$) with water temperature. Spawning tended to occur later in the warmer streams (Fig. 26).

## Spawning Distribution

Coho spawning distribution within the study area is roughly indicated by the distribution of carcass recoveries on the spawning grounds (Table 15). The majority of carcasses (78%) were recovered in the main Cowichan River upstream of Skutz Falls (recovery sections 1-3). Koksilah River tributaries contributed 0.9% and 1.8% to the total coho carcass recovery in 1976 and 1977 respectively.

## Age Composition

The estimated age composition of adult coho returns to the Cowichan-Koksilah study area is presented in Table 16. Age $3_2$ fish dominated the escapement, comprising 92.2% and 96.4% of the total return in 1976 and 1977 respectively. The proportions of jack coho (age $2_2$), 4.2% in 1976 and 1.4% in 1977, were estimated from spawning ground dead recoveries which are likely to have been selective in favor of females and larger fish (Peterson, 1954). The estimated proportions of jack coho in the escapement should therefore be considered minimal. Age $4_3$ coho comprised a minor portion, 3.6% and 2.2%, of the escapement in 1976 and 1977 respectively.

A breakdown of age composition by sex and recovery stream is given in Appendix 22, and age data collected from estuary seine samples in 1977 are listed in Appendix 24.

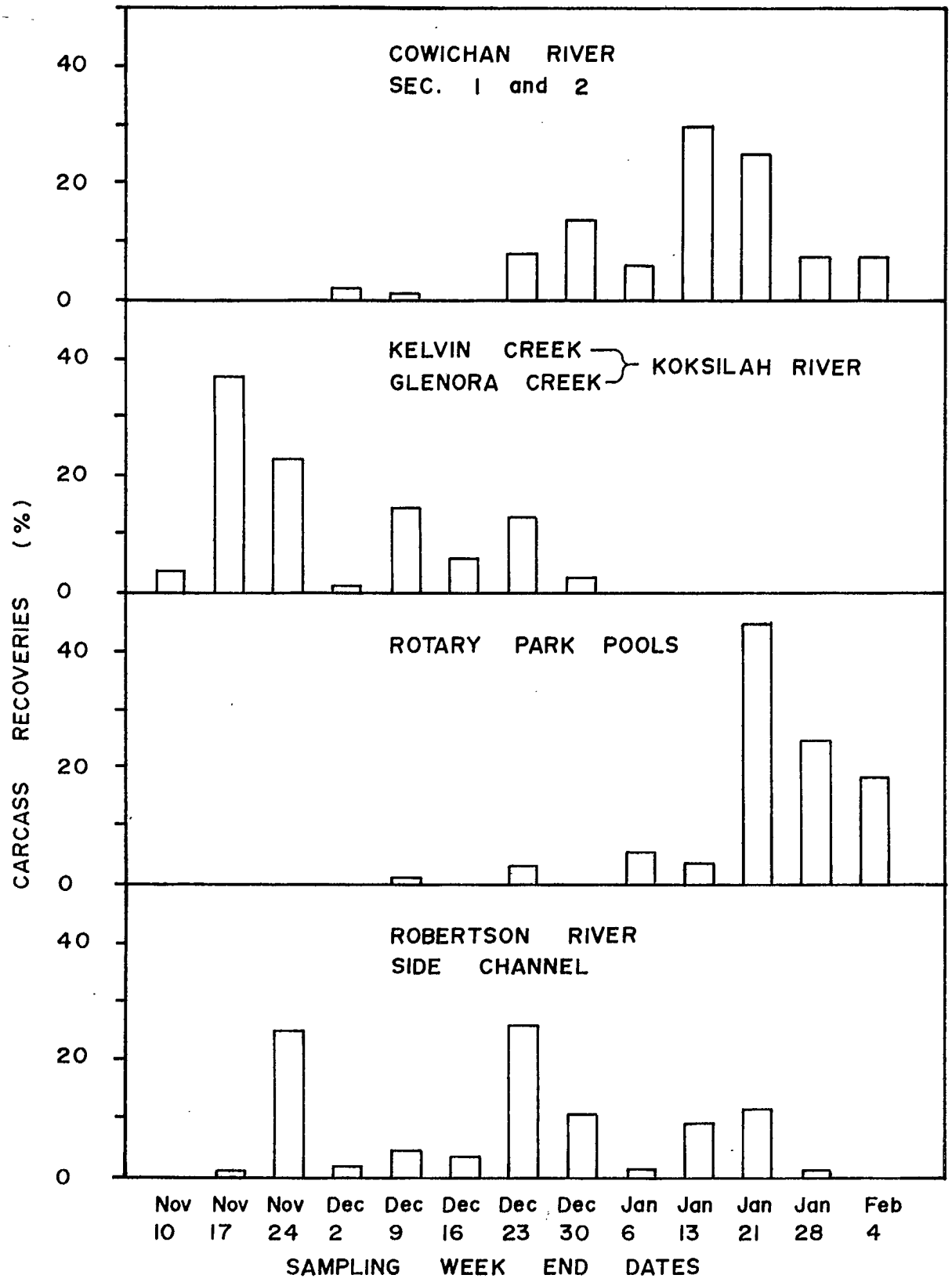



FIG. 25. Comparative timing of coho spawning in the Cowichan River above Skutz Falls and in 3 tributary streams, as indicated by carcass recoveries in 1977-78.

TABLE 14. Coho salmon spawning timing in relation to water temperature in Cowichan-Koksilah study area streams.

| Stream | Date of 50% Carcass Recovery | Estimated Date of Peak Spawning[a] | Mean Stream Temperature (°C)[b] |
|---|---|---|---|
| 1976-77 | | | |
| Robertson R. | Dec. 8 | Nov. 26 | 4.2 |
| Mesachie Ck. | Dec. 31 | Dec. 19 | 5.6 |
| Cowichan R. (Mainstem) | Jan. 7 | Dec. 27 | 7.2 |
| Rotary Park Pools | Jan. 24 | Jan. 12 | 7.7 |
| 1977-78 | | | |
| Glenora and Kelvin creeks (Koksilah R.) | Nov. 22 | Nov. 10 | 2.9 |
| Pastuch Ck. | Dec. 17 | Dec. 5 | 3.5 |
| Robertson R. Side Channel | Dec. 20 | Dec. 8 | 6.1 |
| Cowichan R. Side Channel | Dec. 22 | Dec. 10 | 6.6 |
| Mesachie Ck. | Dec. 26 | Dec. 14 | 5.6 |
| Cowichan R. (Mainstem) | Jan. 13 | Jan. 1 | 6.7 |
| Rotary Park Pools | Jan. 18 | Jan. 6 | 7.7 |

[a]Based on an assumed 12-day spawning ground life span (Willis, 1954).

[b]Mean stream temperature during recovery period (Dec. 28, 1976 - Jan. 21, 1977; Nov. 14, 1977 - Jan. 19, 1978).

## Sex Ratio

Detailed information on coho sex composition from spawning ground dead sampling and estuary sampling is shown in Appendices 23 and 25 respectively. On the spawning grounds females comprised 50.4% (1976) and 54.8% (1977) of samples (including jacks), whereas in the estuary females made up only 40% (1976) and 45% (1977) of the seine catch. As noted in the previous section, spawning ground carcass sampling tends to overestimate the proportion of females. The true percentage of females is therefore likely to have been somewhat lower than spawning ground sampling would indicate.

TABLE 15. Distribution of coho salmon spawning as indicated by carcass recoveries on the Cowichan-Koksilah spawning grounds.

| | | Carcass Recoveries No. | % |
|---|---|---|---|
| 1976 | | | |
| Cowichan River | Sec. 1 | 547 | 35.8 |
| | Sec. 2 | 338 | 22.1 |
| | Sec. 3 | 269 | 17.6 |
| | Sec. 4–7 | 38 | 2.5 |
| | Total | 1192 | 78.0 |
| Rotary Park Pools | | 138 | 9.0 |
| Robertson R.[a] | | 94 | 6.2 |
| Mesachie Ck. | | 66 | 4.3 |
| Pastuch Ck. | | 19 | 1.2 |
| Kelvin Ck. | | 13 | 0.9 |
| Bible Camp Side Channel | | 6 | 0.4 |
| | Overall Total | 1528 | |
| 1977 | | | |
| Cowichan River | Sec. 1 | 1629 | 27.3 |
| | Sec. 2 | 1347 | 22.6 |
| | Sec. 3 | 1358 | 22.8 |
| | Sec. 4–7 | 316 | 5.3 |
| | Total | 4650 | 78.0 |
| Robertson R.[a] | | 432 | 7.2 |
| Rotary Park Pools | | 297 | 5.0 |
| Mesachie Ck. | | 276 | 4.6 |
| Kelvin Ck.– Koksilah R. | | 46 | 1.8 |
| Glenora Ck. – Koksilah R. | | 63 | |
| Pastuch Ck. | | 101 | 1.7 |
| Cowichan Side Channel | | 64 | 1.1 |
| Half Way Ck. | | 19 | 0.3 |
| Bible Camp Side Channel | | 14 | 0.2 |
| | Overall Total | 5962 | |

[a]Includes Robertson R. Side Channel.

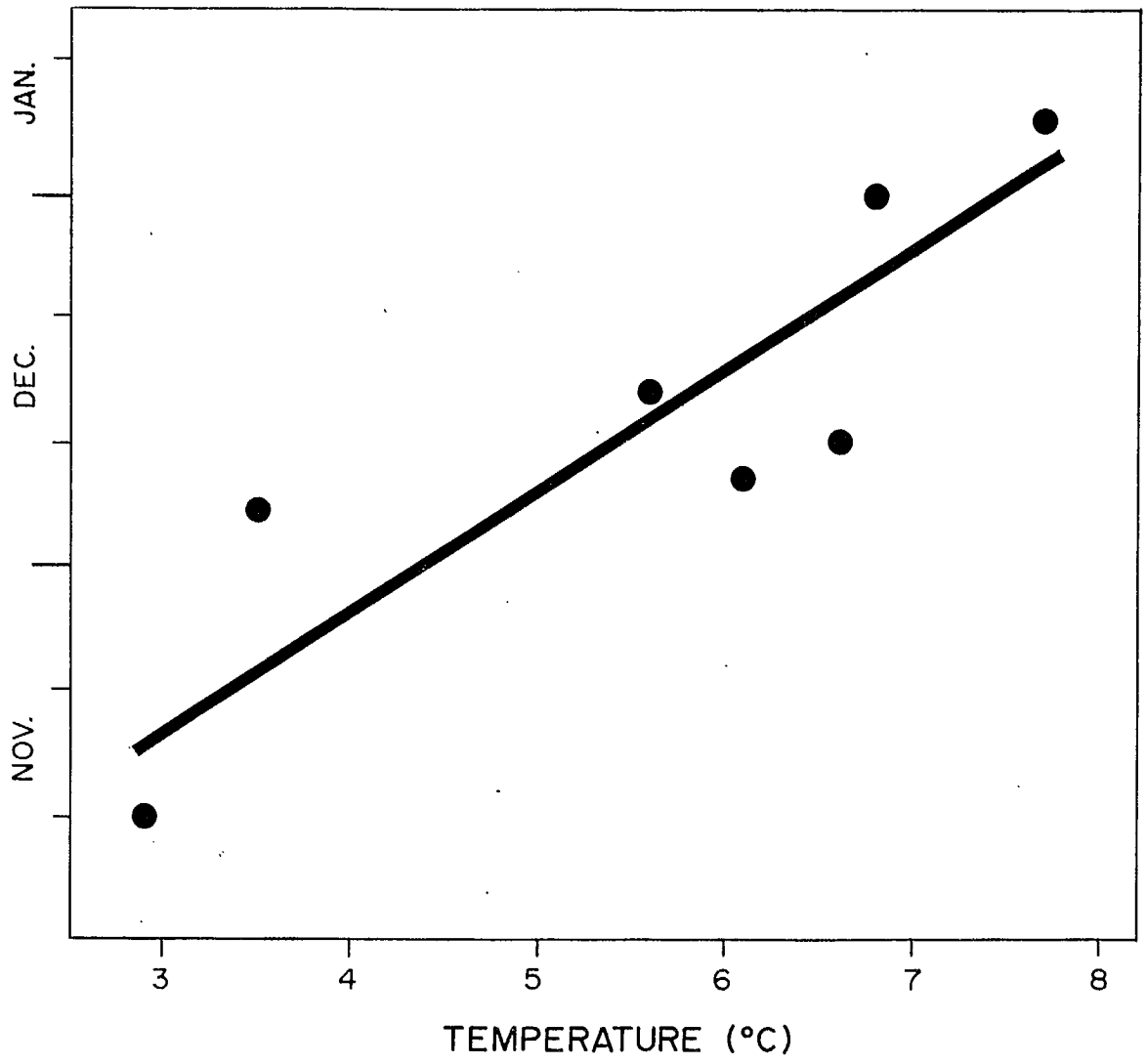



FIG. 26. Relationship between peak date of coho spawning at Cowichan-Koksilah system spawning areas and mean stream temperature during the survey period in 1977-78. Data from Table 14. Line fitted by least squares regression.

Size Composition

Coho length frequency data from the estuary sampling, listed by sampling period (1976) and age class (1977), are given in Appendices 26 and 27. Length frequency data from spawning ground sampling is recorded by age class and recovery location in Appendices 28 and 29.

The mean lengths of coho salmon in each spawning stream or area during 1977 are compared by age class in Table 17. The largest age $3_2$ male and female coho were found in the main Cowichan River and the Cowichan Side Channel. Coho sampled in the tributary streams were consistently smaller than main river coho. Age $3_2$ fish in Kelvin Creek were the smallest of all age $3_2$ coho sampled.

TABLE 16. Age composition of adult coho returns to the Cowichan-Koksilah study area.

| Return Year | Age at Return (%) $2_2$ | $3_2$ | $4_3$ | Estimated Return |
|---|---|---|---|---|
| 1976 | 4.2 | 92.2 | 3.6 | 27660 |
| 1977 | 1.4 | 96.4 | 2.2 | 69350 |

TABLE 17. Comparative mean lengths[a] by age class of coho salmon in spawning streams of the Cowichan-Koksilah study area during 1977.

| Stream | Male | | | | Female | | |
|---|---|---|---|---|---|---|---|
| | $2_2$ | $3_2$ | $4_3$ | Sample Size | $3_2$ | $4_3$ | Sample Size |
| Cowichan River | 31.7 | 54.9 | 56.4 | 107 | 53.9 | 53.2 | 103 |
| Rotary Park Pools | | 53.0 | | 40 | 52 | | 35 |
| Cowichan Side Channel | 34.4 | 54.1 | | 11 | 53.5 | | 32 |
| Bible Camp Side Channel | 30.2 | 52.5 | 53.6 | 5 | 52.9 | | 3 |
| Pastuch Creek | 33.8 | 53.3 | 58.6 | 28 | 52.4 | 52.7 | 40 |
| Robertson R. Side Channel | 31.4 | 52.3 | | 59 | 52.8 | | 90 |
| Mesachie Creek | 31.8 | 52.7 | | 37 | 52.3 | | 53 |
| Half Way Creek | | 51.8 | | 1 | 51 | 58.3 | 7 |
| Kelvin Creek[b] | 27.7 | 52.3 | | 25 | 50.8 | | 27 |
| Means | 32.0 | 53.6 | 56.4 | 288 | 53.0 | 53.8 | 363 |

[a]Post-orbital-hypural length in cm.

[b]Kelvin Creek is not included in calculation of the overall mean lengths.

## Adult Returns from Each Brood Year

The total adult escapement of 1973 brood year coho was estimated at 27,462, consisting of 443 returns at age $2_2$, 25,493 at age $3_2$, and 1,526 at age $4_3$ (Table 18). The total return to escapement of 1974 brood year coho was estimated at 71,765 adults, consisting of 1,162 returns at age $2_2$, 66,853 at age $3_2$, and 3,750 at age $4_3$. In both broods, the majority (93%) of coho returns to escapement were age $3_2$.

## Incidence of Coded-Wire Tagged Fish

Coded-wire tag recoveries totalled 54 from the 1973 brood and 292 from the 1974 brood (Table 19). In the 1973 brood year CWT incidence was higher in the dead recovery than in the estuary sample, whereas in the 1974 brood year CWT incidence was higher in the estuary. For the reasons discussed in the chinook salmon section, it is considered that estuary samples are more likely to represent CWT incidence in the escapement than are spawning ground recoveries. On this basis the incidence of CWT fish in adult coho returns from the 1973 and 1974 brood years is estimated at 1.39% and 3.35% respectively. Estimates of the total numbers of adipose-marked and CWT coho returning to the study area are presented in Table 20.

Basic recovery data for adipose fin-clipped coho returns to the Cowichan-Koksilah system are listed in Appendices 33 and 34. The numbers and incidence of CWT coho are listed by return year and sampling location in Appendix 16.

## Coded-Wire Tag Loss

Argue et al.(1979) estimated the preliberation loss of coded-wire tags from coho smolts at 3.7% in 1976 (1974 brood year). Preliberation tag loss was not estimated for the 1975 tagging. Recoveries of CWT and adipose-marked adult coho indicate that some post-release CWT loss also occurred. The rates of CWT loss (from tagging to adult escapement) for coho are calculated in Table 21, using the incidence of naturally-missing adipose fins among coho smolts at tagging in 1976. Tag loss is estimated at 13.1% and 9.3% for the 1973 and 1974 broods respectively.

## Survival of Marked Fish

The survival of adipose-marked coho smolts from release to adult escapement is estimated at 1.7% and 3.6% for the 1973 and 1974 broods respectively (Table 22). The comparative incidence of tags in the 1974 brood adult return (3.7%) and the estuary smolt population (4.4%) indicates that marking increased the ocean mortality rate of coho smolts. It is estimated that marked 1974 brood smolts survived from release to adult escapement (excluding fishery contributions) at 84% of the rate experienced by unmarked smolts in that brood (Table 22).

TABLE 18. Estimated numbers of coho salmon from each brood year contributing to 1975 - 1978 adult returns to the Cowichan-Koksilah system.

| Return Year | Brood Year 1972 | 1973 | 1974 | 1975 | Total |
|---|---|---|---|---|---|
| 1975 | | 443[a] | | | |
| 1976 | 1007 | 25493 | 1162[a] | | 27662 |
| 1977 | | 1526 | 66853 | 971[a] | 69350 |
| 1978 | | | 3750[b] | | |
| Total | | 27462 | 71765 | | |

[a]Minimum estimate of returns for age 2 (jack) coho.

[b]Estimated by ratio of age 3 to age 4 returns from 1973 brood year.

TABLE 19. Incidence of coded-wire tagged fish (CWT) in coho samples from the Cowichan-Koksilah study area by brood year and year of return.

| Return year | 1973 Brood Year Fish Examined | No. with CWT | CWT(%) | 1974 Brood Year Fish Examined | No. with CWT | CWT(%) |
|---|---|---|---|---|---|---|
| Estuary | | | | | | |
| 1976 | 1167 | 18 | 1.53 | | | |
| 1977 | 273 | 2 | .74 | 5243 | 176 | 3.35 |
| Totals | 1440 | 20 | 1.39 | 5243 | 176 | 3.35 |
| Dead Recovery | | | | | | |
| 1976 | 1365 | 33 | 2.62 | | | |
| 1977 | 122 | 1 | .82 | 5759 | 116 | 2.0 |
| Totals | 1487 | 34 | 2.29 | 5759 | 116 | 2.0 |

TABLE 20. Estimated returns of CWT and fin-marked coho salmon to the Cowichan-Koksilah study area.

| Brood Year | Fish Examined | No. with CWT | CWT Incidence (%) | Estimated Adult Return | Estimated CWT Return | Estimated Total Mark Return[a] |
|---|---|---|---|---|---|---|
| 1973 | 1440 | 20 | 1.39 | 27462 | 382 | 440 |
| 1974 | 5243 | 176 | 3.35 | 71765 | 2404 | 2650 |

[a]Corrected to account for CWT loss of 13.1% (1973 brood) and 9.3% (1974 brood); includes all adipose fin-marked fish.

The relative survival of marked and unmarked 1973 brood coho could not be calculated, as no estimate of mark incidence in the smolt population was available.

## Survival of Unmarked Fish

An estimated 71,765 1974 brood adult coho returned to the Cowichan-Koksilah system from an estuary smolt population estimated by Argue et al. (1979) at 1,649,500 fish. This adult return represents an ocean survival of 4.4%, excluding contributions to fisheries.

## Spawning Distribution of Coded-Wire Tagged Fish in Relation to Tagging Site

The distribution of CWT recoveries on the spawning grounds is shown for each smolt tagging location in Table 23. The locations of adult spawning were in some cases quite widely separated from the smolt tagging site. Of 65 returns from tagging at Mesachie Creek, a tributary to Cowichan Lake, 27 (42%) were recovered in the tagging stream or its tributary, 25 (38%) were recovered in the nearby Robertson River or its tributaries, and 12 (18%) were recovered in the upper Cowichan River (Fig. 1). Similarly, of 48 returns from smolt tagging at Rotary Park Pools on the lower Cowichan, 17 (35%) were recovered at the tagging stream, 27 (56%) were recovered in the upper Cowichan River above Skutz Falls, and 2 (4%) were recovered in the Robertson River.

Straying of coho between the Cowichan and Koksilah rivers was indicated by the recovery of 1 Mesachie Creek tag in Glenora Creek, a Koksilah River tributary, and 1 Kelvin Creek (Koksilah River) tag in the Cowichan River above Skutz Falls(Table 23).

TABLE 21. Calculation of CWT loss rate for marked coho returning to the study area.

| No. of Fish Examined | No. of Adipose-Marked Fish | Incidence of Marks |
|---|---|---|
| 1973 Brood | | |
| 1440[a] | 23 (with and without CWT) | 1.60% |
| 1440[a] | 4 (without CWT) | 0.28% |
| 75409 | 54 (natural marks) | 0.07%[b] |
| 1974 Brood | | |
| 5243[a] | 198 (with and without CWT) | 3.78% |
| 5243[a] | 22 (without CWT) | 0.42% |
| 75409 | 54 (natural marks) | 0.07%[b] |

Tag Loss Incidence = Incidence of Adipose Fin Marks in Each Brood - Incidence of Naturally-Missing Adipose Fins

- 1973 Brood Tag Loss Incidence = 0.28% - 0.07% = 0.21%

- 1974 Brood Tag Loss Incidence = 0.42% - 0.07% = 0.35%

Tag Loss Rate = Tag Loss Incidence ÷ Incidence of Marked Fish (with and without CWT) x 100

- 1973 Brood Tag Loss Rate = 0.21% ÷ 1.6% x 100 = 13.1%

- 1974 Brood Tag Loss Rate = 0.35% ÷ 3.78% x 100 = 9.3%

[a]Includes only fish captured in the estuary, to avoid the influence of additional tag loss from carcasses recovered on the spawning grounds.

[b]Incidence of naturally-missing adipose fins among 1974 brood coho smolts (Argue et al., 1979).

TABLE 22. Estimated survival of marked coho from smolt release to adult escapement and relative ocean survival of marked versus unmarked fish, Cowichan-Koksilah study area.

Ocean Survival of Marked Fish

| Brood Year | No. of Marks Released[a] | Mark Returns | Survival to Return[c] |
|---|---|---|---|
| 1973 | 26,135 | 440 | 1.7% |
| 1974 | 74,483 | 2650 | 3.6% |

Survival of Marked Fish Relative to Unmarked Fish

| Brood Year | Incidence of Marks: Juvenile Population[a] | Incidence of Marks: Adult Return | Relative Survival[b] |
|---|---|---|---|
| 1973 | —— | 1.60% | —— |
| 1974 | 4.37% | 3.69% | 0.84 |

[a] From Armstrong and Argue (1977) and Argue et al.(1979).

[b] Relative Survival = Mark Incidence in Adult Return ÷ Mark Incidence in Juvenile Population.

[c] Excluding contributions to ocean fisheries.

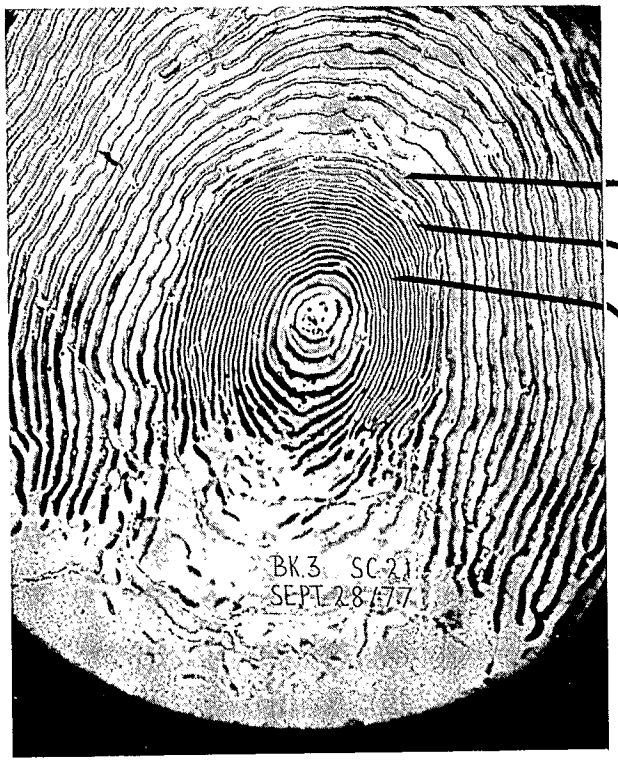
Scale Patterns of Marked Coho

Scales of age $3_2$ coho adults coded-wire tagged in Mesachie and Pastuch creeks are compared in Fig. 27. To the first freshwater annulus, the Mesachie Creek scale had formed 23 circuli , while the Pastuch Creek scale formed only 11 circuli. The nuclear scale patterns indicate a considerably higher growth rate in Mesachie Creek compared to Pastuch Creek, similar to the results obtained in the juvenile study (Argue et al, 1979).

Scales of 1977 age $4_3$ coho adults coded-wire tagged in Mesachie Creek (1976) and Cowichan Side Channel (1975) are compared in Fig. 28. The Mesachie Creek scale has 6-7 circuli to the first freshwater annulus plus 12 circuli to the second freshwater annulus. This pattern shows much less first year growth than is normally found in sub-2 Mesachie Creek smolts, indicating that the fish probably spent its first year in a stream other than Mesachie Creek. The Cowichan River Side Channel scale has 9-11 circuli to the first

TABLE 23. Spawning distribution of coho tagged (CWT) as smolts at various Cowichan-Koksilah study sites.

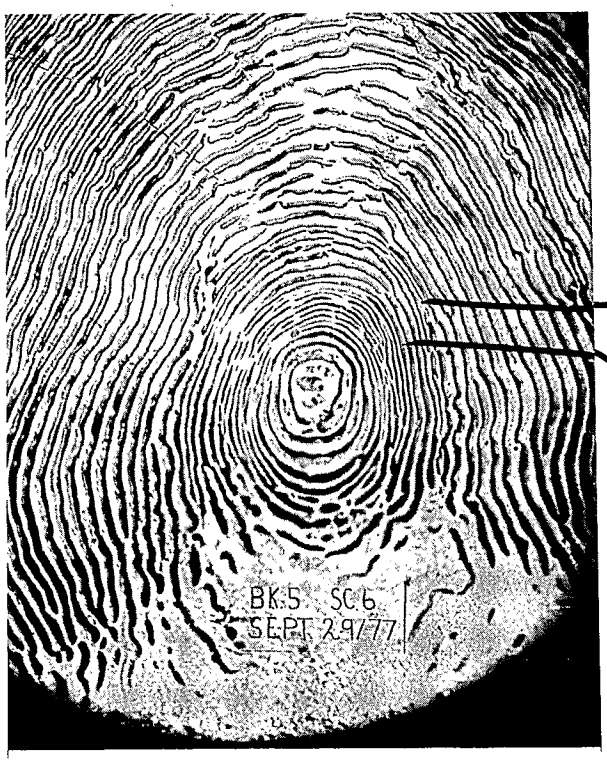
| Carcass Recovery Location | Smolt Tagging Location | | | | | |
|---|---|---|---|---|---|---|
| | Pastuch Creek | Mesachie Creek | Cowichan R. Side Channel | Rotary Park Pools | Kelvin Creek | Total |
| Robertson R. | 2 | | | | | 2 |
| Robertson R. Side Channel | | 23 | 2 | 2 | | 27 |
| Pastuch Creek | | 2 | | | | 2 |
| Half Way Creek | | 6 | | | | 6 |
| Mesachie Creek | | 21 | | | | 21 |
| Cowichan R. Above Skutz Falls | 2 | 12 | 7 | 27 | 1 | 49 |
| Cowichan R. Below Skutz Falls | | | 2 | 2 | | 4 |
| Cowichan R. Side Channel | | | 1 | | | 1 |
| Rotary Park Pools | | | 1 | 17 | | 18 |
| Kelvin Creek | | | | | 4 | 4 |
| Glenora Creek | | 1 | | | 15 | 16 |
| TOTAL | 4 | 65 | 13 | 48 | 20 | 150 |




Spring Growth
(5 circuli after freshwater annulus).

Freshwater Annulus
(after 23 circuli).

Stress check attributed to changes in feeding, temperature or rearing area.




Spring Growth
(7 circuli after freshwater annulus).

Freshwater Annulus
(after 11 circuli).

Magnification 350 x.

FIG. 27. Differences in freshwater growth related to rearing site, as shown in scales of adult coho, age $3_2$, tagged at Mesachie Creek (upper) and Pastuch Creek (lower) in the spring of 1976 and recovered during Cowichan Bay purse seining in September, 1977.

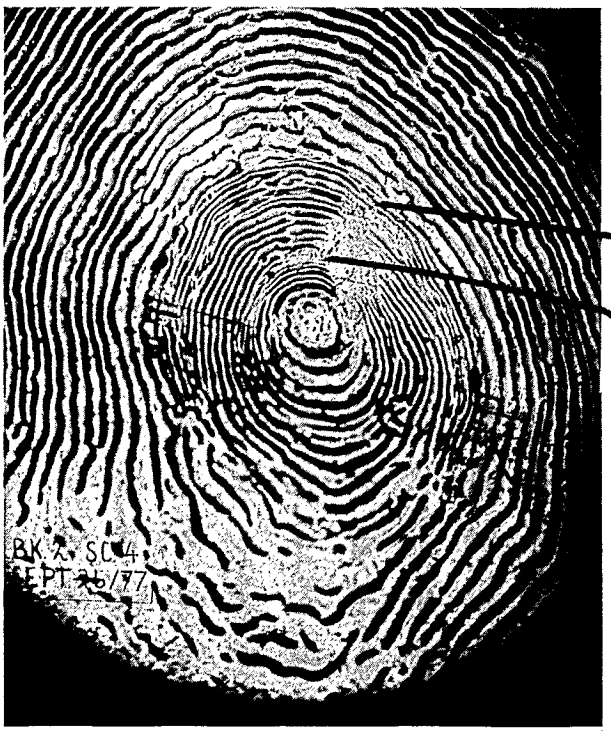



FIG. 28. Scales of adult coho, age $4_3$, tagged at Mesachie Creek in the spring of 1976 (upper) and at Cowichan River Side Channel in the spring of 1975 (lower). Both fish were recovered during Cowichan Bay purse seining in the fall of 1977.

freshwater annulus,while the second annulus is indistinct and not easily recognized for age determination. This fish, which was tagged in 1975, probably moved to another rearing area after its first year.

## CHUM SALMON

Very little incidental information was obtained on chum salmon over the course of this study. Significant numbers of chums did enter the Cowichan estuary during the last week of tagging, October 25-29, in 1976. A sample of 150 chums captured by seine was found to be 93.2% age $4_1$, 5.9% age $3_1$ and 0.8% age $5_1$. Females comprised 42% of the sample.

Small numbers of chum salmon were also observed in swim surveys in the main Cowichan River. The largest count (340) was made in Sections 6 and 7 of the lower Cowichan River during October 25-28, 1976.

## TROUT

Appendix 15 shows the number and distribution of rainbow, cutthroat and brown trout observed during river swim surveys. The majority of all three species (80%) were observed in Section 1 near Lake Cowichan during the October, 1976 survey.

# DISCUSSION

## SPAWNING POPULATION ESTIMATES

Several approaches to estimating adult chinook and coho salmon returns to the Cowichan-Koksilah system were examined in this study. The reliability of each approach is discussed below.

Schnabel-type estimates, based on tagging and recovery within the Cowichan estuary, did not provide estimates of jack male populations for either chinook or coho. Insufficient numbers of tags were applied to and recovered from jacks. Jack chinook (age 2) migrated into the Cowichan River earlier than large chinook (age 3, 4, and 5) and were thus available to purse seining over a shorter time period. This bias may have resulted from the fact that no correction was made for tag loss in the estuary. The measured rate of tag loss in the estuary (56%) was judged to be excessive in comparison to the rate determined for spawning ground tag recoveries (25%) which had been at large for a longer period.

For large (non-jack) coho, Schnabel-type estimates based on estuary tagging and recovery compared well with those obtained from tower counts, being respectively 18% and 1% less than tower counts in 1976 and 1977 (Table 13).

Inadequate tag recoveries on the spawning grounds precluded development of reliable Petersen-type estimates for chinook. The results obtained with coho salmon were varied. The Petersen estimate was comparable to the Schnabel and tower count estimates in 1976, but was almost 4 times these other estimates in 1977 (Table 13).

The Petersen-type estimates tended to be high in relation to those obtained by other methods. Tag shedding may have been underestimated by the double-tagging experiment which produced few recoveries. Other sources of tag loss, such as the native spear fishery in the Cowichan River and the tagging of coho in the estuary which were actually destined for streams outside the study area, may not have been adequately taken into account in developing the estimates. The tendency for positive bias in Petersen-type tag-and-recovery estimates, increasing with distance and time between tagging and recovery, was also frequently observed in the estimation of pink salmon (Oncorhynchus gorbuscha) escapements (Vernon et al., 1964).

Swim surveys of the Cowichan River were valuable only in estimating chinook populations, as the survey timing generally preceded coho spawning. Swim surveys were also conducted before peak chinook spawning in 1976 and 1977 and did not account for a portion of the population which was still in the estuary at the time of the survey. The swim survey method did provide good discrimination of large and jack chinook, and was used to estimate chinook escapements in 1978 and 1979 when the counting tower was not used. However the estimate obtained from the 1979 swim survey, which covered only the first river section below Cowichan Lake, must be considered less reliable than estimates in the 3 previous years.

Tower counts were used to estimate chinook and coho escapements to the Cowichan River in 1976 and 1977. The method enabled discrimination of large and jack chinook, but not large and jack coho. Though tower counts are considered to have less inherent bias than the other enumeration methods, they are likely to underestimate the population, particularly in the case of late-migrating coho. High water levels and reduced visibility resulted in termination of tower counts when coho migration was declining, but before it could be considered complete. In 1976 the tower count included an adjustment for coho arriving after suspension of counting, based on visual observations by the field crew.

## SPAWNING DISTRIBUTION

This study confirmed that the majority of chinook salmon spawned in the main Cowichan River upstream of Skutz Falls. In 1976 chinook carcass recoveries and spawner counts documented respective proportions of 79%

and 78% spawning above Skutz Falls. Swim surveys in 1977 and 1978 also indicated that 83% and 91% of chinook spawned in this area. Earlier studies reported lower proportions, 65% in 1965 and 47% in 1966, of chinook spawning in the section between Cowichan Lake and Skutz Falls (Lister et al., 1971).

Four chinook carcasses were recovered in Glenora and Kelvin creeks, tributaries of the Koksilah River. The main Koksilah River, where chinook are reported to spawn, was not surveyed. Concentration of surveys in the Cowichan River, particularly the tower counts and swim surveys, may have resulted in underestimation of the chinook escapement to the overall study area.

Carcass recovery data indicated that the majority of study area coho salmon (73-76%) also spawn in the main Cowichan River upstream of Skutz Falls. Only 0.9% and 1.8% of the total coho carcass recoveries were made in Koksilah River tributaries in 1976 and 1977, suggesting respective coho escapements of 250 and 1250 fish. However, the lack of surveys in the main Koksilah River probably resulted in underestimation of the coho escapement to this system.

## COHO SPAWNING TIMING

Differences between streams in the timing of coho spawning were correlated with temperature regimes. Coho spawning occurred earliest in the coldest streams, Kelvin and Glenora creeks of the Koksilah system, and latest in the main Cowichan River and Rotary Park Pools, the warmest of the study area streams. A similar relationship between stream temperature and spawning timing has been reported for southeast Alaska pink salmon populations (Sheridan, 1962).

## SURVIVAL OF MARKED AND UNMARKED JUVENILES

In this study 1974 and 1975 brood juvenile chinook, marked by an adipose fin clip and coded-wire tag, survived from release to adult escapement at rates of 0.29% and 0.39% respectively. The survival estimate does not include fishery contributions. Ocean survival of marked chinook was significantly lower than that of unmarked chinook, 1.6% (1974 brood) and 5.5% (1975 brood), based on estimates of total brood year returns in this study and previously reported estimates of juvenile chinook populations in the Cowichan estuary (Armstrong and Argue, 1977; Argue et al. 1979).

Marked coho smolts of the 1973 and 1974 brood years survived from release to adult escapement at rates of 1.7% and 3.6% respectively. The survival of 1974 brood unmarked coho smolts, calculated from the estuary smolt population estimate (Argue et al. 1979) and adult return data in this report, is estimated at 4.4%.

These results indicate that marked juveniles experienced lower ocean survival rates than unmarked juveniles. The relative survival of marked versus unmarked fish may be calculated from the comparative incidence of marked fish in juvenile populations and adult returns. On this basis, relative survival of marked chinook is estimated at 0.18 and 0.08 in the 1974 and 1975 broods respectively. For 1974 brood coho smolts the relative survival of marked fish is estimated at 0.84. By comparison, preliminary data from marking (adipose clip + CWT) of coho smolts at Oregon hatcheries indicates that relative survival of marked smolts approximates 0.70 (R. Garrison, pers. comm.).

Though the coded-wire tag appears to have no effect on salmon growth or survival, the handling of smolts at tagging can cause stress and mortalities (Bergman et al.,1968). At the time of tagging in the Cowichan estuary chinook juveniles were observed to be especially susceptible to the holding and marking procedures. Short-term mortalities of up to 14%, attributable to high water temperatures (to 22°C) and scale loss, were observed (Armstrong and Argue, 1977). It would appear from this experience that marking of chinook at the smolt stage in the estuary severely reduces their survival rate and is therefore not a feasible approach to obtaining information on ocean migration and exploitation.

The ocean survival of Cowichan-Koksilah chinook and coho smolts, from seaward migration to adult return (excluding fishery contributions), can be compared with ocean survival rates of chinook and coho smolts from the Big Qualicum River, another east coast of Vancouver Island stream (E.A. Perry, pers. comm.). The average ocean survival of 1974 and 1975 brood chinook in this study (3.6%) compared favourably with the average survival of 1962 to 1968 brood Big Qualicum chinook (2.4%). A similar comparison of coho smolt ocean survival rates indicates that 1974 brood Cowichan-Koksilah coho survived at a lower rate (4.4%) than the average experienced at Big Qualicum (10.4%). It should be noted, however, that due to year-to-year variation a single year of observation is unlikely to reflect the long-term survival rate.

## SPAWNING DISTRIBUTION OF CODED-WIRE TAGGED COHO

A large percentage (61%) of coded-wire tagged adult coho salmon returned to spawn in locations which differed from the smolt tagging sites. This is apparent from the distribution of coho returns originally tagged at Mesachie Creek, Cowichan River Side Channel and Rotary Park Pools (Table 23). Eighteen percent of coho returns tagged at Mesachie Creek were recovered in the upper 5 km of the main Cowichan River and a further 38% were recovered in Lake Cowichan tributaries other than the original tagging stream. It is believed that following emergence juvenile coho move into the Mesachie Creek-Lake complex for summer rearing and overwintering. During the 1976 tagging program, 13 coho smolts tagged as yearlings at Pastuch Creek in 1975 were recaptured in Mesachie Creek (Argue et al., 1979). Adult recoveries of coho tagged at Rotary Park Pools were similarly dispersed, with 65% recovered as carcasses in the main Cowichan River upstream of the smolt tagging site.

A general explanation for the above behavior is that adult coho salmon return to spawn in the area from which they emerge as fry rather than the area which they utilize for summer rearing or overwintering. Peterson (1979) documented fall and winter movements of coho up to 33 km downstream to overwinter in side channels or ponds. Gray et al. (1978) observed that rearing coho juveniles tagged in one tributary of the Berners River, southeast Alaska, returned to spawn in another tributary of that system.

Straying of coho between the Cowichan and Koksilah rivers was also observed. One of 20 recoveries (5%) from coho originally tagged in Kelvin Creek, a Koksilah River tributary, was recovered in the Cowichan River. One of 130 recoveries (0.8%) from coho smolts tagged in the Cowichan system was recovered in Glenora Creek, another Koksilah River tributary. These rates of apparent straying appear low in comparison to those observed in northern California streams (Taft and Shapovalov, 1938). Over a 6-year period an average of 15% of the coho juveniles tagged in Waddell Creek returned to Scott Creek, 8 km to the south.

## SUMMARY

1. During 1976 to 1979 the returns of adult chinook and coho salmon to the Cowichan and Koksilah River systems were assessed to estimate, for each brood year and species, the total adult return to escapement and the incidence of coded-wire tagged fish in that return. The purpose of the study was to document returns of coho from the 1973 and 1974 brood years and chinook from the 1974 and 1975 brood years which had been marked as juveniles by coded-wire tagging. Additional information was obtained on salmon migration timing, spawning distribution and timing, age and size composition, and subsequent spawning distribution of fish tagged at various sites in the two river systems.

2. Four different approaches were utilized to estimate chinook and coho escapements to the study area: (i) tagging and recovery of tags by purse seine in the estuary; (ii) tagging in the estuary with recovery of tags on the spawning grounds; (iii) tower counts of adult migrants in the Cowichan River; and (iv) swim survey counts of spawners in the Cowichan River.

3. A portion of the adult coho salmon population tagged in Cowichan Bay may have been destined for spawning streams outside the study area. In 1976 and 1977 saltwater sport fishery recoveries of tagged coho outside the Cowichan Bay - Saanich Inlet area, mainly in the San Juan Islands, comprised 25% and 6% respectively of all saltwater sport fishery recoveries. In 1977 two of 86 freshwater tag recoveries of coho by anglers were taken in southeast Vancouver Island streams outside Cowichan Bay.

4. Chinook migration into the Cowichan River commenced with the first significant increase in river discharge in October and peaked during mid-October to early November. Jack chinook tended to enter the river earlier than large chinook. Coho entered the river later than chinook, during periods of increased river discharge from late October to mid-November.

5. Chinook salmon spawning took place in the main Cowichan River; the majority (78-91%) spawned in the upper 18 km of the river above Skutz Falls. Coho salmon spawned in the main Cowichan River and its side channels, and in tributaries to Cowichan Lake and the Koksilah River. As in the case of chinook, the major portion of coho spawning (73-76%) occurred in the Cowichan River above Skutz Falls.

6. Chinook salmon spawned during the period October 15 to November 30, with the estimated peak date in a given year ranging from October 24 to November 11. Coho salmon spawning took place from late October to early February. Timing differed greatly between streams and was correlated with temperature, taking place earlier in the colder streams and later in warmer streams. Estimated dates of peak coho spawning in individual streams ranged from November 10 to January 12.

7. Chinook salmon were almost entirely (99.7%) sub-1 fish, i.e. migrating to sea in the first year of life. Male chinook were ages $2_1$, $3_1$, $4_1$, and $5_1$. Jack males (age $2_1$) dominated adult returns in each year, comprising 76-80% of the males and 57-61% of the total return. Among females, the predominant age $4_1$ group included 61-80% of the return in each year.

8. Age $3_2$ fish dominated the coho escapement in each year, comprising 92.2% and 96.4% of the total return in the two years of coho study (1976 and 1977). Jack male coho (age $2_2$) comprised an estimated 4.2% and 1.4% of the escapement, and age $4_3$ fish made up the remaining 3.6% and 2.2% in each year.

9. Chinook salmon escapement estimates obtained by tower counts (1976 and 1977) and swim surveys (1978 and 1979) were considered to be the most reliable estimates. Chinook escapements estimated by these methods were 7,500 (1976), 8,600 (1977), 10,200 (1978) and 17,100 (1979). Schnabel-type estimates, involving tagging and recovery within the estuary, did not provide estimates of jack chinook (due to inadequate recoveries) and tended to produce a higher estimate of large chinook than tower counts. Petersen-type estimates, obtained by estuary tagging and recovery on the spawning grounds, were consistently much higher than estimates by other methods.

10. Tower counts were considered to provide the most reliable, though somewhat conservative, estimates of coho escapement. Escapement estimates by this method were 27,700 in 1976 and 69,400 in 1977. For large (non-jack) coho, Schnabel-type estimates based on estuary tagging and recovery compared well with those obtained by tower counts. Petersen-type estimates, using tag recoveries on the spawning grounds, were comparable to those obtained by other methods in 1976, but almost 4 times greater than the other estimates in 1977.

11. The estimated adult return of 1974 brood year chinook totalled 9158 fish, consisting of 49.6% age 2, 11.6% age 3, 34.8% age 4, and 4% age 5. The 1975 brood year return was estimated at 9483 fish, with a similar age composition of 51.7% age 2, 5.9% age 3, 38.2% age 4 and 4.2% age 5.

12. The total adult return of 1973 brood year coho was estimated at 27,462, consisting of 1.6% age $2_2$, 92.8% age $3_2$, and 5.6% age $4_3$. The total return to escapement of 1974 brood year coho was estimated at 71,765 adults, consisting of 1.6% age $2_2$, 93.1% age $3_2$ and 5.2% age $4_3$.

13. Incidence of coded-wire tagged fish among 1974 and 1975 brood year chinook was estimated at 0.53% and 0.67% respectively. Ocean survival of marked chinook, from tagging to adult return, was significantly lower than unmarked chinook, 0.29% versus 1.6% (1974 brood) and 0.39% versus 5.5% (1975 brood), based on estimates of total brood year returns in this study and previously reported estimates of juvenile chinook populations in the Cowichan estuary. The survival of marked fish relative to unmarked fish was 0.18 (1974 brood) and 0.08 (1975 brood). Shedding or loss of coded-wire tags from marking to adult return, including the pre-release tag loss, was calculated to be 9.7%.

14. Incidence of coded-wire tagged fish among 1973 and 1974 brood coho was estimated at 1.39% and 3.35% respectively. Coded-wire tagged coho smolts survived from tagging to adult return at rates of 1.7% (1973 brood) and 3.6% (1974 brood). The ocean survival rate of 1974 brood unmarked coho smolts was estimated at 4.4%. The survival of marked smolts relative to unmarked smolts was estimated at 0.84. Shedding or loss of coded-wire tags from marking to adult return, including the pre-release tag loss, was calculated at 13.1% and 9.3% for the 1973 and 1974 broods respectively.

15. A large percentage (61%) of coded-wire tagged adult coho salmon returned to spawn in locations which differed from the smolt tagging sites. Evidence indicating dispersal of juvenile coho both downstream and upstream of spawning areas to rear or overwinter was reviewed. It was postulated that returning adult coho home to the area from which they emerge as fry rather than the area they utilize for summer rearing or overwintering.

16. Straying of coho between the Cowichan and Koksilah rivers was also observed. Indicated rates of straying, based on 1 adult recovery in each system, amounted to 5% and 0.8%.

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# APPENDICES

APPENDIX 1 DESCRIPTION OF SET LOCATIONS FOR PURSE SEINING IN COWICHAN BAY DURING 1976 AND 1977.

1976

| Date | Set no. | Description | Remarks |
|---|---|---|---|
| Sep 30 | 1 | N.A.[a] | |
| 30 | 2 | " | |
| 30 | 3 | " | |
| Oct 5 | 4 | " | |
| 6 | 5 | Blind set on North Side | |
| 6 | 6 | N.A. | |
| 7 | 7 | Middle 25 F | |
| 7 | 8 | Middle | |
| 7 | 9 | Off Westcan | |
| 8 | 10 | Off Westcan | |
| 8 | 11 | N.A. | too many to retain |
| 12 | 12 | Off boundary buoy | |
| 12 | 13 | " | |
| 12 | 14 | North of Westcan | |
| 13 | 15 | Off Texaco dock | |
| 13 | 16 | Off Westcan | released approx 200 (mixed chinook & coho) |
| 14 | 17 | North of Westcan | |
| 14 | 18 | Off Westcan | |
| 14 | 19 | " | released approx 400 (mixed chinook & coho) |
| 14 | 20 | Blind set north of Westcan | no fish |
| 14 | 21 | Off Westcan | released approx.350 |
| 14 | 22 | Blind set north of Westcan | no fish |
| 15 | 23 | Off Westcan | released approx.350 chinook |
| 15 | 24 | " | |
| 15 | 25 | " | |
| 15 | 26 | " | released approx.150 chinook |
| 19 | 27 | On boundary line | |
| 19 | 28 | Just inside boundary | |
| 19 | 29 | Outside boundary | |
| 19 | 30 | Off Westcan | |
| 20 | 31 | N.A. | |
| 20 | 32 | " | |
| 20 | 33 | " | |
| 20 | 34 | " | |
| 20 | 35 | " | |
| 21 | 36 | Off boundary buoy | |
| 21 | 37 | " | |
| 21 | 38 | Boundary buoy | |
| 21 | 39 | Off Westcan | |
| 21 | 40 | North side | |
| 22 | 41 | Boundary buoy | |
| 22 | 42 | N.A. | |
| 22 | 43 | " | back lash |
| 25 | 44 | Off main channel | |
| 26 | 45 | Off Westcan | |
| 26 | 46 | " | |
| 26 | 47 | North shore | |
| 27 | 48 | North of Westcan | dumped set |
| 27 | 49 | Off boundary buoy | |
| 27 | 50 | N.A. | |
| 28 | 51 | Blind set east of gov't dock | 19 chinook grilse, mended large hole in net |
| 28 | 52 | Off north channel | |

[a]Not available.

APPENDIX 1 (cont.)

1977

| Date | Set No. | Description | Remarks |
|---|---|---|---|
| Sep 22 | 1 | Westcan dock | 20 chinook grilse. |
| | 2 | " | One sockeye in catch. |
| 23 | 3 | " | Released approx.30 chinook and 40 coho without checking for tags or marks(3 chinook dead). |
| | 4 | " | |
| | 5 | | |
| 26 | 6 | 30 F mid estuary | |
| | 7 | | Set released,large no. of grilse |
| 28 | 8 | Boundary buoy | |
| | 9 | Just outside drop-off | One pink in catch. |
| 29 | 10 | Off Westcan | |
| | 11 | | |
| | 12 | | One pink in catch. |
| 30 | 13 | Off Westcan | Released approx.85 adult and 20 jack chinook without checking for tags or marks. |
| | 14 | " | |
| | 15 | " | |
| Oct 4 | 16 | " | |
| | 17 | " | |
| | 18 | " | |
| 5 | 19 | " | 10,000 herring (age 0+). |
| | 20 | " | |
| | 21 | " | |
| 6 | 22 | " | |
| | 23 | " | Set released(approx.50 chinook and 20 coho). |
| | 24 | Along sport boundary | |
| | 25 | Blind set | No catch. |
| 7 | 26 | Off Westcan | |
| | 27 | Blind set off Westcan | |
| 11 | 28 | Off Westcan | |
| 12 | 29 | " | On edge of main chinook school. |
| 13 | 31 | Blind set north shore near Skinner Pt. | No catch. |
| 13 | 32 | North shore near Skinner Pt. | |
| 13 | 33 | Westcan dock on edge of chinooks | Approx.20 chinook grilse; a few jumpers. |
| 13 | 34 | | |
| 18 | 35 | Off Westcan | |
| 18 | 36 | | |
| 18 | 37 | | |
| 19 | 38 | Off Westcan | |
| 19 | 39 | " | |
| 20 | 40 | " | |
| 20 | 41 | " | |
| 21 | 42 | Off North Arm | |
| 21 | 43 | " | |
| 22 | 44 | " | |
| 22 | 45 | " | |
| 25 | 46 | | |

APPENDIX 1 (cont.)

1977

| Date | Set No. | Description | Remarks |
|---|---|---|---|
| Oct 26 | 47 | Off Westcan | |
| 26 | 48 | Off Genoa Bay | |
| 27 | 49 | Off north shore | |
| 27 | 50 | Off Genoa Bay | |
| 27 | 51 | Off North shore | No catch. |
| 27 | 52 | " | |
| 28 | 53 | Off Genoa Bay | |
| 28 | 54 | " | Occasional jumper; held set open 15 minutes. |

APPENDIX 2 TAG SERIES USED TO TAG CHINOOK AND COHO DURING THE PURSE SEINING IN COWICHAN BAY.

1976

| | Date | Type | Tag Series | Total Tagged |
|---|---|---|---|---|
| Chinook | Sep 28-30 | Spaghetti | 06000-06199 | 199 |
| | Oct 5 | " | 06400-06599 | 199 |
| | Oct 7-15 | " | 07400-07799 | 396 |
| | | | | 794 |
| Coho | Sep 30-Oct 19 | disk | X0000-X0563 | 560 |
| | Oct 20-26 | " | X2000-X2551 | 543 |
| | | | | 1103 |

1977

| | | | | |
|---|---|---|---|---|
| Chinook | Sep 22-23 | spaghetti | 06200-06399 | 199 |
| | Sep 23-28 | " | 06600-06999 | 394 |
| | Sep 28-Oct 7 | " | 10000-10499 | 499 |
| | | | | 1092 |
| Coho | Sep 22-29 | spaghetti | 08000-08499 | 497 |
| | Sep 29-Oct 4 | " | 08500-08999 | 498 |
| | Oct 4- 5 | | 09000-09499 | 498 |
| | Oct 5- 7 | " | 09500-09999 | 497 |
| | Oct 7-11 | " | 10500-10705 | 204 |
| | Oct 13 | " | 10717-10811 | 95 |
| | Oct 18 | " | 10881-10999 | 119 |
| | Oct 13-18 | " | 18625-18823 | 198 |
| | Oct 13 | " | B08137+B08138 | 2 |
| | Oct 18-21 | " | B28500-B29499 | 962 |
| | Oct 21 | " | B26500-B26999 | 467 |
| | Oct 21 | " | B27500-B27724 | 196 |
| | Oct 13 | Spaghetti/disk[a] | 10706-10716/X10000-X10010 | 11 |
| | Oct 18 | " " | 10812-10880/X10011-X10078 | 68 |
| | Oct 19-20 | " " | X07050-X07397/X10079-X10424 | 345 |
| | Oct 23-27 | " " | B27725-B28237/X10425-X10882 | 454 |
| | | | | 5111 |

[a]Coho double tagged with spaghetti and disk tags.

1978

| | | | | |
|---|---|---|---|---|
| Chinook | Sep 21 | Spaghetti | 19525-19535 | 11 |
| | Sep 28 | " | 19536-19540 | 5 |
| | Oct 6 | " | 19541-19573 | 32 |
| | | | | 48 |

1979

| | | | | |
|---|---|---|---|---|
| Chinook | Sep 21 | Spaghetti | B19575-19674 | 76 |
| | | " | B19975-19999 | 23 |
| | | " | B12101-12270 | 59 |
| | Oct 2 | " | B19675-19874 | 81 |
| | | | | 239 |

APPENDIX 3 CATCH AND TAGGING INFORMATION FOR CHINOOK AND COHO SALMON CAUGHT BY PURSE SEINING IN COWICHAN BAY, 1976-1979.

1976

| Date | Set | Catch Checked | | Catch Tagged | | | Tags Recaptured | | Mark Recoveries | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Chinook | Coho[a] | Chinook | | Coho | Chinook | Coho | Chinook | Coho |
| | | | | Large | Jack | | | | | |
| Sep 30 | 1-3 | 200 | 21 | 196 | 3 | 8 | - | - | 0 | 1 |
| Oct 05 | 4 | 200 | 2 | 198 | 1 | 2 | 1 | 0 | 0 | 0 |
| 06 | 5 | 0 | 1 | 0 | 0 | 0 | 0[b] | 0 | 0 | 0 |
| 06 | 6 | 29 | 136 | 0 | 0 | 114 | 1[b] | 0 | 0 | 1 |
| 07 | 7 | 27 | 14 | 21 | 2 | 0 | 2 | 0 | 0 | 0 |
| 07 | 8 | 10 | 49 | 4 | | 47 | 2 | 0 | 0 | 2 |
| 07 | 9 | 7 | 17 | 0 | | 15 | 0 | 0 | 0 | 0 |
| 08 | 10 | 89 | 5 | 66 | | 0 | 3 | 0 | 0 | 0 |
| 08 | 11 | - | - | 0 | | 0 | - | - | - | - |
| 12 | 12 | 8 | 14 | 6 | | 13 | 2 | 0 | 0 | 1 |
| 12 | 13 | 3 | 1 | 0 | | 0 | 0 | 0 | 0 | 0 |
| 12 | 14 | 134 | 177 | 0 | | 173 | 11 | 1 | 0 | 0 |
| 13 | 15 | 55 | 23 | 47 | 2 | 21 | 5 | 2 | 0 | 0 |
| 13 | 16 | 37 | 61 | 32 | | 61 | 1 | 0 | 0 | 0 |
| 14 | 17-22 | 159 | 39 | 80 | | 34 | 6 | 1 | 0 | 0 |
| 15 | 23-26 | 153 | 24 | 134 | 2 | 17 | 8 | 0 | 0 | 0 |
| 19 | 27 | 1 | 38 | 0 | | 36 | 1 | 0 | 0 | 1 |
| 19 | 28 | 2 | 21 | 0 | | 19 | 1 | 0 | 0 | 2 |
| 19 | 29 | 0 | 3 | 0 | | 0 | - | 1 | 0 | 0 |
| 19 | 30 | - | 2 | 0 | | 0 | - | - | - | 1 |
| 20 | 31 | 5 | 23 | 0 | | 21 | 2 | 1 | 0 | 1 |
| 20 | 32 | 0 | 27 | 0 | | 26 | 0 | 0 | 0 | 0 |
| 20 | 33 | 0 | 27 | 0 | | 26 | 0 | 0 | 0 | 1 |
| 20 | 34 | 5 | 121 | 0 | | 111 | 1 | 3 | 0 | 7 |
| 20 | 35 | 2 | 19 | 0 | | 19 | 0 | 0 | 0 | 0 |
| 21 | 36 | 7 | 55 | 0 | | 53 | 1 | 1 | 0 | 1 |
| 21 | 37 | 0 | 79 | 0 | | 73 | 0 | 4[b] | 0 | 2 |
| 21 | 38 | 0 | 25 | 0 | | 21 | 0[b] | 3 | 0 | 1 |
| 21 | 39 | 1 | 0 | 0 | | 0 | 1[b] | 0 | 0 | 0 |
| 21 | 40 | 0 | 0 | 0 | | 0 | - | - | - | - |
| 22 | 41 | 2 | 76 | 0 | | 71 | 0 | 4 | 0 | 0 |
| 22 | 42 | 3 | 63 | 0 | | 62 | 3 | 0 | 0 | 1 |
| 22 | 43 | - | - | 0 | | 0 | - | - | - | - |
| 25 | 44 | 7 | 10 | 0 | | 10 | 0 | 0 | 0 | 0 |
| 26 | 45 | 1 | 7 | 0 | | 7 | 0 | 0 | 0 | 0 |
| 26 | 46 | 90 | 45 | 0 | | 43 | 9 | 2[b] | 0 | 0 |
| 26 | 47 | 0 | 4 | 0 | | 0 | 0 | 1[b] | 0 | 0 |
| TOTAL | | 1237 | 1229 | 784 | 10 | 1103 | 61 | 24 | 0 | 23 |

[a] Catch checked includes adipose clipped fish (CWT) recaptured.

[b] Tag number not recorded.

APPENDIX 3 (cont.)

1977

| Date | Set | Catch Checked | | | Catch Tagged | | | Tags Recaptured | | | Mark Recoveries | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Chinook | | Coho | Chinook | | Coho | Chinook | | Coho | Chinook | | Coho |
| | | Large | Jack | | Large | Jack | | Large | Jack | | Large | Jack | |
| Sep 22 | 1 | 3 | 64 | 32 | 3 | 63 | 24 | - | - | - | 0 | 1 | 2 |
| | 2 | 72 | 42 | 39 | 72 | 42 | 39 | - | - | - | 0 | 0 | 0 |
| 23 | 3 | 242 | 27 | 4 | 229 | 27 | 3 | 1 | 0 | - | 2 | 0 | 1 |
| | 4 | 3 | 15 | 2 | 2 | 15 | 2 | 1 | 0 | - | 0 | 0 | 0 |
| | 5 | 30 | 33 | 25 | 28 | 32 | 24 | 2 | 0 | - | 1 | 0 | 1 |
| 26 | 6-7 | 59 | 7 | 183 | 53 | 7 | 175 | 6 | 0 | - | 0 | 0 | 7 |
| 28 | 8 | 81 | 5 | 44 | 74 | 3 | 41 | 5 | 2 | 2 | 0 | 1 | 1 |
| | 9 | 233 | 10 | 108 | 226 | 8 | 95 | 5 | 2 | 1 | 0 | 0 | 11 |
| 29 | 10 | 78 | 3 | 20 | 66 | 2 | 18 | 11 | 0 | 1 | 0 | 1 | 1 |
| | 11 | 7 | 4 | 4 | 6 | 2 | 4 | 1 | 2 | 0 | 0 | 0 | 0 |
| | 12 | 56 | 12 | 229 | 36 | 212 | 638 | 12 | 0 | 2 | 0 | 0 | 13 |
| 30 | 13 | 8 | 4 | 17 | 6 | 4 | 16 | 2 | 0 | 0 | 0 | 0 | 1 |
| | 14 | 4 | 6 | 23 | 2 | 6 | 23 | 2 | 0 | 0 | 0 | 0 | 0 |
| | 15 | 101 | 22 | 226 | 0 | 0 | 207 | 16 | 2 | 4 | 0 | 0 | 15 |
| Oct 4 | 16 | 3 | 0 | 12 | 3 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 2 |
| | 17 | 35 | 9 | 347 | 0 | 0 | 321 | 8 | 2 | 10 | 0 | 0 | 16 |
| | 18 | 0 | 0 | 93 | 0 | 0 | 87 | 0 | 0 | 2 | 0 | 0 | 4 |
| 5 | 19 | 4 | 2 | 85 | 0 | 0 | 79 | 1 | 0 | 2 | 0 | 0 | 4 |
| | 20 | 6 | 0 | 154 | 0 | 0 | 144 | 1 | 0 | 3 | 0 | 0 | 7 |
| | 21 | 27 | 2 | 92 | 22 | 0 | 90 | 5 | 0 | 2 | 0 | 1 | 0 |
| 6 | 22-23 | 55 | 6 | 139 | 25 | 0 | 134 | 8 | 0 | 2 | 0 | 1 | 3 |
| | 24-25 | 3 | 0 | 109 | 0 | 0 | 93 | 0 | 0 | 10 | 0 | 0 | 6 |
| 7 | 26-27 | 6 | 1 | 166 | 17 | 0 | 158 | 0 | 0 | 3 | 0 | 0 | 5 |
| 11 | 28 | 5 | 11 | 213 | 0 | 0 | 194 | 2 | 1 | 8 | 0 | 0 | 11 |
| 12-13 | 29-31 | N.A. | N.A. | N.A. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Oct 13 | 32 | 0 | 0 | 12 | 0 | 0 | 11 | 0 | 0 | 1 | 0 | 0 | 0 |
| | 33 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 34 | 137 | 20 | 210 | 0 | 0 | 192 | 2 | 1 | 6 | 0 | 0 | 12 |
| Oct 18 | 35 | 3 | 1 | 75 | 0 | 0 | 68 | 0 | 0 | 2 | 0 | 0 | 5 |
| | 36 | 10 | 4 | 251 | 0 | 0 | 234 | 3 | 0 | 9 | 0 | 0 | 8 |
| | 37 | 68 | 4 | 304 | 0 | 0 | 281 | 4 | 0 | 15 | 0 | 1 | 8 |
| Oct 19 | 38 | 23 | 1 | 273 | 0 | 0 | 262 | 2 | 0 | 4 | 0 | 0 | 8 |
| | 39 | 2 | 1 | 240 | 0 | 0 | 217 | 0 | 0 | 16 | 0 | 0 | 7 |
| Oct 20 | 40 | 0 | 1 | 137 | 0 | 0 | 128 | 0 | 0 | 5 | 0 | 0 | 3 |
| | 41 | 4 | 1 | 381 | 0 | 0 | 360 | 1 | 0 | 12 | 0 | 0 | 9 |
| Oct 21 | 42 | 4 | 0 | 269 | 0 | 0 | 246 | 0 | 0 | 16 | 0 | 0 | 7 |
| | 43 | 0 | 0 | 506 | 0 | 0 | 464 | 0 | 0 | 32 | 0 | 0 | 10 |
| Oct 22 | 44 | 3 | 0 | 106 | 0 | 0 | 97 | 0 | 0 | 2 | 0 | 0 | 6 |
| | 45 | 0 | 0 | 61 | 0 | 0 | 57 | 0 | 0 | 2 | 0 | 0 | 2 |
| Oct 25 | 46 | 1 | 0 | 61 | 0 | 0 | 57 | 0 | 0 | 4 | 0 | 0 | 0 |
| Oct 26 | 47 | 9 | 1 | 7 | 0 | 0 | 6 | 2 | 0 | 1 | 0 | 0 | 0 |
| | 48 | 0 | 0 | 124 | 0 | 0 | 117 | 0 | 0 | 2 | 0 | 0 | 5 |
| Oct 27 | 49 | 0 | 0 | 10 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 50-51 | 0 | 0 | 16 | 0 | 0 | 14 | 0 | 0 | 1 | 0 | 0 | 1 |
| | 52 | 3 | 1 | 99 | 0 | 0 | 96 | 0 | 0 | 1 | 0 | 0 | 2 |
| Oct 28 | 53-54 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | | 1388 | 320 | 5516 | 870 | 222 | 511 | 103 | 12 | 183 | 3 | 6 | 204 |

APPENDIX 3 (cont.)

1978

| Date | Set | Catch Checked | | | Catch Tagged | | | Tags Recaptured | | | Mark Recoveries | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Chinook | | Coho | Chinook | | Coho | Chinook | | Coho | Chinook | | Coho |
| | | Large | Jack | | Large | Jack | | Large | Jack | | Large | Jack | |
| Sep 21 | 1 | | | | | | | | | | | | |
| | 2 | 11 | | | 11 | | | | | | | | |
| 28 | 3 | 5 | | | 5 | | | | | | | | |
| 29 | 4 | 240 | 1 | | 0 | 0 | | | | | 1 | 0 | |
| Oct 6 | 5 | 215 | | 7 | 32 | | | | | | 2 | 0 | |
| TOTAL | | 471 | 1 | 7 | 48 | 0 | | | | | 3 | 0 | |

1979

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sep 21 | 1-2 | 158 | | 50 | 158 | | | | | | 1 | | |
| Oct 2 | | 81 | | 5 | 81 | | | | | | 1 | | |
| Oct 12 | | 0 | | 30 | 0 | | | | | | | | |
| TOTAL | | 239 | | 85 | 239 | | | 0 | 0 | | 2 | | |

APPENDIX 4 SCHNABEL-TYPE ESTIMATES OF CHINOOK AND COHO SALMON POPULATIONS IN COWICHAN BAY.

Coho (1976)

| Date | Catch Checked $C_t$ | Tags Available $M_t$ | $C_t \times M_t$ | Tags Recaptured $R_t$ | Population Estimate |
|---|---|---|---|---|---|
| Oct 12 | 192 | 186 | 35712 | 1 | 35712 |
| 13 | 84 | 372 | 31248 | 2 | 15624 |
| 14 | 39 | 454 | 17706 | 1 | 17706 |
| 19 | 64 | 505 | 32320 | 1 | 32320 |
| 20 | 217 | 560 | 121520 | 4 | 30380 |
| 21 | 159 | 763 | 121317 | 8 | 15165 |
| 22 | 139 | 910 | 126490 | 4 | 31623 |
| 26 | 56 | 1053 | 58968 | 3 | 19656 |
| TOTAL | | | | 24 | |
| | | | | Average | 24773 |
| | | Schnabel population estimate | | | 21811 |
| | | 95% confidence limits | | | (15317, 35408) |

Chinook (1976)

| Date | Catch Checked $C_t$ | Tags Available $M_t$ | $C_t \times M_t$ | Tags Recaptured $R_t$ | Population Estimate |
|---|---|---|---|---|---|
| Oct 7 | 44 | 398 | 17512 | 4 | 4378 |
| 8 | 89 | 425 | 37825 | 3 | 12608 |
| 12 | 145 | 491 | 71195 | 13 | 5477 |
| 13 | 92 | 497 | 45724 | 6 | 7621 |
| 14 | 159 | 578 | 91902 | 6 | 15317 |
| 15 | 153 | 658 | 100674 | 8 | 12584 |
| 26 | 91 | 794 | 72254 | 9 | 8028 |
| TOTAL | | | | 49 | |
| | | | | Average | 9430 |
| | | Schnabel population estimate | | | 8742 |
| | | 95% confidence limits | | | (6745, 12108) |

APPENDIX 4 (cont.)

Large Chinook (1977)

| Date | Catch Checked $C_t$ | Tags Available $M_t$ | $C_t \times M_t$ | Tags Recaptured $R_t$ | Population Estimate | |
|---|---|---|---|---|---|---|
| Sep 23 | 275 | 75 | 20625 | 4 | 5156 | |
| 26 | 59 | 334 | 19706 | 6 | 3284 | |
| 28 | 314 | 387 | 121518 | 10 | 12152 | |
| 29 | 141 | 687 | 96867 | 24 | 4036 | |
| 30 | 113 | 795 | 89835 | 20 | 4492 | |
| Oct 4 | 38 | 803 | 30514 | 8 | 3814 | |
| 5 | 37 | 806 | 37882 | 7 | 5412 | |
| 6 | 58 | 828 | 48024 | 8 | 6003 | |
| 11 | 5 | 870 | 4350 | 2 | | |
| 13 | 137 | 870 | 119190 | 2 | | |
| 18 | 81 | 870 | 70470 | 7 | | |
| 19 | 25 | 870 | 21750 | 2 | | 14192 |
| 20 | 4 | 870 | 3480 | 1 | | |
| 26 | 9 | 870 | 7830 | 2 | | |
| TOTAL | | | | 103 | | |
| | | | | Average | 6505 | |
| | | | Schnabel population estimate | | 6654 | |
| | | | 95% confidence limits | | (5540, 8148) | |

Jack Chinook (1977)

| Date | Catch Checked $C_t$ | Tags Available $M_t$ | $C_t \times M_t$ | Tags Recaptured $R_t$ | Population Estimate | |
|---|---|---|---|---|---|---|
| Sep 28 | 15 | 186 | 2790 | 4 | 698 | |
| 29 | 19 | 197 | 3743 | 2 | 1872 | |
| 30 | 32 | 212 | 6784 | 2 | 3392 | |
| Oct 4 | 9 | 222 | 1998 | 2 | | |
| 11 | 11 | 222 | 2442 | 1 | | 2220 |
| 13 | 20 | 222 | 4440 | 1 | | |
| TOTAL | | | | 12 | | |
| | | | | Average | 2046 | |
| | | | Schnabel population estimate | | 1707 | |
| | | | 95% confidence limits | | (1057, 3580) | |

Combined Estimate: Large Chinook 6654
Jack Chinook 1707
TOTAL 8361

95% confidence limits (6597, 11728)

APPENDIX 4 (cont.)

Coho Salmon (1977)

| Date | Catch Checked $C_t$ | Tags Available $M_t$ | $C_t \times M_t$ | Tags Recaptured $R_t$ | Population Estimate |
|---|---|---|---|---|---|
| Sep 28 | 152 | 267 | 40584 | 3 | 13528 |
| 29 | 253 | 403 | 101959 | 3 | 33986 |
| 30 | 266 | 638 | 169708 | 4 | 42427 |
| Oct 4 | 452 | 884 | 399568 | 12 | 33297 |
| 5 | 331 | 1302 | 430962 | 7 | 61566 |
| 6 | 248 | 1615 | 400520 | 12 | 33377 |
| 7 | 166 | 1842 | 305772 | 3 | 101924 |
| 11 | 213 | 2000 | 426000 | 8 | 53250 |
| 13 | 222 | 2194 | 487068 | 7 | 69581 |
| 18 | 630 | 2397 | 1510110 | 26 | 58081 |
| 19 | 513 | 2980 | 1528740 | 20 | 76437 |
| 20 | 518 | 3459 | 1791762 | 17 | 105398 |
| 21 | 775 | 3947 | 3058925 | 48 | 63728 |
| 22 | 167 | 4657 | 777719 | 4 | 194430 |
| 25 | 61 | 4811 | 293471 | 4 | 73368 |
| 26 | 131 | 4868 | 637708 | 3 | 212569 |
| TOTAL | | | | 181 | |
| | | | | Average | 76684 |

Schnabel population estimate 67915

95% confidence limits (59961, 80422)

APPENDIX 5 SPAWNING GROUND DEAD RECOVERY AND LIVE COUNTS OF CHINOOK SALMON FROM THE COWICHAN RIVER, 1976 - 1979.

1976

| Section | Date | Live Count[a] | | Dead Recovery | | | | | Floy Tag Recoveries |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Unmarked | | | Marked | | |
| | | Actual | Estimate | Large | Jack | Combined | Large | Jack | |
| 1 | Oct. 25 | 3621 | 4260 | | | 60 | | | |
| 2 | | 74 | 87 | | | 10 | | | |
| 3 | 26 | 420 | 568 | | | 24 | | | |
| 4 | | 174 | 236 | | | - | | | |
| 5 | 28 | 97 | 129 | | | 7 | | | |
| 6 | 27 | 289 | 482 | | | 8 | | | |
| 7 | | 451 | 693 | | | 67 | | | 2 |
| 1 | Nov.5-15 | | | 330 | 230 | | | | 1 |
| 2 | | | | 190 | 148 | | | | 4 |
| 3 | | | | 61 | 48 | | 0 | 1 | 1 |
| 4 | | | | 125 | 68 | | | | 1 |
| 5 | | | | 31 | 6 | | | | |
| 6 | | | | 31 | 9 | | | | |
| 7 | | | | 18 | 2 | | | | |
| 1 | Nov. 17 | | | 57 | 27 | | | | 4 |
| 2 | | | | 17 | 4 | | | | |
| 4 | Nov.17 & 19 | | | 25 | 8 | | | | |
| 1 | Nov. 18 | | | 57 | 37 | | | | 2 |
| 1 | Nov. 22 | | | 30 | 18 | | | | |
| 3 | 23 | | | 1 | 5 | | | | |
| 5 | 24 | | | 2 | 0 | | | | |
| 6 | | | | 6 | 1 | | | | |
| 1 | Dec. 2 | | | 4 | 0 | | | | 1 |
| 2 | | | | 10 | 0 | | | | |
| 3 | | | | 3 | 0 | | | | |
| | TOTAL | | | 998 | 611 | 176 | 0 | 1 | 16 |

[a]Live counts are from the swim survey, Oct. 25 - 28, 1976.

APPENDIX 5 (cont.)

1977

| Section | Date | Live Count | | Dead Recovery | | | | | | | Floy Tag Recovery |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Unmarked | | | | Marked | | | |
| | | Actual | Estimate | Male | Jack | Female | Unsexed | Male | Jack | Female | |
| 1 | Nov. 14 | 30 | – | – | 4 | – | 79 | | | | 1 |
| 2 | 15 | 30 | – | 17 | 4 | 19 | | | | | – |
| 3 | 15 | – | – | 4 | – | 8 | | | | | – |
| 4 | 16 | – | – | 5 | – | 6 | | | | | – |
| 5 | 16 | – | – | 7 | – | 2 | | | | | – |
| 1 | 17 | – | – | 17 | 3 | 54 | | | | | 1 |
| 4 | 19 | – | – | 6 | – | 4 | | | | | – |
| 5 | 19 | – | – | 1 | – | 2 | | | | | – |
| 1 | 21 | – | – | 13 | 5 | 52 | | | | | 3 |
| 2 | 22 | – | – | 10 | 2 | 4 | | | | | – |
| 3 | 22 | – | – | 5 | 2 | 6 | | | | | – |
| 4 | 23 | – | – | 1 | 1 | – | | | | | – |
| 5 | 23 | – | – | 1 | 2 | 1 | | | | | – |
| 1 | 25 | – | – | 84 | 8 | 87 | | | | | 3 |
| 2 | 28 | – | – | 46 | 8 | 45 | | | | | 3 |
| 3 | 28 | – | – | 15 | 14 | 31 | | | | | – |
| 1 | Dec. 1 | – | – | – | – | 2 | | | | 1 | – |
| 2 | 2 | – | – | 3 | 1 | 20 | | | | | – |
| 4 | 5 | – | – | 8 | – | 13 | | | | | – |
| 1 | 6 | – | – | 1 | – | 3 | | | | | – |
| 1 | 12 | – | – | 1 | – | 6 | | | | | – |
| 1 | 19 | – | – | 2 | – | 3 | | | | | – |
| 2 | 20 | – | – | 9 | – | 12 | | | | | – |
| 1 | 27 | – | – | 1 | – | 2 | | | | | – |
| TOTAL | | | | 257 | 54 | 382 | 79 | | | 1 | 11 |

APPENDIX 5 (cont.)

1978

| Section | Date | Live Count | Dead Recovery Unmarked Large | Dead Recovery Unmarked Jack | Dead Recovery Marked Large | Dead Recovery Marked Jack | Floy Tag Recovery |
|---|---|---|---|---|---|---|---|
| 1 | Oct. 26[b] | | 101 | | 1 | | |
| 1 | Nov. 1 | 310 | 96 | 27 | 1 | | |
| 1 | 2 | 780 | 167 | 64 | | | |
| 1 | 3 | 410 | 206 | 76 | 1 | | |
| 1 | 6 | | 210 | 73 | | | |
| 4,5,6 | 7 | | 9 | 6 | | | |
| 1 | 8 | | 135 | 44 | 2 | | |
| 2 | 8 | | 44 | 8 | | | |
| 1 | 9 | | 133 | 55 | 1 | | |
| 2 | 9 | | 22 | 7 | | | |
| 4 | 14 | | 39 | 11 | 1 | | |
| 1 | 21 | | 107 | 42 | | | 1 |
| | TOTAL | 1500 | 1269 | 413 | 7 | | 1 |

[b]102 fish taken for disease analysis on Oct. 26.

1979

| Section | Date | Live Count | Dead Recovery Unmarked Female | Dead Recovery Unmarked Male | Dead Recovery Marked Female | Dead Recovery Marked Male | Floy Tag Recovery |
|---|---|---|---|---|---|---|---|
| 1 | Nov. 14 | | 95 | 34 | | 1 | 1 |
| | 15 | | 85 | 54 | 2 | | 1 |
| | 22 | | 82 | 45 | 1 | | |
| | 23 | | 32 | 21 | 1 | | 1 |
| | 26 | | 45 | 30 | | | 1 |
| | 29 | | 36 | 15 | 1 | | 2 |
| | Dec. 3 | | 49 | 43 | | | |
| | TOTAL | | 424 | 242 | 5 | 1 | 6 |

APPENDIX 6 COHO SALMON SPAWNING GROUND DEAD RECOVERY DATA FROM THE COWICHAN-KOKSILAH SYSTEM, 1976 AND 1977.

1976

| Stream | Section | Date | Live Count | | Dead Recovery | | | | | | Disk Tag Recovery | Water | | | Weather |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Unmarked | | | | Marked | | | | | | |
| | | | Actual | Estimate | Male | Jack | Female | Unsexed | Male | Female | | Visibility | Level | Temp. °C | |
| Cowichan River | 1 | Oct 25 | 6 | 7 | – | – | – | – | – | – | – | – | – | – | – |
| | 2 | 25 | 0 | 0 | – | – | – | – | – | – | – | – | – | – | – |
| | 3 | 26 | 47 | 55 | – | – | – | – | – | – | – | – | – | – | – |
| | 4 | 26 | 29 | 39 | – | – | – | – | – | – | – | – | – | – | – |
| | 5 | 28 | 1 | 1 | – | – | – | – | – | – | – | – | – | – | – |
| | 6 | 27 | 13 | 21 | 1 | – | – | – | – | – | – | – | – | – | – |
| | 7 | 27 | 140 | 233 | 2 | – | – | – | – | – | – | – | – | – | – |
| | 1 | Nov 5 to | – | – | – | – | – | – | – | – | – | – | – | – | – |
| | 2 | Nov 15 | – | – | 1 | – | – | – | – | – | – | – | – | – | – |
| | 3 | " | – | – | 1 | – | – | – | – | – | – | – | – | – | – |
| | 4 | " | – | – | 1 | – | 2 | – | – | – | – | – | – | – | – |
| | 5 | " | – | – | 1 | – | 2 | – | – | – | – | – | – | – | – |
| | 6 | " | – | – | 3 | – | – | – | – | – | – | – | – | – | – |
| | 7 | " | – | – | 1 | – | – | – | – | – | – | – | – | – | – |
| | 1 | Nov 17 | – | – | 4 | – | 1 | – | – | – | 1 | – | – | – | – |
| | 4 | Nov 17 & 19 | – | – | – | – | – | 14 | – | – | 3 | Poor | Rising | – | – |
| | 1 | 18 | – | – | 2 | – | 1 | – | – | – | – | – | – | – | – |
| | 1 | 22 | – | 5000 | 2 | – | 2 | – | – | – | 1 | – | – | – | – |
| | 2 | 23 | – | 2000 | – | – | – | 7 | – | – | – | – | – | – | – |
| | 3 | 23 | – | 1000 | – | – | – | 9 | – | – | – | – | – | – | – |
| | 5 | 24 | – | 0 | – | – | – | 3 | – | – | – | – | – | – | – |
| | 6 | 24 | – | – | – | – | – | 5 | – | – | – | – | – | – | – |
| | 1 | Dec 2 | 947 | 5000 | – | – | – | 8 | – | – | 2 | Poor | Stable | 7.5 | Cold, foggy |
| | 2 | 2 | 184 | 700 | – | – | – | 21 | – | – | 5 | " | " | 7.5 | " |
| | 3 | 2 | 140 | 400 | – | – | – | 20 | – | 2 | 1 | " | " | 7.5 | " |
| | 1 | 7 | 1248 | 4000 | 32 | 3 | 14 | – | – | – | 4 | Good | " | 9 | Rain |
| | 1 | 14 | 1358 | 4000 | 42 | 2 | 24 | – | 1 | 1 | 1 | " | Rising | 9 | Overcast |
| | 1 | 20 | 736 | 4000 | 24 | – | 14 | – | – | – | 2 | Medium | " | 8 | Rain |
| | 2 | 21 | 268 | 700 | 20 | 3 | 19 | – | – | – | – | Good | " | 8.5 | L. rain |
| | 3 | 21 | 192 | 500 | 8 | 2 | 6 | – | – | 1 | – | " | " | 8.5 | " |
| | 3 side | 21 | 107 | 209 | – | – | 1 | – | – | – | – | " | " | 8.5 | " |
| | 1 | 29 | 107 | 3000 | 18 | – | 18 | – | – | – | 2 | " | " | 8 | Clear |
| | 2 | 29 | 83 | 800 | 12 | – | 5 | – | – | 1 | – | " | " | 8 | " |
| | 3 | 29 | 50 | 300 | 9 | – | 4 | – | – | – | 1 | " | " | 8 | " |
| | 1 | Jan 3 | 518 | 2500 | 32 | 1 | 43 | – | – | 1 | – | " | Stable | 7 | L. overcast |
| | 2 | 3 | 71 | 500 | 14 | 1 | 17 | – | – | – | – | " | " | 7 | " |
| | 3[a] | 3 | 88 | 500 | 12 | 2 | 11 | – | – | 2 | – | " | " | 7 | " |
| | 3[a] | 7 | 144 | 350 | 16 | 6 | 23 | – | – | 2 | – | " | " | 7 | " |
| | 1 | 13 | 494 | 1500 | 48 | – | 65 | – | 3 | – | 1 | " | Dropping | 6 | " |
| | 2 | 13 | 36 | 150 | 64 | – | 56 | – | – | 2 | – | " | " | 6 | " |
| | 3 | 13 | 30 | 150 | 20 | – | 21 | – | 1 | 1 | – | " | " | 6 | " |
| | 3 | 16 | 26 | 70 | 19 | 1 | 23 | – | – | – | – | " | Stable | 7 | L. rain |
| | 1 | 18 | 186 | 500 | 10 | 1 | 8 | – | – | 1 | – | Medium | Rising | 7 | Rain |
| | 2 | 18 | 11 | 150 | 8 | – | 18 | – | – | 1 | – | " | " | 7 | " |
| | 1 | 21 | 102 | 300 | 19 | – | 27 | – | 1 | – | – | Good | Stable | 7 | Clear |
| | 2 | 21 | 6 | 75 | 8 | 1 | 7 | – | 2 | – | – | " | " | 7 | " |
| | 3 | 21 | 17 | 75 | 7 | – | 13 | – | – | 1 | – | " | " | 7 | " |
| | 1 | 26 | 99 | 300 | 13 | – | 14 | – | 1 | – | – | " | " | 6 | " |
| | 2 | 26 | 0 | 25 | 9 | 3 | 12 | – | – | – | – | " | " | 6 | " |
| | 3 | 26 | 16 | 50 | 4 | – | 3 | – | – | – | – | " | " | 6 | " |
| | 1 | 31 | 40 | 100 | 3 | 1 | 3 | – | – | 1 | – | Medium | Dropping | 6 | Rain |
| | 2 | 31 | 3 | 20 | 4 | 1 | 8 | – | – | – | – | " | " | 6 | " |
| | 3 | 31 | 3 | 20 | 4 | – | 6 | – | – | – | – | " | " | 6 | " |
| | 1 | Feb 4 | 78 | 125 | 4 | – | 5 | – | – | – | – | Good | " | 6 | Overcast |
| | 2 | 4 | 3 | 20 | 2 | – | 3 | – | – | – | – | " | " | 6 | " |
| | 3 | 4 | 0 | 0 | 0 | – | 3 | – | – | – | – | " | " | 6 | " |
| | 1 | 7 | 14 | 75 | 6 | – | 9 | – | – | – | – | " | " | 6 | Clear |
| | 2 | 7 | 5 | 20 | 2 | – | 1 | – | – | – | – | " | " | 6 | " |
| | 3 | 7 | 6 | 20 | 2 | – | 1 | – | – | – | – | " | " | 6 | " |
| | 1,2,3 | 11 | – | – | – | – | – | – | – | – | – | – | – | 6 | – |
| | | Totals | | | 514 | 28 | 513 | 87 | 9 | 17[b] | 24 | | | | |

[a] Includes side channels 1,2, and 3.

[b] Does not include 1 mark recovery Dec. 3 in Sec. 4.

# APPENDIX 6 (cont.)

1976

| Stream | Section | Date | Live Count | | Dead Recovery | | | | | | Disc Tag Recovery | Water | | | Weather |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Actual | Estimate | Unmarked | | | | Marked | | | Visibility | Level | Temp. °C | |
| | | | | | Male | Jack | Female | Unsexed | Male | Female | | | | | |
| Pastuch Creek | | Nov 30 | 3 | 5 | – | – | 1 | – | – | – | – | Good | Stable | 5 | Clear |
| | | Dec 7 | 3 | 3 | 1 | – | 1 | – | – | – | – | " | " | 6 | Rain |
| | | 15 | 14 | 20 | 1 | – | Unknown | – | – | – | – | " | Rising | 7 | " |
| | | 19 | 23 | 40 | 1 | – | 1 | – | – | – | – | " | Stable | 5 | Clear |
| | | 22 | 9 | 15 | 1 | – | 5 | – | – | – | – | " | " | 6.5 | Overcast |
| | | 30 | 21 | 40 | – | – | 2 | – | – | – | – | " | " | 5 | Clear |
| | | Jan 4 | 6 | 10 | – | – | – | – | – | – | – | " | Dropping | 3.5 | Overcast |
| | | 6 | – | – | – | – | – | – | – | – | – | " | Stable | 3 | Clear |
| | | 10 | – | – | 1 | – | 1 | – | – | – | – | " | " | 3.5 | Overcast |
| | | 14 | – | – | – | – | – | – | – | – | – | " | " | 4 | " |
| | | 17 | 2 | 2 | 1 | – | – | – | – | – | – | Medium | Rising | 4 | Rain |
| | | 19 | 0 | 0 | 1 | – | – | – | – | – | – | " | " | 5 | Overcast |
| | | TOTALS | | | 7 | – | 11 | 0 | 0 | 0 | 0 | | | | |
| Rebertson River | A | Nov 30 | 58 | 70 | 1 | – | 1 | – | – | – | – | Good | Stable | 3.5 | Clear |
| | B | 30 | 16 | 25 | – | – | 1 | – | – | – | – | " | " | 3.5 | " |
| | C | Dec 1 | 36 | 50 | 1 | – | 1 | – | – | – | – | " | " | 3.5 | " |
| | O | 6 | 33 | 35 | 1 | – | – | – | – | – | – | " | " | 5 | L. rain |
| | A | 7 | 89 | 120 | 8 | – | 10 | – | – | – | – | " | " | 7 | " |
| | B | 7 | 62 | 72 | – | – | 2 | – | – | – | 1 | " | " | 7 | " |
| | C | 7 | 41 | 50 | – | – | – | – | – | – | – | " | " | 7 | " |
| | A | 15 | 21 | 100 | 1 | – | 2 | – | – | – | – | Poor | Rising | 7.5 | Rain |
| | A | 19 | 48 | 100 | 1 | – | 3 | – | – | – | – | Good | Stable | 5 | Clear |
| | B | 19 | 129 | 150 | 1 | – | 1 | – | – | – | – | " | " | 5 | " |
| | C | 19 | 36 | 50 | – | – | – | – | – | – | – | " | " | 5 | " |
| | A side | 19 | 76 | 80 | 4 | 1 | 6 | – | – | – | – | " | " | 5 | " |
| | A | 22 | 123 | 150 | 1 | – | – | – | – | – | – | " | " | 8 | " |
| | B | 22 | 149 | 200 | – | – | 1 | – | – | – | – | " | " | 6 | Overcast |
| | C | 22 | 36 | 50 | – | – | – | – | – | – | – | " | " | 6 | " |
| | A side | 22 | 18 | 25 | 2 | – | 4 | – | – | 1 | – | " | " | 8.5 | " |
| | A | 30 | 8 | 10 | – | – | 3 | – | – | – | – | " | " | 5 | Clear |
| | B | 30 | 18 | 35 | 1 | – | 1 | – | – | – | – | " | " | 5 | " |
| | C | 30 | 0 | 10 | – | – | 1 | – | – | – | – | " | " | 5 | " |
| | A side | 30 | 45 | 50 | 8 | 2 | 6 | – | – | – | – | " | Dropping | 8 | " |
| | A | Jan 4 | 13 | 20 | 1 | – | 2 | – | – | – | – | " | " | 4 | Overcast |
| | B | 4 | 1 | 5 | – | – | 2 | – | – | – | – | " | " | 4 | " |
| | C | 4 | – | – | – | – | 1 | – | – | – | – | " | " | 4 | " |
| | A side | 4 | 1 | 1 | – | – | – | – | – | – | – | " | " | 7 | " |
| | A | 6 | 11 | 11 | – | – | 1 | – | – | – | – | " | " | 3.5 | Clear |
| | A side | 10 | 0 | 0 | – | – | 1 | – | – | – | – | " | Stable | 7 | Overcast |
| | A | 10 | 7 | 10 | – | – | 3 | – | – | – | – | " | " | 4 | " |
| | A | 14 | 3 | 3 | 1 | – | – | – | – | – | – | " | " | 4.5 | " |
| | A side | 19 | 1 | 1 | 4 | – | 1 | – | – | – | – | " | Rising | 7 | " |
| | TOTALS | | | | 36 | 3 | 54 | – | 0 | 1 | 1 | | | | |
| Mesachie Creek | | Dec 1 | 8 | 15 | 1 | – | 3 | – | – | – | – | " | Stable | 7 | Clear |
| | | 7 | 2 | 2 | 4 | – | 1 | – | – | – | – | " | " | 7.5 | Rain |
| | | 15 | 18 | 20 | 5 | – | 2 | – | – | – | – | " | " | 7.5 | " |
| | | 19 | 34 | 40 | 1 | – | 2 | – | – | – | – | " | " | 7 | Clear |
| | | 22 | 26 | 30 | 2 | 1 | 3 | – | – | – | – | " | " | 7 | Overcast |
| | | 30 | 83 | 100 | 2 | – | 4 | – | – | – | – | " | Rising | 6.5 | Clear |
| | | Jan 4 | 26 | 35 | 7 | – | 11 | – | – | – | – | " | Dropping | 6 | Overcast |
| | | 6 | 7 | 16 | 3 | – | 10 | – | – | – | – | " | Stable | 6 | Clear |
| | | 10 | 0 | 0 | 1 | – | 2 | – | – | – | – | " | " | 5 | Overcast |
| | | 14 | 1 | 1 | – | – | – | – | – | – | – | " | " | 5 | " |
| | | 17 | 0 | 0 | – | – | 1 | – | – | – | – | " | " | 5 | Rain |
| | | TOTALS | | | 26 | 1 | 39 | 0 | 0 | 0 | 0 | | | | |

# APPENDIX 6 (cont.)

1976

| Stream | Section | Date | Live Count | | Dead Recovery | | | | | | Disk Tag Recovery | Water | | | Weather |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Actual | Estimate | Unmarked | | | | Marked | | | Visibility | Level | Temp.°C | |
| | | | | | Male | Jack | Female | Unsexed | Male | Female | | | | | |
| Rotary Park | Slough | Dec 20 | 2 | 5 | – | – | – | – | – | – | – | Good | Stable | 6 | Overcast |
| | " | 27 | 7 | 20 | – | – | – | – | – | – | – | " | " | 10.5 | Clear |
| | Creek | 28 | 6 | 10 | 2 | – | – | – | – | – | – | " | " | 6 | " |
| | Slough | 29 | 12 | 15 | – | – | 2 | – | – | – | – | " | " | 10.5 | " |
| | Creek | 30 | 3 | 3 | – | – | 1 | – | – | – | – | " | " | 9 | " |
| | Slough | 30 | 14 | 18 | – | – | – | – | – | – | – | " | " | 9 | " |
| | Creek | Jan 5 | 2 | 10 | 1 | 1 | 4 | – | – | 1 | – | " | " | 7 | " |
| | Slough | 6 | 0 | 5 | 0 | 1 | 3 | – | – | – | – | " | " | 7 | " |
| | Creek | 10 | 2 | 2 | 11 | 8 | 9 | – | – | – | – | " | " | 8 | Overcast |
| | " | 17 | 0 | 0 | 0 | 2 | 2 | – | – | – | – | " | " | 9 | Rain |
| | " | 19 | 10 | 15 | 1 | 2 | 1 | – | – | – | – | Medium | Rising | 7 | Clear |
| | | 24 | 1 | 1 | 8 | 1 | 4 | – | 1 | – | – | Good | Stable | 7.5 | Overcast |
| | | 31 | 3 | 5 | 5 | 2 | 9 | – | – | 2 | – | " | Dropping | 7.5 | Rain |
| | | Feb 2 | 2 | 5 | 7 | 8 | 7 | – | 1 | 1 | – | " | Stable | 7.5 | Cloudy |
| | | 4 | 2 | 5 | 3 | 2 | 5 | – | 1 | – | – | " | " | 8 | " |
| | | 7 | 0 | 0 | 0 | 1 | – | – | 1 | – | – | " | " | 7.5 | Clear |
| | | 11 | 0 | 0 | 3 | – | – | – | 1 | 2 | – | " | " | 7.5 | Rain |
| | | TOTALS | | | 46 | 28 | 53 | 0 | 5 | 6 | 0 | | | | |
| Cowichan Side Channel (IR #5) | | Dec 6 | – | – | – | – | – | – | – | – | – | Good | Stable | – | " |
| | | 15 | – | – | – | – | – | – | – | – | – | " | " | – | " |
| | | 23 | – | – | – | – | – | – | – | – | – | " | " | – | Clear |
| | | 30 | – | – | – | – | – | – | – | – | – | " | " | – | Clear |
| | | Jan 5 | – | – | – | – | – | – | – | – | – | " | " | – | " |
| Bible Camp Side Channel | | Dec 6 | 1 | 1 | – | – | – | 2 | – | – | – | " | " | 7.5 | Rain |
| | | 15 | 1 | 1 | – | – | 1 | – | – | – | – | " | Rising | 9 | " |
| | | 23 | 0 | 0 | – | – | – | – | – | – | – | " | Stable | 8 | Clear |
| | | 30 | – | – | – | – | – | – | – | – | – | " | " | – | " |
| | | Jan 5 | – | – | – | – | – | – | – | – | – | " | " | 7 | " |
| | | 14 | – | – | 0 | 1 | 2 | – | – | – | – | " | " | 6.5 | Overcast |
| | | TOTALS | | | 0 | 1 | 3 | 2 | 0 | 0 | 0 | | | | |
| Kelvin Creek | | Nov 24 | 1 | 1 | 1 | – | 2 | – | – | – | – | Good | Stable | 7 | Clear |
| | | Dec 8 | 0 | 0 | 1 | – | – | – | – | – | – | " | " | 8 | Rain |
| | | 16 | 3 | – | 1 | – | – | – | – | – | – | Poor | Rising | 8 | Overcast |
| | | 23 | 2 | 5 | 1 | – | – | – | – | – | 1 | Good | Stable | 6 | Clear |
| | | 31 | 1 | 1 | 1 | – | 1 | – | – | – | – | " | Rising | 6.5 | " |
| | | Jan 5 | – | – | – | – | 1 | – | – | – | – | " | Stable | 2 | " |
| | | 10 | – | – | 2 | – | – | – | – | – | – | " | " | 2.5 | Overcast |
| | | 17 | – | – | – | – | 1 | – | – | – | – | " | Rising | 5 | Rain |
| | | 19 | – | – | – | – | – | – | – | – | – | Poor | " | – | " |
| | | 24 | – | – | – | – | – | – | – | – | – | – | – | 2.5 | – |
| | | TOTALS | | | 7 | 0 | 5 | 0 | 0 | 0 | 1 | | | | |

# APPENDIX 6 (cont.)

1977

| Stream | Section | Date | Week | Live Count | | Dead Recovery | | | | | | Tag Recovery[a] | | Visibility | Level | Water Temp °C | Weather |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Unmarked | | | Marked | | | | | | | | |
| | | | | Actual | Estimate | Male | Jack | Female | Male | Jack | Female | Floy | Double | | | | |
| Cowlchan River | 1 | Nov 14 | 2 | - | - | 1 | - | - | - | - | - | - | - | poor | rising | 9.5 | rain |
| | 3 | 15 | 2 | - | - | 2 | - | - | - | - | - | 2 | - | poor | stable | 9.5 | rain |
| | 4 | 16 | 2 | - | - | - | - | 1 | - | - | - | - | - | poor | stable | 9.5 | sunny |
| | 5 | 16 | 2 | - | - | - | - | - | - | - | - | - | - | poor | stable | 9.5 | sunny |
| | 1 | 17 | 2 | 100 | - | 3 | - | 1 | - | - | - | 2 | - | medium | stable | 9.5 | cloudy |
| | 4 | 19 | 2 | - | - | 2 | - | 4 | - | - | - | - | - | poor | dropping | 7.5 | sunny,clear |
| | 5 | 19 | 2 | - | - | 2 | - | 2 | - | - | - | 1 | - | poor | dropping | 7.5 | sunny,clear |
| | 1 | 21 | 3 | 73 | - | 3 | 1 | - | - | - | - | - | - | poor | dropping | 8 | sunny,cold |
| | 2 | 22 | 3 | - | - | 1 | - | 1 | - | - | - | - | - | poor | stable | 7 | sunny |
| | 3 | 22 | 3 | - | - | 3 | 1 | 9 | - | - | - | - | - | poor | stable | 7 | sunny |
| | 4 | 23 | 3 | - | - | - | - | 1 | - | - | - | - | - | poor | stable | 7 | cloudy |
| | 5 | 23 | 3 | - | - | - | - | - | - | - | - | - | - | poor | stable | 7 | snowing |
| | 1 | 25 | 3 | 18 | - | 3 | - | 4 | - | - | - | - | - | poor | rising | 7 | heavy rain |
| | 2 | 28 | 4 | 33 | - | 5 | - | 4 | - | - | - | - | - | poor | rising | 7 | rain |
| | 3 | 28 | 4 | 18 | - | 5 | - | 8 | - | - | - | 2 | - | poor | rising | 7 | rain |
| | 1 | Dec 1 | 4 | 211 | - | 17 | - | 18 | - | - | - | 3 | - | medium | rising | 7 | rain |
| | 2 | 2 | 4 | 18 | - | 3 | - | 4 | - | - | - | - | - | poor | rising | 7.5 | rain |
| | 3 | 2 | 4 | 17 | - | 3 | 1 | 8 | - | - | - | - | - | medium | rising | 7.5 | rain |
| | 4 | 5 | 5 | - | - | 7 | - | 4 | 1 | - | - | - | - | poor | stable | 6 | frosty |
| | 1 | 6 | 5 | 97 | - | 13 | - | 9 | - | - | - | 2 | - | medium | rising | 7 | rain |
| | 2 | 7 | 5 | 22 | - | 2 | - | 5 | - | - | - | - | - | medium | stable | 6 | frosty |
| | 3 | 7 | 5 | 21 | - | 6 | 1 | 3 | - | - | - | - | 1 | medium | stable | 6 | frosty |
| | 4 | 8 | 5 | - | - | 5 | - | 9 | - | - | - | - | - | poor | stable | 5.5 | frosty |
| | 5 | 8 | 5 | - | - | - | - | - | - | - | - | - | - | - | - | 5.5 | - |
| | 1 | 12 | 6 | 358 | - | 15 | - | 18 | - | - | - | 2 | - | medium | rising | 6 | rain |
| | 1 | 19 | 7 | 105 | - | 36 | 2 | 22 | 1 | - | 1 | - | - | medium | dropping | 6 | frosty |
| | 2 | 20 | 7 | 40 | - | 34 | - | 18 | - | - | - | - | - | medium | dropping | 6 | frosty |
| | 3 | 20 | 7 | 71 | - | 26 | - | 20 | - | - | - | - | - | medium | dropping | 6 | - |
| | 4 | 21 | 7 | - | - | 6 | - | 3 | - | - | - | - | - | poor | dropping | 5 | frosty |
| | 5 | 21 | 7 | | - | 1 | - | - | - | - | - | - | - | poor | dropping | 5 | frosty |
| | 1 | 21 | 7 | 140 | - | 11 | - | 14 | - | - | - | - | - | good | dropping | 6 | clear, cool |
| | 2 | 22 | 7 | 266 | - | 39 | - | 31 | - | - | - | 1 | 1 | good | dropping | 6 | clear, cool |
| | 3 | 22 | 7 | 197 | - | 18 | - | 12 | - | - | - | - | - | good | dropping | 6 | clear, cool |
| | 1 | 27 | 8 | 709 | 1500 | 75 | 3 | 123 | - | - | - | 2 | 1 | good | dropping | 6 | clear, sunny |
| | 2 | 28 | 8 | 138 | - | 93 | 3 | 101 | 4 | - | 2 | 2 | 1 | medium | stable | 5.5 | rainy, cold |
| | 4 | 29 | 8 | 39 | - | 40 | 1 | 49 | - | - | 1 | - | - | good | stable | 5 | rain |
| | 1 | Jan 3 | 9 | 188 | 500 | 16 | - | 21 | - | - | - | - | - | good | dropping | 5 | snow, rain |
| | 1 | 4 | 9 | 260 | 500 | 11 | - | 11 | - | - | - | - | - | good | rising | - | rain, warm |
| | 2 | 4 | 9 | 93 | 500 | 48 | - | 60 | - | - | 2 | 1 | 1[b] | good | rising | - | rain, warm |
| | 3 | 4 | 9 | 50 | 200 | 16 | - | 22 | - | - | - | - | - | good | rising | - | rain, warm |
| | 4 | 5 | 9 | - | - | 11 | 1 | 7 | - | - | - | - | - | good | rising | 4 | rain |
| | 5 | 5 | 9 | - | - | - | - | - | - | - | - | - | - | - | - | 4 | rain |
| | 1 | 10 | 10 | 299 | 2000 | 152 | 5 | 237 | 4 | - | 4 | 5 | - | good | rising | 5 | overcast |
| | 1 | 11 | 10 | 73 | 150 | 64 | - | 58 | 2 | - | 1 | 3 | - | good | stable | 5 | light rain |
| | 2 | 12 | 10 | 102 | 500 | 171 | 4 | 190 | - | - | 1 | 6 | - | good | stable | 5 | rain |
| | 3 | 13 | 10 | 66 | 200 | 122 | 2 | 112 | 3 | - | - | 1 | - | good | stable | - | overcast, mild |
| | 3 | 16 | 11 | 129 | 300 | 88 | - | 102 | - | - | 2 | 2 | - | medium | stable | 5 | rain |
| | 4 | 17 | 11 | 5 | - | 30 | 2 | 32 | - | - | 1 | 1 | - | poor | stable | 5 | overcast |
| | 5 | 17 | 11 | 3 | - | 3 | - | 2 | - | - | - | - | - | poor | stable | 5 | overcast |
| | 1 | 18 | 11 | 203 | 1000 | 98 | 4 | 124 | 1 | - | - | 1 | - | good | stable | 5.5 | overcast |
| | 1 | 19 | 11 | - | 1600 | 129 | 1 | 107 | - | - | - | 2 | 1[b] | - | stable | - | overcast, mild |
| | 2 | 19 | 11 | - | 200 | 27 | - | 21 | - | - | - | - | - | - | stable | - | overcast, mild |
| | 2 | 20 | 11 | 86 | 200 | 93 | 4 | 129 | - | - | 2 | 3 | - | good | stable | 5.5 | rain |
| | 3 | 23 | 12 | 257 | 500 | 102 | - | 97 | - | - | 1 | 1 | - | good | stable | - | light rain |
| | 3 | 24 | 12 | 120 | 200 | 92 | - | 102 | - | - | - | 1 | - | good | stable | 5 | overcast |
| | 1 | 25 | 12 | 583 | 700 | 43 | - | 60 | - | - | 2 | - | - | good | stable | 5 | overcast |
| | 2 | 26 | 12 | 136 | 250 | 39 | 2 | 73 | - | - | 1 | - | - | good | stable | 5 | overcast |
| | 3 | 26 | 12 | 28 | 75 | 25 | 2 | 31 | 1 | - | 1 | 2 | 1 | good | stable | 5 | overcast |
| | 7 | 26 | 12 | 106 | 150 | 14 | - | 21 | - | - | 1 | - | - | good | stable | 5 | overcast |
| | 3 | 27 | 12 | - | - | 52 | - | 69 | - | - | - | 2 | 1[b] | good | stable | 6 | overcast |
| | 1 | 30 | 13 | 235 | 500 | 35 | - | 45 | - | - | - | - | - | good | dropping | 4.5 | overcast, cold |
| | 2 | 31 | 13 | 24 | 40 | 48 | - | 82 | - | - | - | 1 | - | good | dropping | 5 | snowing |
| | 3 | 31 | 13 | - | - | 31 | - | 42 | - | - | - | - | - | good | dropping | 5 | snowing |
| | 3 | Feb 2 | 13 | - | - | 53 | - | 62 | - | - | - | - | - | - | rising | - | raining |
| | 7 | 3 | 13 | 13 | 20 | 14 | - | 17 | - | - | - | - | - | - | - | - | - |
| | 4 | 3 | 13 | 4 | - | 6 | - | 13 | - | - | - | - | - | - | - | - | - |
| | 4 | No date | - | - | - | - | - | - | - | - | 2 | - | - | - | - | - | - |
| | | | TOTAL | | | 2113 | 40 | 2455 | 17 | 0 | 25 | 51 | 8 | | | | |

# APPENDIX 6 (cont.)

1977

| Stream | Section | Date | Week | Live Count | | Dead Recovery | | | | | | Tag Recovery[a] | | Visibility | Level | Water Temp °C | Weather |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Unmarked | | | Marked | | | | | | | | |
| | | | | Actual | Estimate | Male | Jack | Female | Male | Jack | Female | Floy | Double | | | | |
| Robertson River | 1,2 | Nov 8 | 1 | 41 | 55 | – | – | – | 1 | – | – | – | – | good | – | – | overcast |
| | 1A | 8 | 1 | 6 | 10 | – | – | – | – | – | – | – | – | good | – | – | overcast |
| | 1 | 15 | 2 | 28 | 50 | – | – | – | – | – | – | – | – | poor | rising | 7.5 | occasional rain |
| | 1A | 15 | 2 | 321 | 340 | 1 | – | 1 | 1 | – | – | – | – | good | stable | 7.5 | occasional rain |
| | 1,2,3 | 21 | 3 | 81 | 110 | – | – | 3 | – | – | – | – | – | good | dropping | 3 | – |
| | 1A | 22 | 3 | 106 | 106 | 6 | 2 | 18 | – | – | – | 1 | – | good | stable | 6.5 | – |
| | 1A | 24 | 3 | 2 | 2 | 20 | – | 54 | – | – | 7 | 1 | – | good | stable | 7 | cloudy |
| | 1A | 29 | 4 | 355 | 400 | 2 | – | 1 | – | – | 2 | 1 | – | medium | rising | 4.5 | clear, sunny |
| | 1A | 30 | 4 | – | – | – | – | 1 | – | – | – | – | – | – | – | – | – |
| | 1,2,3 | Dec 5 | 5 | 140 | 185 | 2 | – | – | – | – | – | – | – | good | dropping | 6 | snowing |
| | 1A | 5 | 5 | 203 | 203 | 6 | – | 16 | 1 | – | 3 | 1 | – | good | dropping | 7.5 | snowing |
| | 1 | 8 | 5 | 30 | 30 | – | – | 1 | – | – | – | – | – | good | stable | 3 | frosty |
| | 1A | 8 | 5 | 142 | 150 | 8 | – | 9 | – | – | – | – | – | good | stable | 6.5 | frosty |
| | 1A | 12 | 6 | 121 | 350 | 2 | – | 4 | – | – | – | 2 | – | poor | rising | 5 | raining |
| | 1A | 15 | 6 | 527 | 550 | 4 | 2 | 2 | – | – | – | – | – | good | stable | 6 | raining |
| | 1A | 19 | 7 | 218 | 225 | 14 | 3 | 36 | 1 | – | 1 | 2 | – | good | low,stable | 6.5 | frosty |
| | 1,2,3 | 19 | 7 | 254 | 280 | 6 | – | 5 | – | – | – | 1 | – | good | low,stable | 4.5 | frosty |
| | 1A | 22 | 7 | 134 | 134 | 12 | – | 31 | 1 | – | 2 | – | – | good | low,stable | 6 | frosty |
| | – | 23 | 7 | 2 | 10 | – | – | 2 | – | – | – | – | – | good | dropping | 7 | sunny, warm |
| | – | 28 | 8 | 50 | 50 | – | – | – | – | – | – | – | – | good | stable | 2 | clear |
| | 1A | 28 | 8 | 6 | 10 | 18 | – | 26 | – | – | – | – | – | good | dropping | 5 | – |
| | 1A | Jan 3 | 9 | 1 | 1 | 1 | – | 2 | – | – | – | – | – | good | low,stable | 5 | snowing |
| | 1,2,3 | 3 | 9 | 12 | 12 | 2 | – | 3 | – | – | 1 | – | – | good | low,stable | 3 | snowing |
| | 1A | 9 | 10 | 121 | 121 | 2 | 2 | 3 | 1 | – | – | – | – | good | rising | – | light rain |
| | 1A | 12 | 10 | 97 | 97 | 18 | 2 | 5 | 3 | – | – | – | – | good | stable | 6 | raining |
| | 1A | 18 | 11 | 3 | 3 | 11 | – | 29 | – | – | 6 | – | – | – | – | 6 | overcast |
| | 1A | 23 | 12 | – | – | | 1 | 2 | – | – | – | – | – | good | low,stable | 5 | light rain |
| | | | TOTAL | | | 135 | 12 | 254 | 9 | 0 | 22 | 9 | 0 | | | | |
| Mesachie Creek | ME | Nov 8 | 1 | 12 | 20 | – | – | – | – | – | – | – | – | good | stable | – | overcast |
| | ME | 15 | 2 | 160 | 200 | 1 | – | 1 | – | – | – | – | – | good | stable | – | overcast |
| | ME | 22 | 3 | 154 | 160 | 3 | 1 | 4 | – | – | 1 | 1 | 2[c] | good | stable | 8 | occasional rain |
| | ME | 24 | 3 | – | – | 8 | 1 | 8 | 2 | – | 1 | – | – | good | stable | – | cloudy |
| | ME | 28 | 4 | 185 | 250 | 3 | 2 | 3 | 1 | 1 | 5 | – | – | good | stable | 6 | rain |
| | ME | 30 | 4 | 180 | 200 | 7 | – | 7 | 1 | – | 2 | – | – | good | stable | 6.5 | light rain |
| | ME | Dec 6 | 5 | 72 | 150 | 4 | – | 8 | – | – | 1 | – | – | good | rising | 5.5 | heavy rain |
| | ME | 8 | 5 | 155 | 155 | 2 | – | 4 | 1 | – | – | – | – | good | stable | 5 | – |
| | ME | 12 | 6 | 31 | – | 1 | – | 2 | – | – | – | 1 | – | poor | rising | 5 | heavy rain |
| | ME | 19 | 7 | 159 | 200 | 4 | 2 | 5 | – | – | – | – | – | good | dropping | 5 | frosty |
| | ME | 23 | 7 | 165 | 225 | 6 | 1 | 13 | – | – | 2 | 2 | 1[b] | good | low,stable | – | clear, cool |
| | ME | 28 | 8 | 194 | 250 | 11 | – | 19 | – | – | 1 | – | – | medium | stable | 4 | clear, cool |
| | ME | Jan 3 | 9 | 9 | 9 | 32 | – | 38 | 1 | – | – | – | – | good | low,stable | 2 | snowing |
| | ME | 9 | 10 | 26 | 26 | 9 | – | 20 | – | – | – | – | – | good | rising | – | light rain |
| | ME | 12 | 10 | 5 | 5 | 5 | – | 4 | – | – | – | 1 | – | good | stable | 4 | rain |
| | ME | 18 | 11 | 9 | – | 2 | – | 8 | – | – | 1 | – | – | – | – | – | overcast |
| | ME | 23 | 12 | 13 | 13 | 1 | – | 4 | – | – | 1 | – | – | good | low,stable | – | light rain |
| | | | TOTAL | | | 148 | 7 | 99 | 6 | 1 | 15 | 5 | 3 | | | | |
| Half Way Creek | HW | Dec 6 | 6 | 28 | – | 1 | – | 2 | – | – | 1 | – | – | good | rising | – | heavy rain |
| | HW | 13 | 6 | 7 | – | – | – | – | – | – | – | – | – | good | rising | – | rain |
| | HW | 14 | 6 | 16 | – | – | – | 2 | 1 | – | – | – | – | good | rising | – | heavy rain |
| | HW | 20 | 7 | 7 | – | 2 | – | 3 | – | – | 4 | – | – | good | dropping | | frosty, cold |
| | HW | 23 | 7 | 4 | – | – | – | 2 | – | – | – | – | – | good | dropping | – | warm, sunny |
| | HW | Jan 9 | 10 | 4 | 4 | – | – | 1 | – | – | – | – | – | good | rising | – | light rain |
| | | | TOTAL | | | 3 | 0 | 10 | 1 | 0 | 5 | | | | | | |

# APPENDIX 6 (cont.)

1977

| Stream | Section | Date | Week | Live Count | | Dead Recovery | | | | | | Tag Recovery[a] | | Visibility | Level | Water Temp °C | Weather |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Actual | Estimate | Unmarked | | | Marked | | | Floy | Double | | | | |
| | | | | | | Male | Jack | Female | Male | Jack | Female | | | | | | |
| Cowichan Side Channel | C Sch | Nov 16 | 2 | – | – | – | – | – | – | – | – | – | – | good | stable | 9 | overcast |
| | | Dec 1 | 4 | – | – | – | – | – | – | – | – | – | – | good | stable | 7.5 | – |
| | | 12 | 6 | 6 | – | – | – | – | – | – | – | – | – | good | rising | 6.5 | heavy rain |
| | | 14 | 6 | 6 | – | 1 | – | – | – | – | – | – | – | poor | rising | – | heavy rain |
| | | 20 | 7 | 43 | 50 | 2 | – | 13 | 1 | – | – | – | – | good | dropping | 6.5 | frosty, cold |
| | | 23 | 7 | 15 | 20 | 6 | 1 | 18 | – | – | – | – | – | good | dropping | 6 | sunny, warm |
| | | 29 | 8 | 1 | 1 | 4 | 1 | 13 | – | – | – | – | – | good | dropping | 4 | rain |
| | | Jan 9 | 9 | – | – | – | – | – | – | – | – | – | – | – | – | – | rain |
| | | 18 | 11 | – | – | – | 2 | 2 | – | – | – | – | – | – | – | – | overcast |
| | | 24 | 12 | – | – | – | – | – | – | – | – | – | – | – | – | – | overcast |
| | | | TOTAL | | | 13 | 4 | 46 | 1 | 0 | 0 | | | | | | |
| Bible Camp Side Channel | BC | Nov 16 | 2 | – | – | – | – | – | – | – | – | – | – | poor | rising | 9 | overcast |
| | BC | 25 | 3 | – | – | – | – | – | – | – | – | – | – | poor | rising | 7 | rain |
| | BC | 29 | 4 | 1 | – | 1 | – | 1 | – | – | – | – | – | poor | stable | 7 | clear, sunny |
| | BC | Dec 1 | 4 | 1 | – | – | – | – | – | – | – | – | – | medium | rising | 7 | light rain |
| | BC | 12 | 6 | – | – | – | – | – | – | – | – | – | – | poor | rising | – | – |
| | BC | 14 | 6 | – | – | 1 | – | – | – | – | – | – | – | poor | rising | 7 | heavy rain |
| | BC | 20 | 7 | 2 | 5 | – | – | 1 | – | – | – | – | – | medium | stable | 5 | frosty, cold |
| | BC | 23 | 7 | 17 | – | – | – | – | – | – | – | – | – | poor | – | 6 | sunny, warm |
| | BC | 28 | 8 | – | – | – | – | – | – | – | – | – | – | good | stable | 3.5 | rain |
| | BC | Jan 4 | 9 | – | – | – | – | – | – | – | – | – | – | medium | drop | 6 | light rain |
| | BC | 18 | 11 | 8 | – | – | – | 2 | – | – | – | – | – | – | – | 6 | overcast |
| | BC | 24 | – | 5 | 5 | 4 | 1 | 3 | – | – | – | – | – | good | low,stable | 6 | overcast |
| | | | TOTAL | | | 6 | 1 | 7 | 0 | 0 | 0 | | | | | | |
| Rotary Park | RP | Nov 16 | 2 | 1 | – | – | – | – | – | – | – | – | – | poor | rising | 9.5 | overcast |
| | RP | 22 | 3 | 1 | 5 | – | – | – | – | – | – | – | – | good | stable | 7 | sunny, clear |
| | RP | Dec 5 | 5 | – | – | – | – | – | – | – | – | – | – | – | – | – | – |
| | RP | 8 | 5 | 14 | – | – | – | 3 | – | – | – | – | – | poor | stable | 5 | frosty |
| | RP | 16 | 6 | 20 | 50 | – | – | – | – | – | – | – | – | good | stable | – | overcast |
| | RP | 21 | 7 | 18 | 25 | 4 | – | 3 | – | – | 2 | – | – | good | stable | 9 | clear, cold |
| | RP | Jan 4 | 7 | 11 | 25 | 5 | – | 3 | 1 | – | – | – | – | good | low,stable | 7 | rain |
| | RP | 5 | 9 | 52 | 100 | 6 | – | – | – | – | – | – | – | medium | stable | 9.5 | overcast |
| | RP | 13 | 10 | 100 | 200 | 7 | – | 2 | 1 | – | – | – | – | good | stable | – | overcast |
| | RP | 19 | 11 | 198 | 300 | 54 | 5 | 69 | 1 | – | – | – | – | – | stable | 7 | overcast |
| | RP | 25 | 12 | 80 | 150 | 26 | 1 | 41 | 1 | – | 2 | – | – | – | stable | – | overcast |
| | RP | Feb 1 | 13 | – | – | 5 | – | 8 | – | – | – | – | – | – | low, stable | 4 | clear |
| | RP | 3 | 13 | 35 | 40 | 16 | – | 26 | – | – | – | – | – | – | – | 7 | – |
| | | No Date | | | | | | | 5 | | | | | | – | – | – |
| | | | TOTAL | | | 123 | 6 | 155 | 9 | 0 | 4 | | | | | | |
| Kelvin Creek | K | Nov 9 | 1 | 2 | – | – | – | – | – | – | – | – | – | poor | rising | 5 | heavy rain |
| | K1[e] | 9 | 1 | 41 | 60 | – | – | 2 | 1 | – | 1 | 1 | – | good | stable | 5.5 | – |
| | K | 17 | 2 | 31 | 50 | 1 | – | 4 | 1 | – | – | – | – | poor | stable | 5 | sunny |
| | K1 | 17 | 2 | 124 | 150 | 9 | 1 | 17 | 3 | – | 4 | 1 | 1 | good | stable | 5 | clear, sunny |
| | K1 | 21 | 3 | – | – | – | – | 1 | – | – | 3 | – | – | good | stable | 2 | clear, sunny |
| | K | 22 | 3 | 2 | 2 | 1 | – | 4 | – | – | – | 1 | – | good | stable | 0 | sunny |
| | K1 | 22 | 3 | 6 | 15 | 5 | – | 10 | 1 | – | | – | – | good | stable | 4.5 | overcast |
| | K1 | 30 | 4 | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – |
| | K | Dec 6 | 5 | 5 | 15 | 4 | 2 | 7 | 1 | 1 | – | – | – | medium | rising | 3.5 | heavy rain |
| | K1 | 7 | 5 | – | – | – | – | – | – | – | 1 | – | – | – | – | – | – |
| | K | 16 | 6 | 3 | – | 2 | – | – | – | – | 1 | – | – | medium | dropping | 4.5 | overcast |
| | K1 | 16 | 6 | 2 | – | 1 | – | 1 | – | – | 1 | – | – | medium | dropping | 4 | overcast |
| | K | 21 | 7 | 2 | 5 | 4 | 2 | 8 | – | – | – | 1 | – | good | stable | – | clear, cold |
| | K | 30 | 8 | – | – | 2 | – | 1 | – | – | – | – | – | good | low,stable | 3 | overcast |
| | | | TOTAL | | | 29 | 5 | 55 | 7 | 1 | 12 | 4 | 1 | | | | |
| Pastuch | PA | Nov 8 | 1 | 10 | 20 | – | – | 1 | – | – | – | – | – | good | – | – | – |
| | PA | 15 | 2 | 110 | 170 | – | – | – | – | – | – | – | – | medium | stable | – | occasional rain |
| | PA | 21 | 3 | 55 | 55 | – | – | 1 | – | – | – | – | – | good | dropping | 3 | sunny, clear |
| | PA | 26 | 3 | 52 | 52 | – | – | – | – | – | – | – | – | good | stable | 3 | overcast |
| | PA | 29 | 4 | 70 | 70 | 2 | 1 | 2 | – | – | – | – | – | good | rising | 4 | clear, sunny |
| | PA | Dec 5 | 5 | 38 | 45 | 3 | 1 | 6 | – | – | 1 | – | – | good | stable | 4 | snowing |
| | PA | 8 | 5 | 13 | 13 | 2 | – | 2 | – | – | – | 1 | – | good | stable | 2 | frosty |
| | PA | 12 | 6 | 76 | 100 | 2 | – | 3 | – | – | – | 1 | – | good | rising | 4 | heavy rain |
| | PA | 15 | 6 | 62 | 75 | 8 | – | 2 | 2 | – | – | 1 | – | good | stable | 5.5 | rain |
| | PA | 19 | 7 | 112 | 115 | 9 | – | 11 | – | – | – | – | – | good | stable | 3.5 | frosty |
| | PA | 22 | 7 | 73 | 75 | 5 | – | 6 | – | – | 2 | – | – | good | low, stable | 4 | clear, cool |
| | PA | 28 | 8 | 3 | 5 | 1 | – | 4 | – | – | – | – | – | good | low, stable | 2 | clear, cool |
| | PA | Jan 3 | 9 | 1 | 1 | – | – | – | – | – | – | – | – | good | low, stable | 5 | snowing |
| | PA | 9 | 10 | 34 | 34 | 2 | – | 4 | – | – | – | – | – | good | rising | – | light rain |
| | PA | 12 | 10 | 23 | 23 | 3 | – | 3 | – | – | – | – | – | good | stable | 4 | raining |
| | PA | 17 | 11 | 8 | 8 | 1 | 2 | 7 | – | – | 1 | – | – | good | stable | 5 | overcast |
| | PA | 23 | 12 | 1 | 1 | – | – | 1 | – | – | –[c] | – | – | good | low, stable | 4 | light rain |
| | | | TOTAL | | | 38 | 4 | 53 | 2 | 0 | 4 | 3 | 0 | | | | |

[a] Does not include loose tags.

[b] Disk tag not attached.

[c] One recovery with disk tag only; one recovery with floy tag only.

[d] Robertson River side channel.

[e] Glenora Creek.

APPENDIX 7 RECOVERY DATA FOR CHINOOK SALMON TAGGED IN COWICHAN BAY, 1976 - 1979.

| Tag Number | Date Tagged | Date Recovered | Location Recovered | Sex |
|---|---|---|---|---|
| 1976 | | | | |
| Dead Recovery[a] | | | | |
| 06132 | Sep 30 | Nov 17 | Cowichan R. Sec. 1 | F |
| 06154 | " | Nov 13 | " " " 4 | M |
| 06591 | Oct 5 | Nov 17 | " " " 1 | F |
| 07405 | Oct 7 | Nov 10 | " " " 2 | F |
| 07421 | " | " | " " " 2 | M |
| 07518 | Oct 13 | Nov 11 | " " " 3 | F |
| 07566 | " | Nov 18 | " " " 1 | F |
| 07623 | Oct 14 | Nov 6 | " " " 2 | F |
| 07626 | " | Nov 17 | " " " 1 | F |
| 07654 | " | Nov 6 | Cowichan R. Skutz Falls | F |
| 07671 | Oct 15 | Nov 18 | Cowichan R. Sec. 1 | F |
| 07690 | " | Nov 8 | " " " 1 | F |
| 07737 | " | Nov 24 | " " " 6 | F |
| 07756 | " | Nov 10 | " " " 2 | F |
| | | | Total = 14 recoveries | |
| Sports Fishery | | | | |
| 07498 | Oct 12 | Oct 30 | Cowichan Bay | M |
| Indian Spear Fishery | | | | |
| 06067 | Sep 30 | Oct 20 | Lower Cowichan R. | F |
| 06088 | " | Oct 25 | " " " | M |
| 06174 | " | - | " " " | M |
| 06401 | Oct 5 | Oct 25 | " " " | F |
| 06407 | " | - | " " " | F |
| 06526 | " | Oct 25 | " " " | M |
| 06587 | " | - | " " " | M |
| 07423 | Oct 7 | Oct 14 | " " " | M |
| 07424 | " | Oct 25 | " " " | M |
| 07466 | Oct 8 | - | " " " | F |
| 07485 | " | Oct 25 | " " " | M |
| 07543 | Oct 13 | - | " " " | F |
| 07619 | Oct 14 | Oct 28 | " " " | M |
| 07698 | Oct 15 | Oct 25 | " " " | M |
| 07704 | " | Oct 20 | " " " | M |
| 07746 | " | Nov 7 | " " " | F |
| 07747 | " | Oct 25 | " " " | F |
| | | | Total = 17 recoveries | |
| 1977 | | | | |
| Dead Recovery | | | | |
| 06309 | Sep 22 | Nov 22 | Cowichan R. Sec. 1 | F |
| 06321 | " | Nov 28 | " " " 2 | F |
| 06335 | " | " | " " " 2 | F |
| 06662 | Sep 23 | " | " " " 2 | M |
| 06785 | " | Nov 14 | " " " 1 | F |

[a] 2 carcasses recovered in the Oct 25-28 swim survey are not included.

APPENDIX 7 (cont.)

| Tag Number | Date Tagged | Date Recovered | Location Recovered | Sex |
|---|---|---|---|---|
| 06945 | Sep 26 | Nov 17 | Cowichan R. Sec. 1 | F |
| 10074 | Sep 28 | Nov 22 | " " " 1 | F |
| 10134 | " | Nov 21 | " " " 1 | F |
| 10138 | " | " | " " " 1 | F |
| 10379 | Sep 29 | Nov 22 | " " " 1 | F |
| 10392 | " | Nov 21 | " " " 1 | F |
| | | | Total = 11 recoveries | |
| Sports Fishery | | | | |
| 06222 | Sep 22 | Oct 23 | Cowichan R.Skutz Falls | M(J) |
| 06256 | " | Oct 5 | " " " " | M(J) |
| X06687 | Sep 23 | - | " " " " | F |
| X06717 | " | Oct 10 | Cowichan R.Bible Camp Slough | M |
| 10046 | Sep 28 | " | Cowichan Bay | M |
| | | | Total = 5 recoveries | |
| 1978 | | | | |
| Dead Recovery | | | | |
| B19545 | Oct 6 | Nov 21 | Cowichan R. Sec. 1 | M |
| Sports Fishery | | | | |
| B19529 | Sep 21 | Oct 4 | Cowichan R. bridge | F |
| 1979 | | | | |
| Dead Recovery | | | | |
| 19625 | Sep 21 | Nov 14 | Cowichan R. Sec. 1 | F |
| 19653 | " | Nov 26 | " " " 1 | M |
| 19766 | Oct 2 | Nov 14 | " " " 1 | F |
| 19816 | " | Nov 29 | " " " 1 | M |
| 19976 | Sep 21 | Nov 29 | " " " 1 | F |
| 19986 | " | Nov 15 | " " " 1 | F |
| | | | Total = 6 recoveries | |
| Adult Collection | | | | |
| 19644 | Sep 21 | Oct 28 | Road Pool, L.Cowichan | F |
| 19674 | " | Oct 26 | " " " " | F |
| 19782 | Oct 2 | Oct 29 | " " " " | F |
| 19788 | " | Oct 29 | " " " " | F |
| 19805 | " | Oct 28 | " " " " | F |
| 19850 | " | Oct 29 | " " " " | F |
| | | | Total = 6 recoveries | |
| Sport Fishery | | | | |
| 12114 | Sep 21 | Oct 7 | Separation Point | F |

APPENDIX 8 RECOVERY DATA FOR COHO SALMON TAGGED IN COWICHAN BAY, 1976 and 1977.

| Tag Number | Date Tagged | Date Recovered | Location Recovered | Sex |
|---|---|---|---|---|
| Spawning Ground Dead, 1976 | | | | |
| X0024 | Oct 6 | Dec 7 | Cowichan R.Sec. 1 | M |
| X0099 | " | " | " " " 1 | M |
| X0150 | " | Nov 17 | " " " 4 | M |
| X0205 | Oct 12 | Dec 2 | " " " 2 | M |
| X0423 | Oct 15 | " | " " " 1 | F |
| X0500 | " | Nov 17 | " " " 1 | M |
| X0504 | " | Dec 7 | " " " 1 | M |
| X0529 | Oct 19 | Jan 13 | " " " 1 | M |
| X2032 | Oct 20 | Dec 2 | " " " 2 | M |
| X2117 | " | Dec 2 | " " " 2 | M |
| X2149 | " | Dec 2 | " " " 2 | F |
| X2174 | " | Dec 7 | " " " 1 | F |
| X2223 | " | Nov 22 | " " " 1 | M |
| X2232 | " | Dec 20 | " " " 1 | M |
| X2245 | " | Dec 2 | " " " 3 | M |
| X2257 | " | Nov 19 | " " " 4 | F |
| X2281 | Oct 21 | Dec 2 | " " " 1 | M |
| X2285 | " | Dec 20 | " " " 1 | M |
| X2298 | " | Dec 29 | " " " 3 | F |
| X2301 | " | Dec 7 | Robertson R. | F |
| X2372 | " | Dec 29 | Cowichan R.Sec. 1 | F |
| X2388 | " | Dec 23 | Kelvin Ck. | M |
| X2460 | Oct 22 | Nov 19 | Cowichan R.Sec. 4 | M |
| X2462 | " | Dec 14 | " " " 1 | M |
| X2463 | " | Dec 2 | " " " 2 | M |
| X2509 | Oct 26 | Dce 29 | " " " 1 | F |
| | | | Total = 26 recoveries | |
| Sport Fishery, 1976 | | | | |
| X0033 | Oct 6 | Oct 16 | Saanich Inlet,Mill Bay, Whiskey Point | F |
| X0056 | " | Oct 13 | San Juan Islands | M |
| X0096 | " | Nov 10 | Area 7A,Salmon Banks | F |
| X0294 | Oct 12 | Oct 17 | Saanich Inlet,Bamberton Shore | F |
| X0331 | " | Oct 20 | Washington | F |
| X0369 | " | Oct 28 | | F |
| X0481 | Oct 15 | Oct 22 | Cowichan Bay | F |
| X0483 | " | Oct 16 | Cowichan Bay | F |
| X0486 | " | Oct 22 | Cowichan Bay | M |
| X0489 | " | Oct 20 | Cowichan Bay | F |
| X2013 | Oct 20 | Oct 31 | Cowichan Bay | F |
| X2033 | " | Oct 24 | Saanich Inlet, Mill Bay | M |
| X2091 | " | Nov 2 | Area 7A, Salmon Banks | F |
| X2153 | " | Nov 7 | Cowichan Bay,Cherry Point | M |
| X2178 | " | | | F |
| X2259 | Oct 21 | Oct 22 | Cowichan Bay | M |

APPENDIX 8 (Cont.)

| Tag Number | Date Tagged | Date Recovered | Location Recovered | Sex |
|---|---|---|---|---|
| X2264 | Oct 21 | Nov 11 | Cowichan River, ½ mile below Skultz Falls | F |
| X2322 | " | " | Cowichan R., Stoltz pool | F |
| X2397 | Oct 22 | Nov/76 | Lake Cowichan | M |
| X2506 | Oct 26 | Nov 20 | Cowichan Bay | M |
| | | | Total = 20 recoveries | |
| Native Fishery, 1976 | | | | |
| X0053 | Oct 6 | - | Lower Cowichan R. | M(J) |
| X0089 | " | - | " " " | M |
| X0109 | " | Oct 25 | " " " | M |
| X0110 | " | - | " " " | M |
| X0129 | Oct 7 | Nov 1 | " " " | F |
| X0134 | " | - | " " " | F |
| X0195 | Oct 12 | - | " " " | F |
| X0242 | " | - | " " " | M |
| X0247 | " | - | " " " | M |
| X0271 | " | - | " " " | M |
| X0273 | " | - | " " " | M |
| X0302 | " | - | " " " | F |
| X0325 | " | - | " " " | M |
| X0396 | Oct 13 | Nov 15 | " " " | M |
| X0440 | " | - | " " " | M |
| X0472 | Oct 14 | - | " " " | M |
| X0503 | Oct 15 | - | " " " | F |
| X0507 | " | Oct 30 | " " " | F |
| X0558 | Oct 19 | - | " " " | M |
| X2061 | Oct 20 | - | " " " | M |
| X2082 | " | - | " " " | F |
| X2088 | " | - | " " " | F |
| X2142 | " | - | " " " | F |
| X2152 | Oct 21 | - | " " " | M |
| X2210 | " | - | " " " | M |
| X2258 | " | - | " " " | M |
| X2269 | " | - | " " " | F |
| X2315 | " | - | " " " | M |
| X2390 | Oct 22 | - | " " " | M |
| X2412 | " | - | " " " | M |
| X2416 | " | - | " " " | M |
| X2448 | " | - | " " " | F |
| X2474 | " | - | " " " | M |
| X2526 | Oct 26 | - | " " " | M |
| | | | Total = 34 recoveries | |
| Spawning Ground Dead, 1977 | | | | |
| 08179 | Sep 26 | Nov 17 | Glenora Ck. | - |
| 08375 | Sep 28 | Nov 23 | Robertson R.,Sec.1A | - |
| 08390 | " | Dec 1 | Cowichan R.Sec.1 | F |

APPENDIX 8 (cont.)

| Tag Number | Date Tagged | Date Recovered | Location Recovered | Sex |
|---|---|---|---|---|
| 18687 | Oct 13 | Dec 12 | Cowichan R. Sec.1 | - |
| 18726 | Oct 18 | " | " " " 1 | - |
| 18737 | " | Jan 12 | " " " 2 | F |
| 18762 | " | Dec 1 | " " " 1 | F |
| 18781 | " | Dec 6 | " " " 1 | - |
| 08644 | Sep 30 | Nov 24 | Robertson R. Sec. 1A | - |
| 08997 | Oct 4 | Nov 29 | " " " | F |
| 09083 | " | Dec 6 | Cowichan R. Sec. 1 | F |
| 09123 | " | Dec 19 | Robertson R. Sec. 1 | F |
| 09322 | Oct 5 | Dec 12 | Pastuch Creek | - |
| 09477 | " | " | Robertson R. Sec. 1A | - |
| 09487 | " | Nov 28 | Cowichan R. Sec. 3 | - |
| 09530 | " | Dec 15 | Pastuch Creek | - |
| 09603 | " | Dec 8 | " " | - |
| 09622 | Oct 6 | Nov 22 | Kelvin Creek | M |
| 09640 | " | Dec 27 | Cowichan R. Sec. 1 | - |
| 09688 | " | Nov 23 | Mesachie Creek | - |
| 09748 | " | Dec 5 | Robertson R. Sec. 1A | - |
| 10522 | Oct 11 | Dec 29 | Cowichan R. Sec. 2 | - |
| 10549 | " | Dec 19 | Robertson R. Sec. 1A | - |
| 10586 | " | Dec 12 | " " " | F |
| 10607 | " | Jan 11 | Cowichan R. Sec. 1 | M |
| 10686 | " | Dec 12 | Mesachie Creek | - |
| 10914 | Oct 18 | Jan 12 | Cowichan R. Sec. 2 | F |
| 10964 | " | Dec 28 | " " " 2 | - |
| 10970 | " | Nov 28 | " " " 3 | - |
| B26505 | Oct 21 | Jan 26 | " " " 3 | F |
| B26507 | " | Nov 17 | " " " 1 | - |
| B26520 | " | Jan 16 | " " " 3 | M |
| B26567 | " | Jan 24 | " " " 3 | M |
| B26593 | " | Jan 12 | " " " 2 | - |
| B26604 | " | Jan 11 | " " " 1 | F |
| B26613 | " | " | " " " 1 | F |
| B26629 | " | Jan 4 | " " " 2 | - |
| B26649 | " | Jan 20 | " " " 2 | M |
| B26672 | " | Jan 16 | " " " 3 | M |
| B26695 | " | Dec 19 | Robertson R. Sec. 1A | - |
| B26700 | " | Jan 31 | Cowichan R. Sec. 2 | M |
| B26754 | " | Dec 22 | Mesachie Creek | - |
| B26833 | " | Jan 10 | Cowichan R. Sec. 1 | F |
| B26895 | " | Jan 19 | " " " 1 | F |
| B26924 | " | Nov 15 | " " " 3 | - |
| B26958 | " | Dec 1 | " " " 1 | F |
| B26999 | " | Dec 22 | Mesachie Creek | - |
| B26529 | " | Nov 17 | Cowichan R. Sec. 1 | - |
| B27595 | " | Jan 20 | " " " 2 | F |
| B27671 | " | Jan 19 | " " " 1 | F |
| B27700 | " | Jan 20 | " " " 2 | F |
| B28505 | Oct 18 | Jan 10 | " " " 1 | F |

APPENDIX 8 (cont.)

| Tag Number | Date Tagged | Date Recovered | Location | Sex |
|---|---|---|---|---|
| B28506 | Oct 18 | Dec 21 | Kelvin Creek | - |
| B28532 | " | Nov 19 | Cowichan R. Sec. 5 | - |
| B28547 | " | Jan 12 | " " " 2 | F |
| B28556 | Oct 18 | Jan 10 | " " " 1 | F |
| B28660 | Oct 18 | Jan 18 | " " " 1 | F |
| B28673 | " | Dec 28 | " " " 2 | - |
| B28680 | " | Nov 9 | Glenora Creek | - |
| B28698 | " | Jan 10 | Cowichan R. Sec. 1 | M |
| B28771 | " | Jan 12 | " " " 2 | F |
| B28810 | Oct 19 | " | " " " 2 | M |
| B28817 | " | Jan 26 | " " " 3 | M |
| B28852 | " | Jan 27 | " " " 3 | F |
| B28898 | " | Dec 27 | " " " 1 | - |
| B28927 | " | Jan 27 | " " " 3 | - |
| B29014 | " | Nov 15 | " " " 3 | - |
| B29132 | Oct 20 | Jan 13 | " " " 3 | M |
| B29152 | " | Jan 12 | Mesachie Creek | - |
| B29155 | " | Jan 10 | Cowichan R. Sec. 1 | F |
| B29234 | " | Jan 23 | " " " 3 | F |
| B29483 | Oct 21 | Jan 17 | " " " 4 | M |

Total = 72 recoveries

Spawning Ground Dead, Double Tagged, 1977

| | | | | |
|---|---|---|---|---|
| X07053/ /X10101 | Oct 19 " | Jan 4 Nov 23 | Cowichan R. Sec. 2 Mesachie Creek | - F |
| X07276/X10306 | Oct 20 | Nov 17 | Glenora Creek | - |
| X07309/ | " | Jan 27 | Cowichan R. Sec. 3 | - |
| X07391/X10418 | " | Dec 27 | " " " 1 | - |
| B27753/X10451 | Oct 23 | Dec 7 | " " " 3 | - |
| B27920/ | Oct 25 | Jan 19 | " " " 1 | - |
| B27923/ | " | Nov 23 | Mesachie Creek | F |
| B27926/ | " | Dec 22 | " " | F |
| B27931/X10605 | " | " | Cowichan R. Sec. 2 | - |
| B27947/ | " | Jan 26 | " " " 3 | - |
| B28061/X10719 | Oct 26 | Dec 28 | " " " 2 | - |

Total = 12 recoveries

Sport Fishery, 1977

| | | | | |
|---|---|---|---|---|
| 08028 | Sep 22 | Oct 14 | Cowichan R., ½ mile below Silver Bridge | F |
| 08087 | Sep 23 | Oct /77 | | - |
| 08204 | Sep 26 | Oct 14 | Cowichan Bay | - |
| 08259 | " | Oct 10 | Cowichan R., Stone Church | - |
| 08471 | Sep 29 | Dec 22 | Buckam's Creek | - |
| 08528 | " | Oct 13 | Saanich Inlet, Mill Bay, Whiskey Point | - |
| 08623 | " | Nov 19 | Cowichan River | - |

APPENDIX 8 (cont.)

| Tag Number | Date Tagged | Date Recovered | Location | Sex |
|---|---|---|---|---|
| 08741 | Sep 30 | Dec 10 | Sooke; Donaldson Is. | - |
| 08757 | " | Oct 14 | San Juan Is., Pile Point | - |
| 08768 | " | Oct 12 | Saanaich Inlet, Mill Bay | - |
| 08783 | " | Fall/77 | Cowichan Bay | - |
| 08798 | Sep 29 | Oct 4 | Friday Harbour, Wa. | - |
| 08822 | Sep 30 | - | Separation Pt., Cowichan Bay | M |
| 08837 | " | Oct 22 | Cowichan R., Rotary Park | - |
| 09006 | Oct 4 | Oct 16 | Saanich Inlet, Mill bay | - |
| 09008 | " | Oct 10 | Saanich Inlet, Brentwood | M |
| 09109 | " | Oct 8 | Saanich Inlet, Mill Bay | - |
| 09233 | " | Sep 8/78 | Cowichan River | M |
| 09241 | " | Oct 9 | Hatch Point | - |
| 09382 | Oct 5 | Oct 10 | Saanich Inlet, Mill Bay | - |
| 09388 | Oct 5 | Nov 9 | Cowichan R., Riverbottom Road | - |
| 09503 | " | Oct 12 | Saanich Inlet, Mill Bay | F |
| 09566 | " | Oct 11 | Saanich Inlet, Mill Bay, Whiskey Point | F |
| 09647 | Oct 6 | - | Cowichan Bay | - |
| 09765 | " | Oct 9 | Saanich Inlet, Mill Bay | F |
| 09888 | Oct 7 | Oct 12 | Saanich Inlet, Mill Bay | - |
| 09920 | " | Oct 22 | Cowichan River, Rotary Park | - |
| 10552 | Oct 11 | Oct 19 | Sandheads, troll | - |
| 10556 | " | Nov 27 | Mesachie Creek | M |
| 10660 | " | Oct 21 | Cowichan R., Quamichan area | - |
| 10673 | " | Nov 29 | | F |
| 18703 | Oct 13 | Nov 16 | Robertson River | M |
| 18750 | Oct 18 | Oct/77 | Koksilah River | - |
| B26563 | Oct 21 | Nov 5/78 | Cowichan River, Stoltz Pool | F |
| B26583 | Oct 21 | Nov 7 | Cowichan River, Sawdust Pool | M |
| B26584 | " | Oct 21 | Cowichan Bay | - |
| B26587 | " | - | Torrey Point | - |
| B26670 | " | Nov 6 | Cowichan R., BCFP pumphouse | F |
| B26742 | " | Nov 7 | Cowichan R.,Riverbottom Road | |
| B26750 | " | Jan 1 | Cowichan R., Silver Bridge | M |
| B26810 | " | Nov 2 | Cowichan R., 3 miles below Skutz Falls | - |
| B26816 | " | Oct 15 | | - |
| B26822 | " | Nov 16 | Sutton Ck., Honeymoon Bay | - |
| B26890 | " | Oct 30 | Cowichan R., Stoltz Pool | - |
| B27609 | " | Nov 13 | Cowichan River | F |
| B27673 | " | Dec 21 | Robertson. 1A | M |
| B27705 | " | Nov 11 | Cowichan R., Black Bridge | - |
| B28534 | Oct 18 | Dec 26 | Cowichan R., 1 mile below Skutz Falls | - |
| B28548 | " | Oct 27 | Cowichan Bay | - |
| B28593 | " | Oct 20 | Cowichan Bay | - |
| B28610 | " | Nov 27 | Cowichan River | F |
| B28679 | " | Nov 8 | Cowichan River | F |

APPENDIX 8 (cont.)

| Tag Number | Date Tagged | Date Recovered | Location | Sex |
|---|---|---|---|---|
| B28710 | Oct 18 | Nov 4 | Lake Cowichan weir | - |
| B28752 | " | Nov 12 | Lake Cowichan weir | - |
| B28884 | Oct 19 | Oct/77 | Cowichan R., Near L. Cowichan | - |
| B28904 | " | Nov 29 | Cowichan R., Skutz Falls | - |
| B29027 | " | Nov 27 | Sutton Creek | M |
| B29061 | " | Oct 23 | Cowichan Bay | - |
| B29067 | " | Nov 30 | Robertson 1A | - |
| B29160 | Oct 20 | Nov 14 | Cowichan River | F |
| B29164 | " | Dec 1 | Cowichan R., Riverbottom road | - |
| B29260 | " | Nov 12 | Cowichan R., Skutz Falls | F |
| B29263 | " | Oct 22 | Satellite Channel,Cherry Pt. | M |
| B29300 | " | Oct 29 | Cowichan River | M |
| B29314 | " | Nov 15 | Cowichan River | F |
| B29349 | " | Dec 26 | Cowichan River, 1 mile below Skutz Falls | - |
| B29479 | Oct 21 | Nov 2 | Cowichan River | M |

Total = 67 recoveries

Sport Fishery Double Tagged, 1977

| | | | | |
|---|---|---|---|---|
| X07129/X10158 | Oct 19 | Oct 27 | Cowichan R., Riverbottom Road | - |
| X07240/ | " | Nov 8 | Cowichan River | F |
| /X10269 | " | Nov 11 | " " | M |
| X07329/ | Oct 20 | Nov 21 | " " | M |
| X07338/ | " | Oct 30 | Cowichan River, Stoltz pool | - |
| X07342/X10371 | " | Oct/77 | Koksilah River | - |
| X07366/X10394 | " | Oct 30 | Cowichan River, Skutz Falls | - |
| X07379/X10406 | " | Nov 15 | Cowichan River Section 3 | - |
| B27756/X10454 | Oct 23 | Nov 10 | Cowichan River | - |
| B27795/ | " | Oct 31 | Cowichan River, Stoltz pool | - |
| B27865/X10554 | Oct 23 | Nov 7 | Cowichan R., Riverbottom road | - |
| B28001/X10666 | Oct 26 | Dec 3 | Cowichan River | - |
| B28014/X10677 | " | - | " " | - |
| B28077/X10732 | " | Oct/77 | Cowichan R., near L. Cowichan | - |
| B28196/X10842 | Oct 27 | Nov 9 | Cowichan River | - |

Total = 15 recoveries

Angler Carcass, 1977

| | | | | |
|---|---|---|---|---|
| 08993 | Oct 4 | Nov/77 | Lake Cowichan | - |
| 09596 | Oct 5 | - | Lake Cowichan, Creek | - |
| 09733 | Oct 6 | Nov 16/77 | Richard Creek | - |
| 10745 | Oct 13 | Dec 7/77 | Nixon Creek, L. Cowichan | - |
| 10567 | Oct 11 | Nov/77 | Solly Creek, Westholme | - |
| B26572 | Oct 21 | - | Koksilah River | M |
| B26846 | " | Nov/77 | Lake Cowichan, Creek | - |
| B26887 | " | Nov 24/77 | Goldstream River, Victoria | - |
| B29143 | Oct 20 | Feb 26/78 | Cowichan River, Skutz Falls | - |
| B29222 | " | Oct/77 | Lake Cowichan, Creek | - |
| B29265 | Oct 20 | Nov 16/77 | | |

Total = 11 recoveries

APPENDIX 8 (cont.)

| Tag Number | Date Tagged | Date Recovered | Location | Sex |
|---|---|---|---|---|
| **Angler Carcass, Double Tagged, 1977** | | | | |
| 10875/ | Oct 18 | Nov/77 | Lake Cowichan, Creek | - |
| X07067/ | Oct 19 | " | " " " | - |
| /X10329 | Oct 20 | Jan/78 | Cowichan River | - |
| /X10599 | Oct 25 | Oct/77 | Lake Cowichan | - |
| B27925/ | " | Nov/77 | Mesachie Lake | - |
| B28062/X10720 | Oct 26 | Jan 4/78 | Cowichan River, near Duncan | - |
| | | | Total = 6 recoveries | |
| **Native Fishery, 1977** | | | | |
| 08092 | Sep 23 | Feb 10 | Qualicum | |
| 09678 | Oct 6 | - | Lower Cowichan River | |
| 10514 | Oct 11 | - | " " " | |
| 10667 | Oct 11 | - | " " " | |
| 10718 | Oct 13 | Oct 22 | Cowichan River | |
| 10957 | Oct 18 | Oct 25 | Cowichan River | |
| B28790 | Oct 18 | Oct 20 | Cowichan River | |
| B29198 | Oct 20 | Oct 22 | Cowichan River | |
| B26996 | Oct 21 | Nov 16 | Cowichan River, Silver Bridge | |
| X07282/X10312 | Oct 20 | Nov 16 | Cowichan River, Silver Bridge | |
| /X10239 | Oct 19 | - | Lower Cowichan River | |
| /X10068 | Oct 18 | - | Lower Cowichan River | |
| /X10669 | Oct 26 | - | Lower Cowichan River | |
| | | | Total = 13 recoveries | |

APPENDIX 9 PETERSEN-TYPE POPULATION ESTIMATES FOR RECOVERY OF LARGE TAGGED CHINOOK AND COHO ON THE COWICHAN-KOKSILAH SPAWNING GROUNDS.

| Chinook | | Tags Unavailable for Recovery | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Recovery Period | No. of fish tagged in estuary | Sport Fishery | Native Fishery | Loose Tags | Other Tags | Tag Loss[a] | Tags Available for Recovery[b] (M) | Tags Recovered[c] (R) | Carcasses Examined (C) | Petersen Estimate |
| Nov 5 - Dec 2,1976 | 784 | 1 | 17 | | 2[e] | 25% | 573 | 14 | 998 | 38228 |
| Nov 14 - Dec 27,1977 | 870 | 5 | | | | 25% | 649 | 11 | 719 | 39000 |
| Nov 1 - Nov 21,1978 | 48 | | | | | 25% | 36 | 1 | 1175 | 21756 |
| Nov 14 - Dec 3,1979 | 239 | 1 | | | 6[d] | 25% | 174[d] | 6 | 657 | 16450 |
| Coho | | | | | | | | | | |
| Oct 25, 1976 - Feb 6,1977 | 1097 | 20 | 33 | 1 | | 55% | 470 | 26 | 1420 | 24789 |
| Nov 8, 1977 - Feb 3, 1978 | 5111 | 99 | 13 | 20 | | 25% | 3734 | 84 | 5878 | 258330 |

[a] Tag loss calculation from Appendix 10.

[b] No. tagged in estuary with corrections for tags not available for recovery on spawning grounds and tag loss.

[c] Swim survey tag recoveries not included.

[d] Recoveries during collection of chinook for egg takes.

[e] Recoveries during river float counts.

APPENDIX 10 CALCULATION OF PERCENTAGE TAG LOSS FROM SPAWNING GROUND RECOVERIES OF COWICHAN ESTUARY DOUBLE-TAGGED COHO.

| Source of Tags | Total Recaptures | No. of Recoveries | | |
|---|---|---|---|---|
| | | Both Tags | Spaghetti Only | Disk Only |
| Estuary Purse Seining | 16 | 6 | 1 | 9 |
| Sport Fishermen | 15 | 10 | 4 | 1 |
| Native Fishermen | 4 | 1 | 0 | 3 |
| Angler Carcass Recovery | 6 | 1 | 3 | 2 |
| Spawning Ground Dead Recovery | 12 | 5 | 6 | 1 |
| TOTAL | 53 | 23 | 14 | 16 |
| TOTAL[a] | 18 | 6 | 9 | 3 |
| Percentage Retention | | 33 | 50 | 17 |

| | Spaghetti | Disk |
|---|---|---|
| Percentage Loss | 17 | 50 |
| Adjusted percentage tag loss[b] | 25% | 55% |

[a] Includes only angler and spawning ground carcass recoveries.

[b] Adjustment for percentage which lose both tags.

APPENDIX 11 CHINOOK AND COHO SALMON DIEL MIGRATION PATTERN AT THE SKUTZ FALLS COUNTING TOWER, BASED ON 24-HOUR COUNTS, DURING PEAK MIGRATION IN THE COWICHAN RIVER IN 1976.

| Time (hrs) | Oct. 26 - Nov. 4 Chinook | | Nov. 2 - 11 Coho |
|---|---|---|---|
| | Large | Jack | |
| 0 - 2 | 2.5 | 3.5 | 4.0 |
| 2 - 4 | 3.5 | 2.0 | 2.5 |
| 4 - 6 | 4.5 | 2.0 | 2.5 |
| 6 - 8 | 5.0 | 3.0 | 6.5 |
| 8 - 10 | 8.5 | 5.5 | 7.5 |
| 10 - 12 | 15.0 | 13.5 | 13.0 |
| 12 - 14 | 24.5 | 17.5 | 15.5 |
| 14 - 16 | 14.0 | 13.0 | 15.5 |
| 16 - 18 | 9.5 | 10.5 | 11.5 |
| 18 - 20 | 7.5 | 13.5 | 9.0 |
| 20 - 22 | 4.0 | 10.5 | 8.0 |
| 22 - 24 | 2.0 | 5.5 | 4.5 |

APPENDIX 12 CHINOOK AND COHO SALMON DIEL MIGRATION PATTERNS BASED ON 24-HR COUNTS FROM A TOWER LOCATED AT DUNCAN WATERWORKS PUMPHOUSE, COWICHAN RIVER, 1977.

Chinook

| Time | Sep 20-27 | | Sep 28-Oct 4 | | Oct 5-10 | | Oct 11-15 | | Oct 16-18 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Large (%) | Jack (%) | Large (%) | Jack (%) | Large (%) | Jack (%) | Large (%) | Jack (%) | Large (%) | Jack (%) |
| 0-2 | 8.3 | 18.2 | 24.5 | 24.0 | 26.9 | 16.7 | 33.3 | 12.5 | 14.4 | 17.5 |
| 2-4 | 0 | 24.2 | 16.3 | 19.0 | 30.8 | 13.0 | 27.1 | 15.6 | 13.6 | 15.0 |
| 4-6 | 25.0 | 9.1 | 8.2 | 17.4 | 7.7 | 9.3 | 25.0 | 28.1 | 14.4 | 15.0 |
| 6-8 | 33.3 | 21.2 | 8.2 | 3.3 | 0 | 7.4 | 4.2 | 3.1 | 9.8 | 7.5 |
| 8-10 | 0 | 6.1 | 5.1 | 2.5 | 15.4 | 1.9 | 2.1 | 0 | 2.3 | 0 |
| 10-12 | 0 | 9.1 | 0 | 0 | 7.7 | 0 | 0 | 0 | 2.3 | 2.5 |
| 12-14 | 8.3 | 0 | 0 | 0 | 0 | 0 | 4.2 | 0 | 2.3 | 15.0 |
| 14-16 | 16.7 | 0 | 11.2 | 14.9 | 3.8 | 3.7 | 2.1 | 3.1 | 0 | 0 |
| 16-18 | 0 | 3.0 | 3.1 | 5.8 | 0 | 0 | 0 | 0 | 21.2 | 10.0 |
| 18-20 | 0 | 0 | 0 | 0 | 0 | 3.7 | 2.1 | 0 | 0 | 0 |
| 20-22 | 8.3 | 3.0 | 6.1 | 2.5 | 7.7 | 9.3 | 0 | 6.3 | 9.8 | 7.5 |
| 22-24 | 0 | 6.1 | 17.3 | 10.7 | 0 | 35.2 | 0 | 31.3 | 9.8 | 10.0 |
| Actual Count | 12 | 33 | 98 | 121 | 26 | 54 | 48 | 32 | 132 | 40 |

| Time | Oct 19-20 | | Oct 21-22 | | Oct 23-25 | | Oct 26-27 | |
|---|---|---|---|---|---|---|---|---|
| | Large (%) | Jack (%) | Large (%) | Jack (%) | Large (%) | Jack (%) | Large (%) | Jack (%) |
| 0-2 | 2.0 | 26.7 | 40.0 | 0 | 20.0 | 43.2 | 23.1 | 0 |
| 2-4 | 0 | 20.0 | 10.0 | 18.8 | 13.3 | 5.4 | 27.7 | 0 |
| 4-6 | 4.1 | 20.0 | 20.0 | 31.3 | 13.3 | 2.7 | 10.8 | 0 |
| 6-8 | 4.1 | 6.7 | 0 | 0 | 6.7 | 10.8 | 3.1 | 0 |
| 8-10 | 2.0 | 0 | 0 | 0 | 20.0 | 5.4 | 1.5 | 0 |
| 10-12 | 18.4 | 13.3 | 10.0 | 0 | 0 | 0 | 4.6 | 0 |
| 12-14 | 28.6 | 0 | 0 | 12.5 | 0 | 0 | 6.2 | 0 |
| 14-16 | 36.7 | 0 | 0 | 0 | 6.7 | 0 | 7.7 | 0 |
| 16-18 | 0 | 0 | 0 | 0 | 6.7 | 5.4 | 9.2 | 0 |
| 18-20 | 2.0 | 0 | 0 | 6.3 | 0[a] | 0[a] | 4.6 | 0 |
| 20-22 | 0 | 6.7 | 10.0 | 6.3 | 0 | 16.2 | 1.5 | 0 |
| 22-24 | 2.0 | 6.7 | 10.0 | 25.0 | 13.3 | 10.8 | 0 | 0 |
| Actual Count | 49 | 15 | 10 | 16 | 30 | 37 | 130[b] | 0 |

APPENDIX 12 (cont.)

Coho

| Time | Oct5-10 (%) | Oct11-15 (%) | Oct16-18 (%) | Oct19220 (%) | Oct21-22 (%) | Oct23-24 (%) | Oct26-27 (%) | Adjusted[c] Mean(%) |
|---|---|---|---|---|---|---|---|---|
| 0-2 | 75 | 11.1 | 26.2 | 13 | 21.4 | 1.6 | 4.1 | 2.9 |
| 2-4 | 25 | 22.2 | 4.3 | 8.7 | 21.4 | 6.8 | 2.9 | 4.5 |
| 4-6 | | 44.5 | 4.3 | 0 | 7.1 | 12.8 | 2.4 | 7.1 |
| 6-8 | | | 4.3 | 10.9 | 0 | 33.7 | 2.1 | 16.2 |
| 8-10 | | | 0 | 26.0 | 0 | 23.7 | 2.6 | 12.0 |
| 10-12 | | | 0 | 2.2 | 0 | 3.8 | 15.8 | 10.4 |
| 12-14 | | | 26.2 | 2.2 | 7.1 | 1.2 | 22.9 | 13.2 |
| 14-16 | | | 0 | 0 | 14.3 | 3.5 | 13.6 | 9.1 |
| 16-18 | | | 21.7 | 0 | 0 | 7.0 | 11.8 | 9.7 |
| 18-20 | | | 0 | 10.9 | 0 | 4.2[a] | 6.4 | 5.5 |
| 20-22 | | | 8.7 | 19.6 | 17.9 | 1.0 | 8.2 | 5.0 |
| 22-24 | | 22.2 | 4.3 | 6.5 | 10.8 | 0.7 | 7.2 | 4.4 |
| Actual Count | 12 | 9 | 23 | 46 | 28 | 3236 | 3990[b] | 7226 |

[a]Averaged value.

[b]Adjusted count due to poor visibility.

[c]Mean percent of daily migration, obtained from 24-hour counts prior to and following peak migration, used to estimate the peak coho migration on October 25.

APPENDIX 13 DAILY MIGRATION OF CHINOOK AND COHO SALMON PAST THE COUNTING TOWER LOCATIONS.

1976

| Date | Chinook | | | | | | | | Coho | | | Mean Water Temp. | Visibility | Weather |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hours Counted | | Actual Count | | | | Daily Estimate[d] | | Actual Count | | Daily Estimate[d] | | | |
| | | | Large | | Jack | | Large | Jack | | | | | | |
| | A.M. | P.M. | A.M. | P.M. | A.M. | P.M. | | | A.M. | P.M. | | | | |
| Sep 18 | – | 19-22 | – | – | – | 10 | – | 100 | – | – | 4 | – | 100% | – |
| 19 | 00-07 | 15-24 | 6 | 5 | 18 | 38 | 26 | 118 | 1 | 1 | 4 | – | " | – |
| 20 | 00-07 | 19-24 | 8 | – | 29 | 18 | 27 | 120 | 1 | – | 6 | – | " | – |
| 21 | 00-03 | 17-24 | 3 | 2 | 7 | 28 | 22 | 112 | – | – | 4 | – | " | showers |
| 22 | 00-07 | – | 1 | – | 25 | – | 15 | 80 | – | – | 8 | – | " | overcast |
| 23 | – | 17-24 | – | – | – | 25 | 23 | 108 | – | 1 | 0 | 15.5 | " | " |
| 24 | 00-12 | 12-24 | 4 | – | 10 | 16 | 8 | 52 | – | – | 0 | " | " | clear |
| 25 | 00-07 | 17-24 | – | -1 | 4 | 13 | 2 | 39 | – | – | 0 | " | " | clear |
| 26 | 00-07 | 17-24 | 4 | 2 | 18 | 10 | 14 | 58 | – | – | 3 | 16.5 | " | clear |
| 27 | 00-05 | 18-24 | – | 1 | 12 | 12 | 6 | 68 | 1 | -1 | 4 | 16 | " | " |
| 28 | 00-06 | – | 1 | – | 11 | – | 8 | 56 | 2 | – | 0 | 16.5 | " | " |
| 29 | 00-06 | 19-24 | 3 | 3 | 6 | 10 | 16 | 59 | – | – | 0 | 17 | " | " |
| 30 | 00-06 | 18-24 | 3 | 2 | 6 | 8 | 10 | 40 | – | – | 0 | 18 | " | " |
| Oct 1 | 00-06 | – | 2 | – | 4 | – | 8 | 24 | – | – | 0 | – | – | – |
| 2 | – | – | – | – | – | – | 8 | 25 | – | – | 0 | 17 | 100% | overcast |
| 3 | – | 18-24 | – | 2 | – | 6 | 8 | 26 | – | – | 0 | 17 | " | " |
| 4 | 00-06 | 18-24 | – | 1 | 12 | 15 | 7 | 68 | – | – | 0 | 17 | " | " |
| 5 | 00-06 | – | – | – | 9 | – | 4 | 36 | – | – | 0 | 17 | " | " |
| 6 | – | 18-24 | – | 1 | – | 13 | 8 | 46 | – | – | 0 | 17 | " | clear |
| 7 | 00-06 | – | -1 | – | 5 | – | 5 | 32 | – | – | 0 | 17 | " | " |
| 8 | – | 18-24 | – | 5 | – | 18 | 16 | 55 | – | – | 0 | 16 | " | rain |
| 9 | 00-05 | – | 2 | – | 4 | – | 10 | 42 | – | – | 0 | 16 | " | overcast |
| 10 | – | – | – | – | – | – | 8 | 39 | – | – | 0 | – | – | – |
| 11 | – | 18-24 | – | -1 | – | 7 | 6 | 32 | – | – | 0 | 16 | 100% | overcast |
| 12 | 00-06 | – | 2 | – | 9 | – | 10 | 42 | – | – | 0 | 16 | " | – |
| 13 | – | 18-24 | – | 1 | – | 5 | 6 | 22 | – | – | 0 | 16 | " | clear |
| 14 | 00-06 | – | 2 | – | 7 | – | 8 | 30 | – | – | 0 | 16 | " | " |
| 15 | – | 18-24 | – | 4 | – | 23 | 14 | 74 | – | – | 0 | 16 | " | " |
| 16 | 00-06 | – | – | – | 14 | – | 8 | 56 | – | – | 0 | 15.5 | " | " |
| 17 | – | 18-24 | – | 4 | – | 20 | 20 | 63 | – | – | 0 | 15 | " | " |
| 18 | – | 18-24 | – | 6 | – | 17 | 32 | 78 | – | – | 0 | 14 | " | " |

APPENDIX 13 (cont.)

1976

| Date | Hours Counted | | Chinook | | | | | | Coho | | | Mean Water Temp. | Visibility | Weather |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Actual Count | | | | Daily Estimate[d] | | Actual Count | | Daily Estimate[d] | | | |
| | | | Large | | Jack | | Large | Jack | | | | | | |
| | A.M. | P.M. | A.M. | P.M. | A.M. | P.M. | | | A.M. | P.M. | | | | |
| Oct 19 | 00-06 | - | 4 | - | 8 | - | 20 | 42 | 1 | - | 6 | 14 | 100% | - |
| 20 | - | 18-24 | - | 1 | - | 33 | 14 | 106 | - | - | 0 | 14 | " | clear |
| 21 | 00-06 | - | 3 | - | 7 | - | 22 | 50 | - | - | 0 | 14 | " | - |
| 22 | - | 18-22 | - | - | - | 37 | 12 | 140 | - | 2 | 10 | 13.5 | " | cloudy |
| 23 | - | 12-24 | - | 8 | - | 12 | 30 | 72 | - | 2 | 10 | 13 | " | " |
| 24 | 00-12 | 19-24 | 3 | 6 | 60 | 11 | 24 | 141 | -1 | - | 2 | 13 | " | rain |
| 25 | 00-06 | - | 2 | - | 14 | - | 18 | 70 | 2 | - | 10 | 12 | " | " |
| 26 | - | 18-24 | - | 22 | - | 36 | 90 | 168 | - | - | 6 | 13 | " | cloudy |
| 27 | 00-07 | 18-24 | 11 | 39 | 22 | 50 | 108 | 162 | - | - | 0 | 12.5 | " | " |
| 28 | 00-05 | 17-24 | 38 | 26 | 19 | 14 | 116 | 146 | - | - | 0 | 12.5 | " | " |
| 29 | 00-06 | 17-24 | 11 | 16 | 7 | 23 | 66 | 72 | -1 | 1 | 6 | 12 | " | clear |
| 30 | 00-12 | 12-24 | 24 | 59 | 30 | 46 | 166 | 152 | - | 4 | 6 | 11.5 | 95-80 | rain |
| 31 | 00-07 | 19-24 | 11 | 16 | 8 | 6 | 64 | 34 | - | - | 0 | 12 | 95-80 | " |
| Nov 1 | 00-07 | 17-24 | 4 | 16 | 25 | 55 | 46 | 178 | - | 2 | 8 | 12 | 100 | clear |
| 2 | 00-12 | 12-24 | 72 | 134 | 53 | 107 | 408 | 320 | 58 | 581 | 1212 | 11.5 | 70-100 | " |
| 3 | 00-12 | 12-24 | 40 | 40 | 29 | 48 | 170 | 160 | 344 | 630 | 1966 | 12 | 75-100 | " |
| 4 | 00-12 | 12-14, 16-24 | 21 | 12 | 15 | 18 | 74 | 84 | 177 | 213 | 1040 | 12 | 100 | " |
| 5 | 00-12 | 12-14, 16-22 | -8 | 15 | 6 | 2 | 22 | 18 | 121 | 96 | 530 | 12 | " | cloudy |
| 6 | 00-06 | | | | | | | | | | | | | |
| | 08-12 | 12-24 | 17 | 14 | 16 | 15 | 66 | 66 | 23 | 46 | 142 | 10.5 | " | clear |
| 7 | 00-12 | 12-14, 16-22 | -2 | 3 | 3 | 0 | 9 | 2 | 20 | 18 | 99 | 11.5 | " | cloudy |
| 8 | 00-06 | 12-14 | | | | | | | | | | | | |
| | 08-12 | 16-22 | -3 | 2 | 5 | 5 | -5 | 28 | 58 | 94 | 428 | 12 | " | cloudy |
| 9 | 00-12 | 12-24 | -6 | 7 | 10 | 2 | 2 | 24 | 73 | 88 | 324 | 12.5 | " | clear |
| 10 | 00-06 | 12-14 | | | | | | | | | | | | |
| | 08-12 | 16-22 | 3 | -1 | 8 | 5 | 6 | 30 | 61 | 48 | 302 | 12.5 | 100 | " |
| 11 | 00-06 | | | | | | | | | | | | | |
| | 08-12 | 16-20 | -1 | -2 | 6 | -3 | -6 | 6 | 45 | 15 | 184 | 11.5 | 100 | " |
| 12 | 00-04 | | | | | | | | | | | | | foggy |
| | 08-12 | 16-20 | 0 | -3 | 2 | 16 | -6 | 58 | 17 | 35 | 170 | 11 | 80 | clear |
| 13 | 00-04 | | | | | | | | | | | | | |
| | 08-12 | 16-20 | -3 | -2 | 1 | -2 | - | - | 9 | 17 | 128 | 10.5 | 60-100 | foggy |

APPENDIX 13 (cont.)

1976

| Date | Hours Counted | | Chinook Actual Count | | | | Chinook Daily Estimate[d] | | Coho Actual Count | | Coho Daily Estimate[d] | Mean Water Temp. | Visibility | Weather |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Large | | Jack | | Large | Jack | | | | | | |
| | A.M. | P.M. | A.M. | P.M. | A.M. | P.M. | | | A.M. | P.M. | | | | |
| Nov 14 | 00-04 | 16-20 | 0 | -2 | 0 | 2 | - | - | 16 | 12 | 198 | 10.5 | 80-100 | overcast |
| 15 | 00-04 | | | | | | | | | | | | | |
| | 08-12 | 20-24 | -3 | 2 | 9 | 2 | - | - | 44 | 21 | 244 | 11.5 | 100 | rain |
| 16 | - | 16-20 | - | 0 | - | 3 | - | - | - | 92 | 1401 | 11 | 100 | " |
| 17 | 00-04 | | | | | | | | | | | | | |
| | 08-12 | 14-18 | 1 | 4 | 1 | 1 | - | - | 188 | 90 | 1014 | 10.5 | 80-20 | heavy rain |
| 18 | | | | | | | | | | | | | | heavy rain |
| | - | 13-20 | - | -3 | - | 1 | - | - | - | 354 | 1600 | 11.5 | 0-90 | clear |
| 19 | | 12-14 | | | | | | | | | | | | |
| | 08-12 | 16-20 | -1 | 9 | 0 | -1 | - | - | 613 | 586 | 4500 | 10.25 | 100 | cloudy |
| 20 | 00-06 | 12-14 | | | | | | | | | | | | |
| | 08-12 | 16-22 | 4 | -2 | -1 | 0 | - | - | 274 | 155 | 1256 | 10 | 100 | cloudy |
| 21 | 00-06 | 12-14 | | | | | | | | | | | | |
| | 08-12 | 16-22 | 3 | 5 | -1 | 0 | - | - | 95 | 27 | 434 | 10 | 100 | - |
| 22 | 08-12 | 16-20 | -1 | 6 | 0 | 0 | - | - | 52 | 10 | 270 | 10 | 100 | cloudy |
| 23 | 08-12 | 16-20 | 4 | 1 | 0 | 0 | - | - | 29 | 11 | 240 | 10.5 | 100 | cloudy |
| 24 | 08-12 | 16-20 | -1 | 2 | 0 | 0 | - | - | 10 | 11 | 110 | 10.25 | 80-100 | rain |
| Total | | | 774 | | 1428 | | 1900[e] | 4100[e] | 5598 | | 17900[e] | | | |

APPENDIX 13 (cont.)

1977

| Date | Hours Counted A.M. | Hours Counted P.M. | Chinook Actual Count Large A.M. | Chinook Actual Count Large P.M. | Chinook Actual Count Jack A.M. | Chinook Actual Count Jack P.M. | Chinook Daily Estimate[d] Large | Chinook Daily Estimate[d] Jack | Coho Actual Count A.M. | Coho Actual Count P.M. | Coho Daily Estimate[d] | % Visibility | Weather | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sep 20 | 04-08 | | 5 | | 5 | | 9 | 17 | | | | 100 | rain | Continuous counts |
| 21 | | | | | | | 17[a] | 54[a] | | | | | | No counts |
| 22 | 04-12 | 12-24 | 7 | 4 | 15 | 4 | 24 | 90 | | 1 | 2 | 50-100 | clear/rain | Diel counts begin; rain started |
| 23 | 00-04 | 17-19 | 1 | 0 | 14 | 0 | 24 | 64 | | | | 40-100 | rainy periods | |
| 24 | 05-07 | 17-19 | 5 | 0 | 25 | 0 | 34 | 301 | | | | 100 | overcast | Flow increased by 100 cfs at Lake Cowichan |
| 25 | 05-07 | | 14 | | 16 | | 96 | 212 | | | | 100 | heavy overcast | Fish moving on far side |
| 26 | 05-07 | | 13 | | 25 | | 89 | 331 | | | | 100 | clear | |
| 27 | 05-07 | 18-20 | 6 | | 18 | 1 | 41 | 131 | | | | 100 | mist rising | |
| 28 | 05-07 | | 1 | | 16 | | | | | | | 60 | rain | |
| | 10-12 | 12-14 | 1 | 1 | 4 | 4 | 73 | 462 | | | | 100 | overcast rain | |
| 29 | 05-07 | | 2 | | 25 | | | | | | | 100 | misty | Continuous counts |
| | 10-12 | 12-14 | 0 | 5 | 6 | 17 | 85 | 462 | | | | 100 | sunny | Continuous counts |
| 30 | 05-07 | | 11 | | 17 | | | | | | | 100 | overcast | Continuous counts |
| | 08-12 | 12-24 | 5 | 37 | 3 | 41 | 188 | 208 | | | | 100 | overcast | |
| Oct 1 | 00-08 | | 56 | | 60 | | 196 | 188 | | | | 100 | rain | |
| 2 | 00-03 | 12-13 | 23 | 0 | 51 | 0 | 141 | 305 | | | | 100 | cloudy | |
| 3 | 00-03 | | 12 | | 41 | | 74 | 245 | | | | 100 | mist rising | Poor visibility on far side |
| 4 | | 18-19 | | 0 | | 0 | 48[a] | 144[a] | | | | 100 | overcast | |
| 5 | 00-03 | | 0 | | 5 | | 48[a] | 43 | | | | | | |
| 6 | 00-03 | | 0 | | 6 | | | | | | | 100 | clear | |
| | 06-07 | | 1 | | 2 | | | | | | | 100 | drizzle misty | Continuous counts |
| | 11-12 | 12-14 | 0 | 4 | 0 | 2 | | | | | | 100 | | |
| | | 17-19 | | 0 | | 0 | 22 | 67 | | | | 100 | | |
| 7 | 00-03 | | 5 | | 12 | | | | | | | 100 | mist rising | |
| | 08-12 | 12-24 | 6 | 3 | 1 | 28 | 36 | 107 | | | | 100 | rain | |
| 8 | 00-04 | | 15 | | 16 | | 52 | 101 | 12 | | 24 | 100 | overcast | |
| 9 | 04-08 | 23-24 | 2 | 0 | 9 | 1 | 52 | 58 | | | | 100 | clear | |
| 10 | | 12-14 | | 0 | | 0 | 35[a] | 71[a] | | | | 100 | clear | Water level down |
| 11 | 00-03 | 23-24 | 3 | 1 | 11 | 4 | 17 | 83 | | | | 100 | overcast clear | |
| 12 | 00-01 | | 3 | | 5 | | | | 3 | | | 100 | clear | |
| | 05-08 | 12-13 | 2 | 2 | 4 | 0 | | | 1 | 1 | | 100 | rain | |
| | | 16-24 | | 1 | | 12 | 51 | 78 | | 2 | 21 | 100 | | |
| 13 | 00-12 | 12-16 | 44 | 3 | 19 | 1 | 96 | 64 | 7 | 0 | 18 | 100 | clear | |
| 14 | 00-04 | 23-24 | 17 | 2 | 10 | 4 | 63 | 64 | 3 | 0 | 18 | 100 | clear | |
| 15 | 00-04 | | 24 | | 30 | | | | 13 | | | 100 | overcast | |

APPENDIX 13 (cont.)

1977

| Date | Hours Counted A.M. | Hours Counted P.M. | Chinook Actual Count Large A.M. | Chinook Actual Count Large P.M. | Chinook Actual Count Jack A.M. | Chinook Actual Count Jack P.M. | Chinook Daily Estimate[d] Large | Chinook Daily Estimate[d] Jack | Coho Actual Count A.M. | Coho Actual Count P.M. | Coho Daily Estimate[d] | % Visibility | Weather | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct 15 | 11-12 | | 0 | | 1 | | 79 | 221 | 2 | | 91 | 100 | | |
| 16 | 00-04 | 13-24 | 27 | 57 | 13 | 11 | 231 | 71 | 6 | 14 | 50 | 100 | clear | Water 12°C, visibility poor 1530-1630 |
| 17 | 00-12 | 12-13 | 75 | | 23 | | 256 | 71 | 10 | | 38 | 100 | clear | Water 11°C |
| 18 | 01-04 | 12-13 | 27 | 1 | 13 | 0 | | | 2 | 0 | | 100 | overcast | |
| | | 16-17 | | 0 | | 0 | 146 | 61 | | 0 | 5 | 100 | rain | |
| 19 | 00-04 | | 10 | | 8 | | 216[a] | 34 | 1 | | 9 | 98 | overcast | One chinook downstream |
| 20 | 00-04 | | 72 | | 25 | | | | 15 | | | 90-100 | clear | |
| | 11-12 | 12-24 | 9 | 34 | 2 | 4 | 286 | 93 | 0 | 18 | 92 | 30-100 | sunny | Visibility poor 1300-1500 |
| 21 | 00-12 | 12-24 | 6 | 2 | 11 | 8 | 16 | 38 | 28 | 14 | 84 | 10-100 | rain | Visibility poor 0000-0200 |
| 22 | 00-11 | | 8 | | 8 | | 21 | 32 | 15 | | 60 | 70-100 | overcast | Visibility poor 0400 |
| 23 | 00-04 | 21-24 | 28 | 4 | 57 | 7 | 137 | 190 | 66 | 39 | 2079 | 30-100 | rain | One chinook downstream, water silty |
| 24 | 00-12 | 12-18 | 22 | 4 | 25 | 2 | 64 | 74 | 2664 | 378 | 6465 | 60-100 | overcast | Visibility poor |
| 25[b] | | 14-15 | | 0 | | 0 | 111[a] | 37[a] | | 539 | 39,495[c] | 30 | overcast | Water silty |
| 26[b] | 10-11 | 12-24 | 1 | 11 | 0 | 0 | 194 | 0 | 141 | 1341 | 7,991[c] | 80-85 | overcast | Water silty |
| 27[b] | 00-12 | 12-16 | 46 | 9 | 0 | 0 | | | 515 | 280 | | | overcast | Two coho downstream |
| | | 20-24 | | 5 | | 0 | 350 | 0 | | 73 | 5,068[c] | 80 | overcast | |
| 28[b] | 00-12 | 12-24 | 3 | 10 | 0 | 0 | 52 | 0 | 82 | 343 | 2,124[c] | 80 | rain | Three coho downstream |
| 29 | 00-01 | | 0 | | 0 | | | | 6 | | | | rain | Water rising, heavy silt, counts terminated |
| | TOTAL | | 818 | | 808 | | 3700[e] | 4900[e] | 6635 | | 64,000[e] | | | |

[a] Interpolated counts.

[b] Counts made once per hour.

[c] Daily estimates adjusted according to % visibility for Oct. 25-28.

[d] Daily estimates obtained from % migration counted from 24 hour tower counts.

[e] Rounded total.

APPENDIX 14 CALCULATION OF PERCENTAGE SPAWNING ABOVE AND BELOW THE TOWER LOCATION (SKUTZ FALLS) FROM DEAD RECOVERIES.

| | Dead Recovery | | | | | |
|---|---|---|---|---|---|---|
| | Above Skutz Falls | | | Below Skutz Falls | | |
| Chinook | | | | | | |
| | Large | Jack | Total | Large | Jack | Total |
| No. | 760 | 517 | 1277 | 238 | 94 | 332 |
| % | 76% | 82% | 79% | 24% | 18% | 21% |
| Coho | | | | | | |
| Main River | | | 1133 | | | 82[a] |
| Tributaries and side channels | | | 145 | | | 178 |
| TOTAL | | | 1278 | | | 292 |
| % | | | 81% | | | 19% |

[a]Figure obtained from proportion in dead recovery below Skutz Falls in 1977 due to limited coverage of sections in 1976.

APPENDIX 15 FLOAT COUNTS OF ADULT SALMON AND TROUT IN THE COWICHAN RIVER, 1976 TO 1979.

1976

| Date | Section | Estimated % Observed[a] | Chinook Count | | | Chinook Estimate | | | Coho Count | Coho Estimate | Chum Estimate | Rainbow/Cutthroat Trout Estimate | Brown Trout Estimate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Large | Jack | Carcasses | Large | Jack | Carcasses | | | | | |
| Oct25 | 1 | 85 | 805 | 2816 | 60 | 947 | 3313 | 71 | 6 | 7 | 0 | 1625 | 192 |
| -28 | 2 | 85 | 42 | 32 | 10 | 49 | 38 | 12 | 0 | 0 | 0 | 51 | 13 |
| | 3 | 74 | 165 | 255 | 24 | 223 | 345 | 32 | 47 | 55 | 0 | 26 | 8 |
| | 4 | 74 | 87 | 87 | - | 118 | 118 | - | 29 | 39 | 3 | 27 | 18 |
| | 5 | 75 | 76 | 21 | 7 | 101 | 28 | 9 | 1 | 1 | 0 | 16 | 0 |
| | 6 | 60 | 190 | 99 | 8 | 317 | 165 | 13 | 14 | 23 | 15 | 17 | 0 |
| | 7 | 65 | 426 | 25 | 67 | 655 | 38 | 103 | 142 | 236 | 325 | 238 | 2 |
| Total | | | 1791 | 3335 | 176 | 2410 | 4045 | 240 | 239[b] | 361 | 343 | 2000 | 233 |
| Total Chinook | | | | 5302 | | | 6695 | | | | | | |

[a]Indicate the proportion of the fish represented by the count for each section.

[b]Includes 3 coho carcasses.

1977

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct 3 | 1 | | 244 | 192 | | | | | 10 | | 0 | | 19 |
| - 6 | 2 | | 297 | 392 | | | | | 19 | | 1 | | 6 |
| | 3,4 | | 127 | 234 | | | | | 41 | | 0 | | 0 |
| | 5 | | 72 | 52 | | | | | 2 | | 0 | | 0 |
| | 6 | | 4 | 3 | | | | | 2 | | 0 | | 0 |
| Total | | | 744[b] | 873 | | | | | 70 | | 1 | | 25 |
| Total Chinook | | | | 1617 | | | | | | | | | |

APPENDIX 15 (cont.)

1977

| Date | Section | Estimated % Observed | Chinook Count Large | Chinook Count Jack | Chinook Count Carcasses | Chinook Estimate Large | Chinook Estimate Jack | Chinook Estimate Carcasses | Coho Count | Coho Estimate | Chum Estimate | Rainbow/Cutthroat Trout Estimate | Brown Trout Estimate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Oct17 | 1 | | 598 | 532 | | | | | 92 | | 0 | | 14 |
| -20 | 2[a] | | 332 | 347 | | | | | 79 | | 0 | | - |
| | 3[a] | | 313 | 163 | | | | | 71 | | 0 | | - |
| | 4 | | 95 | 41 | | | | | 23 | | 0 | | - |
| | 5 | | 238 | 98 | | | | | 744 | | 2 | | - |
| | 6 | | 66 | 3 | | | | | 147 | | 1 | | - |
| Total | | | 1642[c] | 1184[d] | | | | | 1156 | | 3 | | - |
| Total Chinook | | | 2826 | | | | | | | | | | |

[a]Actual counts adjusted, depending on percentage visibility.

[b]Includes 1 large chinook carcass.

[c]Includes 8 large chinook carcasses.

[d]Includes 1 jack chinook carcass.

1978

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sep 26 | 1 | 75 | 922 | 524 | 0 | 1229 | 699 | 0 | 160 | 213 | - | | 45 |
| - 28 | 2 | 75 | 630 | 640 | 0 | 840 | 853 | 0 | 194 | 259 | - | | 4 |
| | 3 | 50 | 108 | 56 | 0 | 216 | 112 | 0 | 59 | 118 | - | | 0 |
| | 4 | 35 | 90 | 135 | 2 | 257 | 386 | 6 | 117 | 334 | - | | 0 |
| Total | | | 1750 | 1355 | 2 | 2542 | 2050 | 6 | 530 | 924 | - | | 49 |
| Total Chinook | | | | 3106 | | | 4598 | | | | | | |
| Oct16 | 1 | 60 | 1414 | 2294 | 11 | 2357 | 3823 | 18 | 1528 | 2547 | 0 | | 0 |
| - 18 | 2 | 75 | 564 | 957 | 0 | 752 | 1276 | 0 | 484 | 645 | 2 | | 27 |
| | 3 | 75 | 533 | 414 | 5 | 711 | 552 | 6 | 848 | 1131 | 0 | | 0 |
| | 4 | 75 | 85 | 81 | 3 | 113 | 108 | 4 | 552 | 736 | 1 | | 0 |
| | 5 | 80 | 107 | 102 | 1 | 134 | 128 | 1 | 1364 | 1705 | 2 | | 1 |
| | 6 | 80 | 65 | 82 | 3 | 81 | 103 | 4 | 475 | 594 | 0 | | 0 |
| Total | | | 2768 | 3930 | 23 | 4148 | 5990 | 33 | 5251 | 7358 | 5 | | 28 |
| Total Chinook | | | | 6721 | | | 10171 | | | | | | |

APPENDIX 15 (cont.)

1978

| Date | Section | Estimated % Observed | Chinook Count | | | Chinook Estimate | | | Coho Count | Coho Estimate | Chum Estimate | Rainbow/Cutthroat Trout | Brown Trout Estimate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Large | Jack | Carcasses | Large | Jack | Carcasses | | | | | |
| Nov 15 | 1 | 75 | 689 | 524 | 100 | 919 | 133 | 699 | 1648 | 2197 | 5 | | - |
| Combined Total | | | 1313 | | 100 | | 1751 | | | | | | |

1979

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sep 21 | 1[a] | | 6 | 6 | | | | | | | | | |
| | 2 | | 150 | 400 | | | | | | | | | |
| | 3[b] | | 30 | 41 | | | | | | | | | |
| | 5 | | 48 | 22 | | | | | | | | | |
| Total | | | 234 | 469 | | 1150 | 1950 | | | | | | |
| Oct 11 | 1 | | 914 | 903 | | 2750 | - | | 362 | 1750 | | | |
| Nov 6 | 1 | | - | - | | 7000 | - | | | | | | |

[a]Only 15% of Section 1 was floated.

[b]47% of Section 3 was floated.

APPENDIX 16 INCIDENCE OF CWT (%) IN COHO AND CHINOOK RETURNS TO THE COWICHAN-KOKSILAH STUDY AREA

Coho (1976-1977)

| Sampling Location | Fish Examined | | | | Tagging Location | CWT Code | No. of CWT Returns | | | | | CWT(%) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Male | | Female | | | | Male | | Female | | Unsexed | Male | | Female | | Total | |
| | $3_2$ | $4_3$ | $3_2$ | $4_3$ | | | $3_2$ | $4_3$ | $3_2$ | $4_3$ | $3_2$ | $3_2$ | $4_3$ | $3_2$ | $4_3$ | $3_2$ | $4_3$ |
| Estuary | 689 | | 478 | | Rotary Park | 10/2/5 | 2 | | 4 | | | .29 | | .84 | | .51 | |
| | | | | | | 9/2/5 | 3 | | 3 | | | .44 | | .63 | | .51 | |
| | | | | | Pastuch Ck. | 6/2/5 | 0 | | 3 | | 1 | 0 | | .63 | | .34 | |
| | | | | | C.S.Channel | 14/2/5 | | | 2 | | | | | .42 | | .17 | |
| | | | | | | Total | 5 | | 12 | | 1 | .73 | | 2.52 | | 1.53 | |
| Dead Recovery | 639 | | 726 | | Rotary Park | 10/2/5 | 4 | | 7 | | 1 | .63 | | .96 | | .88 | |
| | | | | | | 9/2/5 | 4 | | 11 | | | .63 | | 1.5 | | 1.1 | |
| | | | | | Pastuch Ck. | 6/2/5 | | | 1 | | | 0 | | .14 | | .07 | |
| | | | | | C.S.Channel | 14/2/5 | 2 | | 2 | | 1 | .31 | | .28 | | .37 | |
| | | | | | | Total | 10 | | 21 | | 2 | 1.57 | | 2.88 | | 2.42 | |
| | | | | | | Overall | 15 | | 33 | | 3 | 1.13 | | 2.74 | | 2.01 | |
| Coho (1977-1978) | | | | | | | | | | | | | | | | | |
| Estuary | 2907 | 127 | 2336 | 146 | Rotary Park | 5/2/7 | 2 | | 5 | | | .07 | | .21 | | .13 | |
| | | | | | | 6/2/7 | 5 | | 6 | | | .17 | | .26 | | .21 | |
| | | | | | Pastuch Ck. | 9/2/7 | 10 | | 5 | | | .34 | | .21 | | .29 | |
| | | | | | C.S.Channel | 14/2/7 | | | 1 | | | .04 | | | | .02 | |
| | | | | | | 10/2/7 | 4 | | 4 | | | .14 | | .17 | | .15 | |
| | | | | | Mesachie Ck. | 7/2/7 | 10 | | 6 | | | .34 | | .26 | | .31 | |
| | | | | | | 8/2/7 | 8 | 1 | 18 | | | .28 | .79 | .77 | | .50 | .37 |
| | | | | | | 13/2/7 | 8 | | 13 | | | .28 | | .56 | | .40 | |
| | | | | | | 11/2/5 | 9 | | 11 | | | .31 | | .47 | | .38 | |

APPENDIX 16 (cont.)

| Sampling Location | Fish Examined | | | | Tagging Location | CWT Code | No. of CWT Returns | | | | | CWT(%) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Male | | Female | | | | Male | | Female | | Unsexed | Male | | Female | | Total | |
| | $3_2$ | $4_3$ | $3_2$ | $4_3$ | | | $3_2$ | $4_3$ | $3_2$ | $4_3$ | $3_2$ | $3_2$ | $4_3$ | $3_2$ | $4_3$ | $3_2$ | $4_3$ |
| | | | | | Kelvin Ck. | 3/2/7 | 12 | | 14 | 1 | 1 | .41 | | .60 | .68 | .50 | .37 |
| | | | | | | 4/2/7 | 11 | | 12 | | | .38 | | .51 | | .44 | |
| | | | | | | Total | 79 | 1 | 95 | 1 | 1 | 2.78 | .79 | 4.02 | .68 | 3.33 | .74 |
| Dead Recovery | 2541 | 70 | 3218 | 52 | Rotary Park | 5/2/7 | 4 | | 6 | | | .16 | | .19 | | .17 | |
| | | | | | | 6/2/7 | 4 | | 7 | | | .16 | | .22 | | .19 | |
| | | | | | Pastuch Ck | 9/2/7 | 2 | | 2 | | | .08 | | .06 | | .07 | |
| | | | | | C.S. Channel | 14/2/5 | 1 | | | | | .04 | | | | .02 | |
| | | | | | | 10/2/7 | 3 | | 4 | | | .12 | | .12 | | .12 | |
| | | | | | Mesachie Ck. | 7/2/7 | 3 | | 3 | | | .12 | | .09 | | .10 | |
| | | | | | | 8/2/7 | 11 | | 17 | | 1 | .43 | | .53 | | .50 | |
| | | | | | | 13/2/7 | 4 | 1 | 5 | | | .16 | 1.4 | .16 | | .15 | .82 |
| | | | | | | 11/2/5 | 3 | | 15 | | 1 | .12 | | .47 | | .33 | |
| | | | | | Kelvin Ck. | 3/2/7 | 3 | | 9 | | 1 | .12 | | .28 | | .23 | |
| | | | | | | 4/2/7 | 2 | | 4 | | 1 | .08 | | .12 | | .12 | |
| | | | | | | Total | 40 | 1 | 72 | | 4 | 1.59 | 1.4 | 2.24 | | 2.0 | .82 |
| | | | | | | Overall | 119 | 2 | 167 | 1 | 5 | 2.18 | 1.01 | 3.01 | .51 | 2.65 | .76 |

APPENDIX 16 (cont.)

Chinook

| Sampling Location | Fish Examined | | | | | | | CWT Code | No. of CWT Recoveries | | | | | | | CWT (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Large | | | | | | Jack | | Large | | | | | | Jack | Large | | | | | | Jack |
| | Male | | | Female | | | | | Male | | | Female | | | | Male | | | Female | | | |
| | $3_1$ | $4_1$ | $5_1$ | $3_1$ | $4_1$ | $5_1$ | | | $3_1$ | $4_1$ | $5_1$ | $3_1$ | $4_1$ | $5_1$ | | $3_1$ | $4_1$ | $5_1$ | $3_1$ | $4_1$ | $5_1$ | |
| 1976 | | | | | | | | | | | | | | | | | | | | | | |
| Estuary | | | | | | | 16 | 7/2/5 | | | | | | | 0 | | | | | | | |
| Dead recovery | | | | | | | 612 | | | | | | | | 1 | | | | | | | .16 |
| | | | | | | | | Overall | | | | | | | | | | | | | | .16 |
| 1977 | | | | | | | | | | | | | | | | | | | | | | |
| Estuary | 402 | | | 128 | | | - | 7/2/5 | 2 | | | | | | | .5 | | | | | | |
| | | | | | | | 320 | 1/2/7 | | | | | | | 4 | | | | | | | 1.25 |
| Dead recovery | 148 | | | 25 | | | | | | | | | | | | | | | | | | |
| | | | | | | | 54 | | | | | | | | | | | | | | | |
| | | | | | | | | Overall | 2 | | | | | | 4 | .36 | | | | | | 1.07 |
| 1978 | | | | | | | | | | | | | | | | | | | | | | |
| Estuary | 41 | 117 | | 21 | 240 | | | 7/2/5 | 0 | 1 | | 0 | 1 | | | | .85 | | | .42 | | |
| Dead recovery | 96 | 279 | | 51 | 608 | | | 7/2/5 | | 1 | | | 1 | | | | .36 | | | .16 | | |
| | | | | | | | | 1/2/7 | 1 | | | | | | | 1.04 | | | | | | |
| | | | | | | | | Overall | 1 | 2 | | 0 | 2 | | | .73 | .51 | | 0 | .24 | | |
| 1979 | | | | | | | | | | | | | | | | | | | | | | |
| Estuary | | 153 | 0 | | 207 | 32 | | 7/2/5 | | | | | | 1 | | | | | | | | 3.1 |
| | | | | | | | | 1/2/7 | | 1 | | | | | | | .65 | | | | | |
| Dead recovery | | 185 | 0 | | 121 | 19 | | 7/2/5 | | | | | | 1 | | | | | | | | 5.26 |
| | | | | | | | | 1/2/7 | | | | | 2 | | | | | | | 1.65 | | |
| | | | | | | | | Overall | | 1 | | | 2 | 2 | | | .30 | | | .61 | | 3.9 |

APPENDIX 17 AGE COMPOSITION OF CHINOOK SALMON IN THE COWICHAN-KOKSILAH STUDY AREA.

1976

| Sampling Location | Date | Male(%) | | | | | Female(%) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | $2_1$ | $3_1$ | $4_1$ | $5_1$ | Sample Size | $3_1$ | $4_1$ | $5_1$ | Sample Size |
| Cowichan Estuary | Sept. 30 | 3.6 | 45.5 | 43.6 | 7.3 | 55 | 12.8 | 83 | 4.2 | 47 |
| | Oct. 5 - 13 | | 23.1 | 76.9 | | 13 | 7.7 | 92.3 | | 26 |
| | Overall | 2.9 | 41.2 | 50 | 5.9 | 68 | 11 | 86.3 | 2.7 | 73 |
| Spawning Ground Dead Recovery[a] | Nov. 5 - 19 | | 39.1 | 56.5 | 4.4 | 46 | 10.6 | 83 | 6.4 | 47 |

[a]Jacks not included in sample; jacks represented 38.3% of total recovery over this time period.

APPENDIX 17 (cont.)

1977

| Sampling Location | Date | Male(%) | | | | | Female(%) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | $2_1$ | $3_1$ | $4_1$ | $5_1$ | Sample Size | $3_1$ | $4_1$ | $5_1$ | Sample Size |
| Cowichan Estuary | Sept. 22 | 100 | 0 | 0 | 0 | 26 | 0 | 0 | 0 | 0 |
| | 23 | 100 | 0 | 0 | 0 | 12 | 100 | 0 | 0 | 1 |
| | 26 | 33.3 | 33.3 | 33.3 | 0 | 6 | 45.5 | 54.5 | | 11 |
| | 29 | 5.0 | 75 | 20 | | 20 | 4.3 | 82.6 | 13.1 | 23 |
| | 30 | 71.4 | 28.6 | 0 | 0 | 14 | | | | 0 |
| | Oct. 4 | | 100 | | | 1 | | 100 | | 1 |
| | 5 | 50 | | 50 | | 2 | 14.2 | 85.8 | | 7 |
| | 6 | | 60 | 40 | | 5 | | 100 | | 5 |
| | 7 | | 66.7 | 33.3 | | 6 | | 100 | | 4 |
| | Overall | 56.5 | 31.5 | 12.0 | | 92 | 15.4 | 78.8 | 5.8 | 52 |
| Spawning Ground Dead Recovery | Nov. 14 - Dec. 2 | 14.3 | 36.7 | 49.0 | | 49 | 6.6 | 93.4 | | 76 |

APPENDIX 17 (cont.)

1978

| Sampling Location | Date | Male(%) | | | | | | | Female(%) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $2_1$ | $3_1$ | $3_2$ | $4_1$ | $5_1$ | $5_2$ | Sample Size | $3_1$ | $3_2$ | $4_1$ | $5_1$ | Sample Size |
| Spawning Ground Dead Recovery | Nov. 1 | | 20 | | 80 | | | 10 | | | 92.9 | 7.1 | 14 |
| | 2 | | 8.3 | | 83.4 | 8.3 | | 12 | 9.1 | | 75.8 | 15.1 | 33 |
| | 3 | 15.4 | 23.1 | 7.7 | 38.5 | 7.7 | 7.7 | 13 | 4.4 | | 73.9 | 21.7 | 23 |
| | 6 | 28.3 | 19.6 | | 50 | 2.2 | | 46 | 3.5 | | 77.2 | 19.3 | 57 |
| | 9 | 14.3 | 28.6 | | 57.1 | | | 21 | 17.2 | 3.4 | 75.9 | 3.4 | 29 |
| | 14 | 57.1 | | | 42.9 | | | 7 | | | 100 | | 11 |
| | Overall | 20.2 | 19.3 | 1.0 | 56.0 | 2.8 | 1.0 | 109 | 6.6 | .6 | 79.0 | 13.8 | 167 |

1979

| Sampling Location | Date | Male(%) | | | | Female(%) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | $3_1$ | $4_1$ | $5_1$ | Sample Size | $3_1$ | $4_1$ | $5_1$ | Sample Size |
| Spawning Ground Dead Recovery | Nov.14-15 | 50 | 50 | | 16 | 10.3 | 75.9 | 13.8 | 29 |
| | Nov.22-26 | 61.9 | 39.1 | | 21 | 44.4 | 52.8 | 2.8 | 36 |
| | Nov.29 - Dec.3 | 100 | 0 | | 2 | 31.6 | 52.6 | 15.8 | 19 |
| | Overall | 59 | 41 | | 39 | 29.8 | 60.7 | 9.5 | 84 |

APPENDIX 18 SEX COMPOSITION OF ADULT CHINOOK (JACKS NOT INCLUDED) RETURNS TO THE COWICHAN-KOKSILAH STUDY AREA.

| | Male | Female | Sample Size |
|---|---|---|---|
| 1976 | | | |
| Cowichan Estuary | 41.4 | 58.6 | 768 |
| Cowichan R. dead recovery | 48.0 | 52.0 | 102 |
| Overall | 42 | 58 | 870 |
| 1977 | | | |
| Cowichan Estuary | 39.9 | 60.1 | 865 |
| Cowichan R. dead recovery | 40.2 | 59.8 | 639 |
| Overall | 40 | 60 | 1504 |
| 1978 | | | |
| Cowichan Estuary | 35.5 | 64.5 | 470 |
| Cowichan R. dead recovery | 34.1 | 65.9 | 273 |
| Overall | 35 | 65 | 743 |
| 1979 | | | |
| Cowichan Estuary | 52.2 | 47.8 | 253 |
| Cowichan R. dead recovery | 30.7 | 69.3 | 127 |
| Overall | 45 | 55 | 380 |

APPENDIX 19 PERCENT BY TAGGING WEEK IN THE COWICHAN ESTUARY OF MALE, FEMALE AND JACK CHINOOK DETERMINED EXTERNALLY.

1976

| Period | Male N | Male % | Female N | Female % | Jack N | Jack % | Total |
|---|---|---|---|---|---|---|---|
| Sept. 28 - Oct. 1 | 101 | 54.9 | 80 | 43.5 | 3 | 1.6 | 184 |
| Oct. 5 - Oct. 8 | 97 | 33.3 | 191 | 65.7 | 3 | 1.0 | 291 |
| Oct. 12 - Oct. 15 | 120 | 39.6 | 179 | 59.1 | 4 | 1.3 | 303 |
| Overall | 318 | 40.9 | 450 | 57.8 | 10 | 1.3 | 778 |

1977

| Period | Male N | Male % | Female N | Female % | Jack N | Jack % | Total |
|---|---|---|---|---|---|---|---|
| Sept. 22 - 23 | 95 | 18.6 | 236 | 46.2 | 180 | 35.2 | 511 |
| Sept. 26 - 30 | 222 | 43.5 | 247 | 48.5 | 41 | 8.0 | 510 |
| Oct. 4 - 7 | 28 | 42.4 | 37 | 56.1 | 1 | 1.5 | 66 |
| Overall | 345 | 31.8 | 520 | 47.8 | 222 | 20.4 | 1087 |

1978

| Period | Male N | Male % | Female N | Female % | Jack N | Jack % | Total |
|---|---|---|---|---|---|---|---|
| Sept. 21 | 2 | 18.2 | 9 | 81.8 | 0 | 0 | 11 |
| Sept. 28 - 29 | 99 | 40.4 | 145 | 59.2 | 1 | .4 | 245 |
| Oct. 6 | 66 | 30.7 | 149 | 69.3 | 0 | 0 | 215 |
| Overall | 167 | 35.5 | 303 | 64.3 | 1 | .2 | 471 |

1979

| Period | Male N | Male % | Female N | Female % | Jack N | Jack % | Total |
|---|---|---|---|---|---|---|---|
| Sept. 21 | 85 | 53.8 | 73 | 46.2 | | | 158 |
| Oct. 2 | 41 | 50.6 | 40 | 49.4 | | | 81 |
| Oct. 12 | 6 | 42.9 | 8 | 57.1 | | | 14 |
| Overall | 132 | 52.2 | 121 | 47.8 | | | 253 |

APPENDIX 20 NOSE-FORK LENGTH FREQUENCY BY AGE CLASS OF CHINOOK SEINED IN THE COWICHAN ESTUARY.

1976

| Frequency Interval(cm) | Male | | Female | |
|---|---|---|---|---|
| | $3_1$ | $4_1$ | $3_1$ | $4_1$ |
| 66.0 - 67.9 | 1 | | | 1 |
| 68.0 - 69.9 | | | | 0 |
| 70.0 - 71.9 | | | 1 | 0 |
| 72.0 - 73.9 | | 1 | | 2 |
| 74.0 - 75.9 | | | | 0 |
| 76.0 - 77.9 | 1 | | 1 | 0 |
| 78.0 - 79.9 | 1 | 1 | | 1 |
| 80.0 - 81.9 | | | | 2 |
| 82.0 - 83.9 | | 1 | | 1 |
| 84.0 - 85.9 | | | | 5 |
| 86.0 - 87.9 | | | | 4 |
| 88.0 - 89.9 | | 1 | | 3 |
| 90.0 - 91.9 | | 4 | | 2 |
| 92.0 - 93.9 | | | | 2 |
| 94.0 - 95.9 | | | | 1 |
| 96.0 - 97.9 | | 1 | | 0 |
| 98.0 - 99.9 | | 1 | | 0 |
| Sample Size | 3 | 10 | 2 | 24 |
| Mean | 74.0 | 88.3 | 74.4 | 84.7 |
| S.D. | 5.67 | 7.91 | 4.03 | 6.8 |

APPENDIX 20 (cont.)

1977

| Frequency Interval(cm) | Male | | | | Female | | |
|---|---|---|---|---|---|---|---|
| | $2_1$ | $3_1$ | $4_1$ | $5_1$ | $3_1$ | $4_1$ | $5_1$ |
| 42.0 - 43.9 | 1 | | | | | | |
| 44.0 - 45.9 | 7 | | | | | | |
| 46.0 - 47.9 | 2 | | | | | | |
| 48.0 - 49.9 | 2 | | | | | | |
| 50.0 - 51.9 | 5 | | | | | | |
| 52.0 - 53.9 | 4 | 1 | | | | | |
| 54.0 - 55.9 | 3 | | | | | | |
| 56.0 - 57.9 | 2 | | | | | | |
| 58.0 - 59.9 | | 1 | 1 | | | | |
| 60.0 - 61.9 | | 1 | | | | | |
| 62.0 - 63.9 | | 2 | | | 1 | | |
| 64.0 - 65.9 | | | | | 3 | | |
| 66.0 - 67.9 | | 3 | 1 | | | | |
| 68.0 - 69.9 | | 9 | 1 | | 1 | | |
| 70.0 - 71.9 | | 2 | | | 1 | 1 | |
| 72.0 - 73.9 | | 1 | 2 | | 2 | | |
| 74.0 - 75.9 | | 4 | | | | | |
| 76.0 - 77.9 | | 3 | | | | 2 | |
| 78.0 - 79.9 | | 1 | 1 | | | 2 | |
| 80.0 - 81.9 | | | 1 | | | 4 | |
| 82.0 - 83.9 | | 1 | 1 | | | 8 | |
| 84.0 - 85.9 | | | 1 | | | 3 | |
| 86.0 - 87.9 | | | | | | 6 | |
| 88.0 - 89.9 | | | | | | 4 | 1 |
| 90.0 - 91.9 | | | 2 | | | 5 | |
| 92.0 - 93.9 | | | | | | 1 | |
| 94.0 - 95.9 | | | | | | 2 | |
| 96.0 - 97.9 | | | | | | | |
| 98.0 - 99.9 | | | | | | 1 | |
| 100.0 - 101.9 | | | | | | 1 | |
| 102.0 - 103.9 | | | | | | | 1 |
| 104.0 - 105.9 | | | | | | | |
| 106.0 - 107.9 | | | | | | | |
| 108.0 - 109.9 | | | | | | | |
| 110.0 - 111.9 | | | | | | | |
| 112.0 - 113.9 | | | | | | | 1 |
| 114.0 - 115.9 | | | | | | | |
| 116.0 - 117.9 | | | | | | | |
| 118.0 - 119.9 | | | | | | | |
| 120.0 - 121.9 | | | | | | 1 | |
| Sample Size | 26 | 29 | 11 | | 8 | 41 | 3 |
| Mean | 49.6 | 69.8 | 77.0 | | 67.9 | 85.0 | 101.1 |
| S.D. | 4.10 | 6.32 | 9.95 | | 4.09 | 14.61 | 11.32 |

APPENDIX 20 (cont.)

1978

| Frequency Interval | Age $3_1$[a] | Age $4_1$[a] | Total[b] |
|---|---|---|---|
| 68.0 - 69.9 | 1 | | 1 |
| 70.0 - 71.9 | | | 0 |
| 72.0 - 73.9 | | | 0 |
| 74.0 - 75.9 | | | 0 |
| 76.0 - 77.9 | | | 0 |
| 78.0 - 79.9 | | 0 | 1 |
| 80.0 - 81.9 | | 1 | 3 |
| 82.0 - 83.9 | | 3 | 3 |
| 84.0 - 85.9 | | 2 | 3 |
| 86.0 - 87.9 | | 3 | 4 |
| 88.0 - 89.9 | | 8 | 13 |
| 90.0 - 91.9 | | 5 | 9 |
| 92.0 - 93.9 | | 2 | 3 |
| 94.0 - 95.9 | | 2 | 3 |
| 96.0 - 97.9 | | 2 | 6 |
| 98.0 - 99.9 | | 0 | 1 |
| Sample Size | 1 | 28 | 50 |
| Mean | 69.3 | 89.1 | 89.2 |
| S.D. | - | 4.1 | 5.5 |

[a]Male and Female are combined.

[b]Includes lengths of chinook with scale samples where age could not be determined.

APPENDIX 21 LENGTH FREQUENCY BY AGE CLASS OF CHINOOK FROM THE COWICHAN RIVER SPAWNING GROUND DEAD RECOVERY.

1976

| Frequency Interval(cm)[a] | Male | | | | Female | | |
|---|---|---|---|---|---|---|---|
| | $2_1$ | $3_1$ | $4_1$ | $5_1$ | $3_1$ | $4_1$ | $5_1$ |
| 36.0 - 37.9 | 2 | | | | | | |
| 38.0 - 39.9 | 1 | | | | | | |
| 40.0 - 41.9 | 3 | | | | | | |
| 42.0 - 43.9 | 5 | | | | | | |
| 44.0 - 45.9 | 8 | | | | | | |
| 46.0 - 47.9 | 5 | | | | | | |
| 48.0 - 49.9 | 8 | | | | | | |
| 50.0 - 51.9 | 4 | | | | | | |
| 52.0 - 53.9 | 1 | | | | | | |
| 54.0 - 55.9 | 2 | | | | | | |
| 56.0 - 57.9 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 58.0 - 59.9 | | 1 | 0 | 0 | 0 | 0 | 0 |
| 60.0 - 61.9 | | 0 | 0 | 0 | 0 | 0 | 0 |
| 62.0 - 63.9 | | 1 | 0 | 0 | 0 | 0 | 0 |
| 64.0 - 65.9 | | 0 | 0 | 0 | 0 | 0 | 0 |
| 66.0 - 67.9 | | 0 | 0 | 0 | 0 | 0 | 0 |
| 68.9 - 69.9 | | 3 | 0 | 0 | 0 | 0 | 0 |
| 70.0 - 71.9 | | 1 | 0 | 0 | 0 | 1 | 0 |
| 72.0 - 73.9 | | 2 | 1 | 0 | 1 | 0 | 0 |
| 74.0 - 75.9 | | 4 | 0 | 0 | 0 | 2 | 0 |
| 76.0 - 77.9 | | 2 | 0 | 0 | 1 | 1 | 0 |
| 78.0 - 79.9 | | 2 | 1 | 0 | 1 | 2 | 0 |
| 80.0 - 81.9 | | 1 | 2 | 0 | 1 | 3 | 0 |
| 82.0 - 83.9 | | 0 | 1 | 0 | 0 | 2 | 0 |
| 84.0 - 85.9 | | 0 | 0 | 0 | 0 | 3 | 0 |
| 86.0 - 87.9 | | 0 | 2 | 0 | 1 | 5 | 1 |
| 88.0 - 89.9 | | 0 | 2 | 0 | 0 | 5 | 0 |
| 90.0 - 91.9 | | 0 | 3 | 0 | 0 | 5 | 2 |
| 92.0 - 93.9 | | 0 | 2 | 0 | 0 | 6 | 0 |
| 94.0 - 95.9 | | 0 | 2 | 0 | 0 | 3 | 0 |
| 96.0 - 97.9 | | 0 | 5 | 0 | 0 | 0 | 0 |
| 98.0 - 99.9 | | 0 | 2 | 1 | 0 | 1 | 0 |
| 100.0 - 101.9 | | 0 | 1 | 1 | 0 | 0 | 0 |
| 102.0 - 103.9 | | 0 | 2 | 0 | 0 | 0 | 0 |
| Sample Size | 40 | 18 | 26 | 2 | 5 | 39 | 3 |
| Mean | 46.4 | 71.9 | 91.6 | 100.6 | 79.4 | 87.2 | 89.2 |
| S.D. | 4.43 | 6.66 | 7.62 | 1.7 | 5.47 | 6.39 | 1.76 |

[a] Nose-fork length.

APPENDIX 21 (cont.)

1977

| Frequency Interval(cm)[b] | Male | | | Female | |
|---|---|---|---|---|---|
| | $2_1$ | $3_1$ | $4_1$ | $3_1$ | $4_1$ |
| 38.0 - 39.9 | 1 | 1 | 0 | 0 | 0 |
| 40.0 - 41.9 | 3 | 0 | 0 | 0 | 0 |
| 42.0 - 43.9 | 1 | 0 | 0 | 0 | 0 |
| 44.0 - 45.9 | 1 | 0 | 0 | 0 | 0 |
| 46.0 - 47.9 | 0 | 0 | 0 | 0 | 0 |
| 48.0 - 49.9 | 1 | 0 | 0 | 0 | 0 |
| 50.0 - 51.9 | 0 | 1 | 0 | 0 | 0 |
| 52.0 - 53.9 | 0 | 0 | 0 | 0 | 0 |
| 54.0 - 55.9 | 0 | 0 | 0 | 0 | 0 |
| 56.0 - 57.9 | 0 | 3 | 0 | 0 | 1 |
| 58.0 - 59.9 | 0 | 3 | 1 | 0 | 0 |
| 60.0 - 61.9 | 0 | 3 | 0 | 2 | 1 |
| 62.0 - 63.9 | 0 | 4 | 0 | 1 | 1 |
| 64.0 - 65.9 | 0 | 2 | 1 | 0 | 3 |
| 66.0 - 67.9 | 0 | 0 | 2 | 1 | 6 |
| 68.0 - 69.9 | 0 | 0 | 1 | 0 | 12 |
| 70.0 - 71.9 | 0 | 1 | 5 | 1 | 14 |
| 72.0 - 73.9 | 0 | 0 | 3 | 0 | 13 |
| 74.0 - 75.9 | 0 | 0 | 5 | 0 | 9 |
| 76.0 - 77.9 | 0 | 0 | 4 | 0 | 6 |
| 78.0 - 79.9 | 0 | 0 | 1 | 0 | 4 |
| 80.0 - 81.9 | 0 | 0 | 1 | 0 | 1 |
| Sample Size | 7 | 18 | 24 | 5 | 71 |
| Mean | 42.8 | 59.6 | 72.5 | 64.6 | 71.6 |
| S.D. | 3.57 | 6.41 | 4.57 | 5.03 | 4.32 |

[b]Postorbital-hypural length.

APPENDIX 21 (cont.)

1979

| Frequency Interval(cm)[b] | Male | | Female | | |
|---|---|---|---|---|---|
| | $3_1$ | $4_1$ | $3_1$ | $4_1$ | $5_1$ |
| 50.0 - 51.9 | | | | | |
| 52.0 - 53.9 | 1 | | | | |
| 54.0 - 55.9 | 3 | | | | |
| 56.0 - 57.9 | 1 | | | | |
| 58.0 - 59.9 | 6 | | 5 | 1 | |
| 60.0 - 61.9 | 4 | | 9 | 1 | |
| 62.0 - 63.9 | 1 | | 5 | 3 | |
| 64.0 - 65.9 | 3 | 2 | 1 | 4 | |
| 66.0 - 67.9 | 2 | 1 | 4 | 6 | 1 |
| 68.0 - 69.9 | 2 | 3 | 1 | 6 | |
| 70.0 - 71.9 | | 2 | | 11 | 1 |
| 72.0 - 73.9 | | 3 | | 7 | |
| 74.0 - 75.9 | | 2 | | 5 | 1 |
| 76.0 - 77.9 | | 1 | | 2 | |
| 78.0 - 79.9 | | 1 | | 1 | 2 |
| 80.0 - 81.9 | | | | 1 | 3 |
| 82.0 - 83.9 | | 1 | | 2 | |
| 84.0 - 85.9 | | | | | |
| Sample Size | 23 | 16 | 25 | 50 | 8 |
| Mean | 60.9 | 71.9 | 62.3 | 70.5 | 76.5 |
| S.D. | 4.77 | 4.54 | 2.98 | 4.94 | 4.93 |

[b]Postorbital-hypural length.

APPENDIX 21 (cont.)

1978

| Frequency Interval(cm)[b] | Male | | | | | | Female | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | $2_1$ | $3_1$ | $3_2$ | $4_1$ | $5_1$ | $5_2$ | $3_1$ | $3_2$ | $4_1$ | $5_1$ | $5_2$ |
| 30.0 - 31.9 | | | | | | | | | | | |
| 32.0 - 33.9 | 2 | | | | | | | | | | |
| 34.0 - 35.9 | 2 | | | | | | | | | | |
| 36.0 - 37.9 | | | | | | | | | | | |
| 38.0 - 39.9 | 3 | | | | | | | | | | |
| 40.0 - 41.9 | 10 | | | | | | | | | | |
| 42.0 - 43.9 | 3 | | | | | | | | | | |
| 44.0 - 45.9 | 1 | | 1 | | | | | | | | |
| 46.0 - 47.9 | 1 | | | | | | | | | | |
| 48.0 - 49.9 | | 1 | | | | | | | | | |
| 50.0 - 51.9 | | 1 | | | | | | | | | |
| 52.0 - 53.9 | | 1 | | | | | 1 | | | | |
| 54.0 - 55.9 | | 1 | | | | | 1 | | 1 | | |
| 56.0 - 57.9 | | 5 | | | | | 3 | | 1 | | |
| 58.0 - 59.9 | | 2 | | 3 | | | 1 | | 4 | | |
| 60.0 - 61.9 | | 4 | | 4 | | | 4 | | 15 | | |
| 62.0 - 63.9 | | 4 | | 4 | | | 1 | | 17 | 1 | 1 |
| 64.0 - 65.9 | | 1 | | 14 | | | | | 20 | 2 | |
| 66.0 - 67.9 | | | | 9 | 1 | | | | 20 | 2 | |
| 68.0 - 69.9 | | 1 | | 7 | | | | | 15 | 2 | |
| 70.0 - 71.9 | | | | 7 | 1 | 1 | | | 16 | 3 | |
| 72.0 - 73.9 | | | | 4 | | | | | 12 | 5 | |
| 74.0 - 75.9 | | | | 6 | 1 | | | | 6 | 4 | |
| 76.0 - 77.9 | | | | 3 | | | | | 5 | 2 | |
| 78.0 - 79.9 | | | | 1 | | | | | | 2 | |
| 80.0 - 81.9 | | | | | | | | | | | |
| Sample Size | 22 | 21 | 1 | 62 | 3 | 1 | 11 | | 132 | 23 | 1 |
| Mean | 40.1 | 58.9 | 44.0 | 68.0 | 70.7 | 71.6 | 58.7 | | 67.6 | 72.1 | 63.5 |
| S.D. | 3.49 | 4.75 | | 4.84 | 3.51 | | 2.96 | | 4.79 | 4.57 | |

[b]Postorbital-hypural length.

APPENDIX 22 AGE COMPOSITION OF COHO SALMON IN THE COWICHAN-KOKSILAH STUDY AREA

Spawning Ground Dead Recovery

1976

| Stream | Male(%) | | | | Female(%) | | |
|---|---|---|---|---|---|---|---|
| | $2_2$ | $3_2$ | $4_3$ | Sample Size | $3_2$ | $4_3$ | Sample Size |
| Cowichan River | 6.1 | 93.9 | | 33 | 100 | | 28 |
| Rotary Park | 18.8 | 81.2 | | 16 | 100 | | 11 |
| Cowichan R. Side Channel[a] | 100 | | | 1 | 100 | | 1 |
| Pastuch Creek | | 75 | 25 | 4 | 100 | | 4 |
| Robertson River[b] | | 100 | | 1 | 87.5 | 12.5 | 8 |
| Mesachie Creek | | 75 | 25 | 8 | 94.7 | 5.3 | 19 |
| Kelvin Creek[c] | | 100 | | 3 | 100 | | 1 |
| Overall | 9.1 | 86.4 | 4.5 | 66 | 97.2 | 2.8 | 72 |

1977

| | Male(%) | | | | Female(%) | | |
|---|---|---|---|---|---|---|---|
| | $2_2$ | $3_2$ | $4_3$ | Sample Size | $3_2$ | $4_3$ | Sample Size |
| Cowichan River | 0.9 | 93.5 | 5.6 | 107 | 98.1 | 1.9 | 103 |
| Rotary Park | | 100 | | 40 | 100 | | 35 |
| Cowichan R. Side Channel[a] | 18.8 | 75 | 6.2 | 16 | 100 | | 35 |
| Pastuch Creek | 7.1 | 89.3 | 3.6 | 28 | 92.5 | 7.5 | 40 |
| Robertson River[b] | 11.9 | 88.1 | | 59 | 100 | | 90 |
| Mesachie Creek | 16.2 | 83.8 | | 37 | 100 | | 53 |
| Half Way Creek | | 100 | | 1 | 85.7 | 14.3 | 7 |
| Kelvin Creek[c] | 8 | 92 | | 25 | 100 | | 27 |
| Overall | 6.7 | 90.7 | 2.6 | 313 | 98.4 | 1.6 | 390 |

[a] Includes Bible Camp Side Channel.

[b] Includes Robertson River Side Channel 1A.

[c] Tributary to the Koksilah River includes Glenora Creek.

APPENDIX 23 SEX COMPOSITION OF COHO SALMON IN SPAWNING GROUND DEAD RECOVERY, COWICHAN-KOKSILAH SYSTEM.

| Stream | Unmarked | | | Marked | | | Total | | | Percentage | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Male | | Female | Male | | Female | Male | | Female | Male | | Female | |
| 1976 | Large | Jack | | Large | Jack | | Large | Jack | | Large | Jack | | |
| Cowichan River | 504 | 27 | 522 | 9 | 0 | 17 | 513 | 27 | 539 | 47.5 | 2.5 | 50.0 | (51.2)[a] |
| Rotary Park Pools | 46 | 28 | 53 | 5 | 0 | 6 | 51 | 28 | 59 | 37 | 20.3 | 42.7 | (53.6) |
| Cowichan Side Channel | | | | | | | | | | | | | |
| Pastuch Creek | 7 | 0 | 11 | 0 | 0 | 0 | 7 | 0 | 11 | 38.9 | 0 | 61.1 | (61.1) |
| Robertson River | 36 | 3 | 54 | 0 | 0 | 1 | 36 | 3 | 55 | 38.3 | 3.2 | 58.5 | (60.4) |
| Masachie Creek | 26 | 1 | 39 | 0 | 0 | 0 | 26 | 1 | 39 | 39.4 | 1.5 | 59.1 | (60.0) |
| Half Way Creek | | | | | | | | | | | | | |
| Kelvin Creek | 7 | 0 | 8 | 0 | 0 | 0 | 7 | 0 | 8 | 46.7 | | 53.3 | (53.3) |
| Overall | 626 | 59 | 687 | 14 | 0 | 24 | 640 | 59 | 711 | 45.4 | 4.2 | 50.4 | (52.6) |
| 1977 | | | | | | | | | | | | | |
| Cowichan River | 2113 | 40 | 2455 | 17 | 0 | 25 | 2130 | 40 | 2480 | 45.8 | 0.9 | 53.3 | (53.8) |
| Rotary Park Pools | 123 | 6 | 155 | 9 | 0 | 4 | 132 | 6 | 159 | 44.4 | 2.0 | 53.6 | (54.6) |
| Cowichan Side Channel | 19 | 5 | 53 | 1 | 0 | 0 | 20 | 5 | 53 | 25.6 | 6.4 | 68.0 | (72.6) |
| Pastuch Creek | 38 | 4 | 53 | 2 | 0 | 4 | 40 | 4 | 57 | 39.6 | 4.0 | 56.4 | (58.8) |
| Robertson River | 135 | 12 | 254 | 9 | 0 | 22 | 144 | 12 | 276 | 33.3 | 2.8 | 63.9 | (65.7) |
| Mesachie Creek | 99 | 7 | 148 | 6 | 1 | 15 | 105 | 8 | 163 | 38.1 | 2.9 | 59.0 | (60.8) |
| Half Way Creek | 3 | 0 | 10 | 1 | 0 | 5 | 4 | 0 | 15 | 21.1 | 0 | 78.9 | (78.9) |
| Kelvin Creek | 29 | 5 | 55 | 7 | 1 | 12 | 36 | 6 | 67 | 33.0 | 5.5 | 61.5 | (65.0) |
| Overall | 2559 | 79 | 3183 | 52 | 2 | 87 | 2611 | 81 | 3270 | 43.8 | 1.4 | 54.8 | (55.6) |

[a] Jacks excluded from calculations.

APPENDIX 24 AGE COMPOSITION OF COHO IN THE COWICHAN ESTUARY, 1977.

| Date | $3_2$ | | $4_3$ | | Total N |
|---|---|---|---|---|---|
| | N | % | N | % | |
| Sep 26 | 3 | 100 | 0 | 0 | 3 |
| 29 | 6 | 75 | 2 | 25 | 8 |
| 30 | 16 | 89 | 2 | 11 | 18 |
| Oct 4 | 18 | 100 | 0 | 0 | 18 |
| 5 | 13 | 87 | 2 | 13 | 15 |
| 7 | 10 | 91 | 1 | 9 | 11 |
| 11 | 12 | 100 | 0 | 0 | 12 |
| 13 | 4 | 100 | 0 | 0 | 4 |
| 18 | 12 | 100 | 0 | 0 | 12 |
| 19 | 13 | 100 | 0 | 0 | 13 |
| 20 | 11 | 100 | 0 | 0 | 11 |
| 23 | 11 | 100 | 0 | 0 | 11 |
| 26 | 8 | 100 | 0 | 0 | 8 |
| 27 | 18 | 100 | 0 | 0 | 18 |
| Overall | 155 | 96 | 7 | 4 | 162 |

APPENDIX 25 COWICHAN ESTUARY PERCENT BY TAGGING WEEK OF MALE, FEMALE AND JACK COHO AS DETERMINED EXTERNALLY.

1976

| Date | Male N | Male % | Female N | Female % | Jacks N | Jacks % | Total |
|---|---|---|---|---|---|---|---|
| Sept. 30 - Oct. 7 | 99 | 54 | 82 | 45 | 2 | 1 | 183 |
| Oct. 11 - Oct. 15 | 162 | 51 | 155 | 49 | 1 | 0.3 | 318 |
| Oct. 18 - Oct. 22 | 337 | 63 | 190 | 36 | 8 | 1 | 535 |
| Oct. 25 - Oct. 29 | 50 | 83 | 9 | 15 | 1 | 2 | 60 |
| Overall | 648 | 59 | 436 | 40 | 12 | 1 | 1096 |

1977

| Date | Male N | Male % | Female N | Female % | Total |
|---|---|---|---|---|---|
| Sept. 30 - Oct. 6 | 257 | 55 | 208 | 45 | 465 |

APPENDIX 26 NOSE-FORK LENGTH FREQUENCY OF COHO SALMON FROM THE COWICHAN ESTUARY,1976.

| Frequency Interval(cm) | Sept 30 - Oct 7 | Oct 11 - Oct 15 | Oct 18 - Oct 22 | Oct 25 - Oct 29 | Total |
|---|---|---|---|---|---|
| 38.0 - 39.9 | 1 | 0 | 1 | 0 | 2 |
| 40.0 - 41.9 | 0 | 0 | 1 | 0 | 1 |
| 42.0 - 43.9 | 0 | 0 | 0 | 0 | 0 |
| 44.0 - 45.9 | 1 | 0 | 0 | 0 | 1 |
| 46.0 - 47.9 | 0 | 1 | 1 | 0 | 2 |
| 48.0 - 49.9 | 0 | 1 | 1 | 0 | 2 |
| 50.0 - 51.9 | 0 | 2 | 6 | 0 | 8 |
| 52.0 - 53.9 | 3 | 2 | 5 | 0 | 10 |
| 54.0 - 55.9 | 3 | 6 | 8 | 1 | 18 |
| 56.0 - 57.9 | 8 | 4 | 14 | 0 | 26 |
| 58.0 - 59.9 | 9 | 15 | 34 | 2 | 60 |
| 60.0 - 61.9 | 16 | 15 | 42 | 2 | 75 |
| 62.0 - 63.9 | 25 | 34 | 55 | 5 | 119 |
| 64.0 - 65.9 | 26 | 52 | 70 | 5 | 153 |
| 66.0 - 67.9 | 30 | 46 | 84 | 8 | 168 |
| 68.0 - 69.9 | 26 | 49 | 75 | 11 | 161 |
| 70.0 - 71.9 | 15 | 36 | 61 | 12 | 124 |
| 72.0 - 73.9 | 15 | 31 | 37 | 3 | 86 |
| 74.0 - 75.9 | 4 | 16 | 17 | 6 | 43 |
| 76.0 - 77.9 | 1 | 2 | 5 | 1 | 9 |
| 78.0 - 79.9 | 0 | 0 | 0 | 0 | 0 |
| 80.0 - 81.9 | 0 | 1 | 3 | 1 | 5 |
| 82.0 - 83.9 | 0 | 0 | 0 | 0 | 0 |
| 84.0 - 85.9 | 0 | 1 | 0 | 0 | 1 |
| 86.0 - 87.9 | 0 | 0 | 0 | 0 | 0 |
| 88.0 - 89.9 | 1 | 0 | 0 | 0 | 1 |
| Sample Size | 184 | 314 | 520 | 57 | 1075 |
| Mean | 65.57 | 66.73 | 65.95 | 68.48 | 66.24 |
| S.D. | 5.70 | 5.27 | 5.58 | 4.84 | 5.52 |

APPENDIX 27 NOSE-FORK LENGTH FREQUENCY OF COHO SALMON BY AGE CLASS FROM THE COWICHAN ESTUARY, 1977.

| Frequency Interval(cm) | Age | | Total |
|---|---|---|---|
| | $3_2$ | $4_3$ | |
| 44.0- 45.9 | 0 | 0 | 0 |
| 46.0- 47.9 | 0 | 0 | 0 |
| 48.0- 49.9 | 0 | 0 | 0 |
| 50.0- 51.9 | 0 | 0 | 0 |
| 52.0- 53.9 | 0 | 0 | 0 |
| 54.0- 55.9 | 1 | 0 | 1 |
| 56.0- 57.9 | 0 | 0 | 0 |
| 58.0- 59.9 | 5 | 1 | 6 |
| 60.0- 61.9 | 16 | 2 | 18 |
| 62.0- 63.9 | 17 | 0 | 17 |
| 64.0- 65.9 | 21 | 1 | 22 |
| 66.0- 67.9 | 27 | 1 | 28 |
| 68.0- 69.9 | 30 | 1 | 31 |
| 70.0- 71.9 | 17 | 0 | 17 |
| 72.0- 73.9 | 7 | 1 | 8 |
| 74.0- 75.9 | 7 | 0 | 7 |
| 76.0- 77.9 | 3 | 0 | 3 |
| 78.0- 79.9 | 2 | 0 | 2 |
| 80.0- 81.9 | 0 | 0 | 0 |
| 82.0- 83.9 | 1 | 0 | 1 |
| Sample Size | 154 | 7 | 161 |
| Mean | 67.23 | 65.06 | 67.14 |
| S.D. | 4.59 | 4.98 | 4.61 |

APPENDIX 28 POSTORBITAL-HYPURAL LENGTH FREQUENCY BY AGE CLASS OF COHO FROM THE COWICHAN RIVER SPAWNING GROUND DEAD RECOVERY, 1976.

TOTAL SYSTEM

| Frequency Interval(cm) | Male | | | Female | |
|---|---|---|---|---|---|
| | $2_2$ | $3_2$ | $4_3$ | $3_2$ | $4_3$ |
| 26.0 - 27.9 | 0 | 1 | 0 | 0 | 0 |
| 28.0 - 29.9 | 2 | 2 | 0 | 0 | 0 |
| 30.0 - 31.9 | 3 | 2 | 0 | 0 | 0 |
| 32.0 - 33.9 | 1 | 0 | 0 | 0 | 0 |
| 34.0 - 35.9 | 0 | 1 | 0 | 0 | 0 |
| 36.0 - 37.9 | 0 | 0 | 0 | 0 | 0 |
| 38.0 - 39.9 | 0 | 0 | 0 | 0 | 0 |
| 40.0 - 41.9 | 0 | 0 | 0 | 0 | 0 |
| 42.0 - 43.9 | 0 | 1 | 0 | 2 | 0 |
| 44.0 - 45.9 | 0 | 5 | 1 | 3 | 0 |
| 46.0 - 47.9 | 0 | 4 | 0 | 7 | 0 |
| 48.0 - 49.9 | 0 | 10 | 0 | 4 | 2 |
| 50.0 - 51.9 | 0 | 8 | 1 | 18 | 0 |
| 52.0 - 53.9 | 0 | 6 | 0 | 17 | 0 |
| 54.0 - 55.9 | 0 | 6 | 1 | 10 | 0 |
| 56.0 - 57.9 | 0 | 6 | 0 | 6 | 0 |
| 58.0 - 59.9 | 0 | 2 | 0 | 3 | 0 |
| 60.0 - 61.9 | 0 | 2 | 0 | 0 | 0 |
| 62.0 - 63.9 | 0 | 1 | 0 | 0 | 0 |
| 64.0 - 65.9 | 0 | 0 | 0 | 0 | 0 |
| Sample Size | 6 | 57 | 3 | 70 | 2 |
| Mean | 30.7 | 49.7 | 50.2 | 51.8 | 48.7 |
| S.D. | 1.62 | 7.95 | 4.95 | 3.64 | 0.71 |

APPENDIX 28 (cont.)

COWICHAN RIVER (MAIN SECTIONS)

| Frequency interval(cm) | Male | | Female |
|---|---|---|---|
| | $2_2$ | $3_2$ | $3_2$ |
| 28.0 - 29.9 | 1 | 1 | 0 |
| 30.0 - 31.9 | 0 | 0 | 0 |
| 32.0 - 33.9 | 1 | 0 | 0 |
| 34.0 - 35.9 | 0 | 0 | 0 |
| 36.0 - 37.9 | 0 | 0 | 0 |
| 38.0 - 39.9 | 0 | 0 | 0 |
| 40.0 - 41.9 | 0 | 0 | 0 |
| 42.0 - 43.9 | 0 | 1 | 2 |
| 44.0 - 45.9 | 0 | 4 | 1 |
| 46.0 - 47.9 | 0 | 2 | 0 |
| 48.0 - 49.9 | 0 | 4 | 1 |
| 50.0 - 51.9 | 0 | 4 | 9 |
| 52.0 - 53.9 | 0 | 2 | 6 |
| 54.0 - 55.9 | 0 | 4 | 4 |
| 56.0 - 57.9 | 0 | 5 | 3 |
| 58.0 - 59.9 | 0 | 2 | 2 |
| 60.0 - 61.9 | 0 | 1 | 0 |
| 62.0 - 63.9 | 0 | 1 | 0 |
| 64.0 - 65.9 | 0 | 0 | 0 |
| Sample Size | 2 | 31 | 28 |
| Mean | 30.7 | 51.5 | 52.2 |
| S.D. | 2.33 | 6.81 | 3.97 |

APPENDIX 29 POSTORBITAL-HYPURAL LENGTH FREQUENCY BY AGE CLASS OF COHO FROM THE COWICHAN RIVER SPAWNING GROUND DEAD RECOVERY, 1977.

TOTAL SYSTEM

| Frequency Interval(cm) | Male | | | Female | |
|---|---|---|---|---|---|
| | $2_2$ | $3_2$ | $4_3$ | $3_2$ | $4_3$ |
| 26.0 - 27.9 | 1 | 0 | 0 | 0 | 0 |
| 28.0 - 29.9 | 2 | 0 | 0 | 0 | 0 |
| 30.0 - 31.9 | 4 | 0 | 0 | 0 | 0 |
| 32.0 - 33.9 | 9 | 0 | 0 | 0 | 0 |
| 34.0 - 35.9 | 3 | 2 | 0 | 0 | 0 |
| 36.0 - 37.9 | 0 | 0 | 0 | 0 | 0 |
| 38.0 - 39.9 | 0 | 1 | 0 | 0 | 0 |
| 40.0 - 41.9 | 0 | 0 | 0 | 2 | 0 |
| 42.0 - 43.9 | 0 | 2 | 0 | 5 | 0 |
| 44.0 - 45.9 | 0 | 6 | 0 | 7 | 0 |
| 46.0 - 47.9 | 0 | 11 | 0 | 21 | 1 |
| 48.0 - 49.9 | 0 | 21 | 0 | 32 | 0 |
| 50.0 - 51.9 | 0 | 36 | 1 | 57 | 1 |
| 52.0 - 53.9 | 0 | 45 | 1 | 86 | 0 |
| 54.0 - 55.9 | 0 | 50 | 2 | 71 | 1 |
| 56.0 - 57.9 | 0 | 61 | 0 | 48 | 2 |
| 58.0 - 59.9 | 0 | 16 | 3 | 19 | 1 |
| 60.0 - 61.9 | 0 | 6 | 1 | 5 | 0 |
| 62.0 - 63.9 | 0 | 1 | 0 | 1 | 0 |
| 64.0 - 65.9 | 0 | 1 | 0 | 2 | 0 |
| 66.0 - 67.9 | 0 | 1 | 0 | 0 | 0 |
| 68.0 - 69.9 | 0 | 0 | 0 | 0 | 0 |
| 70.0 - 71.9 | 0 | 0 | 0 | 0 | 0 |
| 72.0 - 73.9 | 0 | 0 | 0 | 0 | 0 |
| 74.0 - 75.9 | 0 | 0 | 0 | 0 | 0 |
| Sample Size | 19 | 260 | 8 | 356 | 6 |
| Mean | 32 | 53.6 | 56.3 | 53 | 53.8 |
| S.D. | 2.03 | 4.26 | 3.31 | 3.79 | 4.37 |

APPENDIX 29(cont.)

COWICHAN RIVER(MAIN SECTIONS)

| Frequency Interval(cm) | Male | | | Female | |
|---|---|---|---|---|---|
| | $2_2$ | $3_2$ | $4_3$ | $3_2$ | $4_3$ |
| 28.0 - 29.9 | 0 | 0 | 0 | 0 | 0 |
| 30.0 - 31.9 | 1 | 0 | 0 | 0 | 0 |
| 32.0 - 33.9 | 0 | 0 | 0 | 0 | 0 |
| 34.0 - 35.9 | 0 | 0 | 0 | 0 | 0 |
| 36.0 - 37.9 | 0 | 0 | 0 | 0 | 0 |
| 38.0 - 39.9 | 0 | 1 | 0 | 0 | 0 |
| 40.0 - 41.9 | 0 | 0 | 0 | 0 | 0 |
| 42.0 - 43.9 | 0 | 0 | 0 | 1 | 0 |
| 44.0 - 45.9 | 0 | 0 | 0 | 1 | 0 |
| 46.0 - 47.9 | 0 | 4 | 0 | 5 | 0 |
| 48.0 - 49.9 | 0 | 4 | 0 | 6 | 0 |
| 50.0 - 51.9 | 0 | 8 | 1 | 14 | 1 |
| 52.0 - 53.9 | 0 | 19 | 0 | 23 | 0 |
| 54.0 - 55.9 | 0 | 17 | 2 | 18 | 0 |
| 56.0 - 57.9 | 0 | 33 | 0 | 20 | 1 |
| 58.0 - 59.9 | 0 | 11 | 2 | 9 | 0 |
| 60.0 - 61.9 | 0 | 2 | 1 | 3 | 0 |
| 62.0 - 63.9 | 0 | 0 | 0 | 1 | 0 |
| 64.0 - 65.9 | 0 | 0 | 0 | 0 | 0 |
| 66.0 - 67.9 | 0 | 1 | 0 | 0 | 0 |
| Sample Size | 1 | 100 | 6 | 101 | 2 |
| Mean | 31.7 | 54.9 | 56.4 | 53.9 | 53.2 |
| S.D. | 0 | 3.70 | 3.58 | 3.71 | 3.96 |

APPENDIX 29 (cont.)

ROTARY PARK POOLS

| Frequency Interval(cm) | Male $\frac{3}{2}$ | Female $\frac{3}{2}$ |
|---|---|---|
| 40.0 - 41.9 | 0 | 1 |
| 42.0 - 43.9 | 0 | 0 |
| 44.0 - 45.9 | 3 | 0 |
| 46.0 - 47.9 | 2 | 4 |
| 48.0 - 49.9 | 5 | 6 |
| 50.0 - 51.9 | 5 | 6 |
| 52.0 - 53.9 | 6 | 8 |
| 54.0 - 55.9 | 8 | 5 |
| 56.0 - 57.9 | 7 | 3 |
| 58.0 - 59.9 | 2 | 2 |
| 60.0 - 61.9 | 2 | 0 |
| 62.0 - 63.9 | 0 | 0 |
| Sample Size | 40 | 35 |
| Mean | 53 | 52 |
| S.D. | 4.10 | 3.85 |

APPENDIX 29 (cont.)

PASTUCH CREEK

| Frequency Interval(cm) | Male | | | Female | |
|---|---|---|---|---|---|
| | $2_2$ | $3_2$ | $4_3$ | $3_2$ | $4_3$ |
| 32.0 - 33.9 | 1 | 0 | 0 | 0 | 0 |
| 34.0 - 35.9 | 1 | 2 | 0 | 0 | 0 |
| 36.0 - 37.9 | 0 | 0 | 0 | 0 | 0 |
| 38.0 - 39.9 | 0 | 0 | 0 | 0 | 0 |
| 40.0 - 41.9 | 0 | 0 | 0 | 0 | 0 |
| 42.0 - 43.9 | 0 | 0 | 0 | 1 | 0 |
| 44.0 - 45.9 | 0 | 0 | 0 | 2 | 0 |
| 46.0 - 47.9 | 0 | 0 | 0 | 2 | 1 |
| 48.0 - 49.9 | 0 | 3 | 0 | 3 | 0 |
| 50.0 - 51.9 | 0 | 3 | 0 | 7 | 0 |
| 52.0 - 53.9 | 0 | 3 | 0 | 7 | 0 |
| 54.0 - 55.9 | 0 | 7 | 0 | 10 | 1 |
| 56.0 - 57.9 | 0 | 4 | 0 | 3 | 1 |
| 58.0 - 59.9 | 0 | 0 | 1 | 2 | 0 |
| 60.0 - 61.9 | 0 | 1 | 0 | 0 | 0 |
| 62.0 - 63.9 | 0 | 1 | 0 | 0 | 0 |
| 64.0 - 65.9 | 0 | 1 | 0 | 0 | 0 |
| Sample Size | 2 | 25 | 1 | 37 | 3 |
| Mean | 33.8 | 53.3 | 58.6 | 52.4 | 52.7 |
| S.D. | 1.84 | 6.68 | 0 | 3.9 | 5.24 |

APPENDIX 29 (cont.)

ROBERTSON RIVER SECTION 1A

| Frequency Interval(cm) | Male | | Female |
|---|---|---|---|
| | $2_2$ | $3_2$ | $3_2$ |
| 26.0 - 27.9 | 1 | 0 | 0 |
| 28.0 - 29.9 | 1 | 0 | 0 |
| 30.0 - 31.9 | 0 | 0 | 0 |
| 32.0 - 33.9 | 4 | 0 | 0 |
| 34.0 - 35.9 | 1 | 0 | 0 |
| 36.0 - 37.9 | 0 | 0 | 0 |
| 38.0 - 39.9 | 0 | 0 | 0 |
| 40.0 - 41.9 | 0 | 0 | 1 |
| 42.0 - 43.9 | 0 | 1 | 0 |
| 44.0 - 45.9 | 0 | 1 | 2 |
| 46.0 - 47.9 | 0 | 3 | 5 |
| 48.0 - 49.9 | 0 | 6 | 7 |
| 50.0 - 51.9 | 0 | 10 | 17 |
| 52.0 - 53.9 | 0 | 12 | 22 |
| 54.0 - 55.9 | 0 | 11 | 23 |
| 56.0 - 57.9 | 0 | 6 | 9 |
| 58.0 - 59.9 | 0 | 1 | 1 |
| 60.0 - 61.9 | 0 | 1 | 1 |
| 62.0 - 63.9 | 0 | 0 | 0 |
| 64.0 - 65.9 | 0 | 0 | 2 |
| Sample Size | 7 | 52 | 90 |
| Mean | 31.4 | 52.3 | 52.8 |
| S.D. | 2.36 | 3.53 | 3.68 |

APPENDIX 29 (cont.)

MESACHIE CREEK

| Frequency Interval(cm) | Male | | Female |
|---|---|---|---|
| | $2_2$ | $3_2$ | $3_2$ |
| 28.0 - 29.9 | 1 | 0 | 0 |
| 30.0 - 31.9 | 2 | 0 | 0 |
| 32.0 - 33.9 | 3 | 0 | 0 |
| 34.0 - 35.9 | 0 | 0 | 0 |
| 36.0 - 37.9 | 0 | 0 | 0 |
| 38.0 - 39.9 | 0 | 0 | 0 |
| 40.0 - 41.9 | 0 | 0 | 0 |
| 42.0 - 43.9 | 0 | 1 | 2 |
| 44.0 - 45.9 | 0 | 1 | 1 |
| 46.0 - 47.9 | 0 | 2 | 4 |
| 48.0 - 49.9 | 0 | 3 | 5 |
| 50.0 - 51.9 | 0 | 7 | 9 |
| 52.0 - 53.9 | 0 | 3 | 13 |
| 54.0 - 55.9 | 0 | 6 | 10 |
| 56.0 - 57.9 | 0 | 6 | 6 |
| 58.0 - 59.9 | 0 | 2 | 3 |
| 60.0 - 61.9 | 0 | 0 | 0 |
| Sample Size | 6 | 31 | 53 |
| Mean | 31.8 | 52.7 | 52.3 |
| S.D. | 1.30 | 4.19 | 3.72 |

APPENDIX 30 SUMMARY OF CHINOOK AND COHO CWT RECOVERIES FROM THE COWICHAN-KOKSILAH STUDY AREA.

Coho

| Year Tagged | Tagging Location | CWT Code $D_1$ | Ag | $D_2$ | No. of Tags Released | No. of CWT Recoveries: Estuary 1976 | Dead Recovery 1976/77 | Estuary 1977 | Dead Recovery 1977/78 |
|---|---|---|---|---|---|---|---|---|---|
| 1975 | Rotary Park Pools | 10 | 2 | 5 | 10540 | 6 | 12[a] | | |
| | | 9 | 2 | 5 | 7631 | 6 | 15 | | |
| | | 8 | 2 | 5 | 757 | 0 | 0 | | |
| | Pastuch Creek | 6 | 2 | 5 | 4110 | 4 | 1 | | |
| | Cowichan R. side channel | 14 | 2 | 5 | 3097 | 2 | 5 | 1 | 1 |
| | | TOTAL | | | 26135 | 18 | 33 | 1 | 1 |
| 1976 | Rotary Park Pools | 5 | 2 | 7 | 4665 | | | 7 | 10 |
| | | 6 | 2 | 7 | 5435 | | | 11 | 11 |
| | Pastuch Creek | 9 | 2 | 7 | 3332 | | | 15 | 4 |
| | Cowichan R. side channel | 10 | 2 | 7 | 3787 | | | 8 | 7 |
| | Mesachie Creek | 7 | 2 | 7 | 4023 | | | 16 | 6 |
| | | 8 | 2 | 7 | 15128 | | | 27 | 29 |
| | | 13 | 2 | 7 | 10135 | | | 21 | 10 |
| | | 11 | 2 | 5 | 12269 | | | 20 | 19 |
| | Kelvin Creek | 3 | 2 | 7 | 6614 | | | 28 | 13 |
| | | 4 | 2 | 7 | 6764 | | | 23 | 7 |
| | | TOTAL | | | 72152 | | | 176[b] | 116 |

[a] 1 CWT recovery double-tagged;other pin read 8/2/5.

[b] Does not include 1 coho CWT recovery initially tagged as a chinook (1/2/7).

Chinook

| Year Tagged | Brood Year | Tagging Location | CWT Code $D_1$ | Ag | $D_2$ | No. of Tags Released | No. of CWT Recovered: 1976 Estuary | 1976 Dead Recovery | 1977 Estuary | 1977 Dead Recovery | 1978 Estuary | 1978 Dead Recovery | 1979 Estuary | 1979 Dead Recovery |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1975 | 1974 | Cowichan | 7 | 2 | 5 | 18332 | – | 1 | 2 | – | 2 | 2 | 1 | 1 |
| 1976 | 1975 | Estuary | 1 | 2 | 7 | 16673 | – | – | 4 | – | – | 1 | 1 | 2 |
| | | | | | | TOTAL | – | 1 | 6[a] | – | 2 | 3 | 2 | 3 |

[a] Does not include recovery of CWT 2/2/6, tagged at Big Qualicum in 1975.

APPENDIX 31 RECOVERY DATA FOR ADIPOSE-CLIPPED CHINOOK SALMON TAGGED AND RECOVERED IN THE COWICHAN ESTUARY.

| Recovery Year | C.W.T. Code $D_1$ | Ag | $D_2$ | Recovery Date | Age | Sex | Length(cm) Nose-Fork | Length(cm) Postorbital-Hypural |
|---|---|---|---|---|---|---|---|---|
| 1977 | 7 | 2 | 5 | Sept 23 | $3_1$ | M | 74.6 | 60.6 |
| | | | | 23 | $3_1$[a] | M | 42.2 | 35.5 |
| | 1 | 2 | 7 | Sept 22 | $2_1$ | M(J) | 42.8 | 35.6 |
| | | | | 29 | $2_1$ | M(J) | 55.5 | 45.5 |
| | | | | Oct 5 | $2_1$ | M(J) | 48.6 | 40.1 |
| | | | | 18 | $2_1$ | M(J) | 48.5 | 39.1 |
| | 2 | 2 | 6[b] | Sept 28 | $2_1$ | M(J) | 52.9 | 43.6 |
| | No pin | | | Sept 23 | $3_1$ | M | 65.7 | 53.5 |
| 1978 | 7 | 2 | 5 | Sept 29 | $4_1$ | F | 84.9 | 70.0 |
| | | | | Oct 6 | $4_1$ | M | 85.5 | 67.4 |
| | No pin | | | Oct 6 | $4_1$ | F | 85.2 | 71.1 |
| 1979 | 7 | 2 | 5 | Sept 21 | $5_1$ | F | - | - |
| | 1 | 2 | 7 | Sept 21 | $4_1$ | M | - | - |

[a] Scale age read as $2_1$ (Jack; probable misplaced scale sample).

[b] Tag code indicates fall chinook tagged at Big Qualicum in 1975.

APPENDIX 32 RECOVERY DATA FOR ADIPOSE-CLIPPED CHINOOK SALMON TAGGED IN THE COWICHAN ESTUARY AND RECOVERED IN THE COWICHAN RIVER SPAWNING GROUND DEAD RECOVERY.

| Year Recovered | Date Recovered | C.W.T. code $D_1$ | Ag | $D_2$ | Age | Sex | Length(cm) Nose-Fork | Postorbital-Hypural |
|---|---|---|---|---|---|---|---|---|
| 1976 | - | 7 | 2 | 5 | $2_1$ | M(J) | - | - |
| 1977 | Dec 1 | Unknown[a] | | | - | F | - | 56.2 |
| 1978 | Oct 26 | No pin | | | $4_1$ | M | 92.3 | 75.5 |
| | Nov 1 | No pin | | | $4_1$ | F | 89.3 | 70.4 |
| | 3 | 7 | 2 | 5 | $4_1$ | M | - | 70.4 |
| | 8 | 7 | 2 | 5 | $4_1$ | F | - | 74.2 |
| | 8 | 1 | 2 | 7 | $3_1$ | M | - | 60.6 |
| | 9 | No pin | | | $4_1$ | F | - | 74.4 |
| | 14 | No pin | | | $4_1$ | F | 86.8 | 72.4 |
| 1979 | Nov 14 | No pin[b] | | | $3_1$ | M | 71.1 | 55.8 |
| | 15 | No pin | | | $4_1$ | F | - | 66.2 |
| | 15 | 7 | 2 | 5 | $5_1$ | F | - | - |
| | 22 | No pin[b] | | | $3_1$ | F | - | 61.0 |
| | 23 | 1 | 2 | 7 | $4_1$ | F | - | 70.3 |
| | 29 | 1 | 2 | 7 | $4_1$ | F | - | 69.2 |

[a]Marked fish; no information on presence of C.W.T.

[b]Not from 1975 and 1976 coded-wire tagging in Cowichan Estuary.

APPENDIX 33 TAGGING AND RECOVERY DATA FOR ADIPOSE-CLIPPED COHO SALMON RECOVERED IN THE COWICHAN ESTUARY.

1976

| Tagging Location | C.W.T.[a] Code $D_1$ Ag $D_2$ | Recovery Date | Sex | Nose-fork Length(cm) | Weight(kg) |
|---|---|---|---|---|---|
| Rotary Park Pools | 10 2 5 | Oct. 19 | M | 64.7 | 7.4 |
| | | 20 | F | 66.6 | 8.6 |
| | | 20 | F | 62.0 | 6.6 |
| | | 20 | F | 61.7 | 7.0 |
| | | 20 | M | 65.3 | 7.3 |
| | | 21 | F | 60.5 | 6.1 |
| | 9 2 5 | 19 | F | 52.7 | 3.6 |
| | | 19 | M | 47.8 | 3.3 |
| | | 20 | M | 58.5 | 5.2 |
| | | 20 | F | 59.7 | 5.6 |
| | | 20 | F | 61.0 | 6.2 |
| | | 21 | M | 66.8 | 7.6 |
| Pastuch Ck. | 6 2 5 | Sept. 30 | – | 77.2 | – |
| | | Oct. 7 | F | 57.8 | 5.5 |
| | | 12 | F | 63.8 | 6.9 |
| | | 22 | F | 63.4 | 7.2 |
| Cowichan R. Side Channel | 14 2 5 | Oct. 20 | F | 62.9 | 6.6 |
| | | 21 | F | 64.9 | 7.6 |
| | No pin | Oct. 6 | – | 68.5 | 7.9 |
| | | 7[b] | F | 65.7 | 7.7 |
| | | 20 | M | 65.0 | 7.1 |
| | | 21 | M | 55.8 | 5.1 |
| | Lost head | Oct. 19 | M | 69.4 | 8.8 |

[a] Age $3_2$ from C.W.T.

[b] Field identification of missing fin uncertain.

| | | |
|---|---|---|
| Summary: | No. of C.W.T. Recoveries | 18 |
| | No. of no pins | 4 |
| | No. of lost pins | 1 |
| Total | No. of marked coho checked | 23 |

APPENDIX 33 (cont.)

| 1977 Tagging Location | C.W.T. Code $D_1$ | Ag | $D_2$ | Recovery Date | Age[a] | Sex | Length(cm) Nose-Fork | Postorbital-Hypural |
|---|---|---|---|---|---|---|---|---|
| Cowichan R. Side Channel | 14 | 2 | 5 | Oct. 6 | $3_2$[b] | F | 71.4 | 58.3 |
| Rotary Park Pools | 5 | 2 | 7 | Oct. 11 | | F | 67.8 | 53.6 |
| | | | | 18 | | M | 66.4 | 53.6 |
| | | | | 19 | | F | 61.6 | 50.2 |
| | | | | 20 | | F | 62.7 | 52.9 |
| | | | | 22 | | M | 64.9 | 51.8 |
| | | | | 27 | | F | 66.8 | 55.9 |
| | | | | 27 | | F | 62.8 | 52.0 |
| | 6 | 2 | 7 | Oct. 4 | | M | 71.1 | 56.1 |
| | | | | 6 | | F | 62.6 | 51.6 |
| | | | | 6 | | M | 64.9 | 52.8 |
| | | | | 11 | | M | 63.2 | 50.4 |
| | | | | 18 | | F | 61.0 | 49.8 |
| | | | | 19 | | F | 61.2 | 49.8 |
| | | | | 20 | | M | 70.8 | 56.1 |
| | | | | 21 | | F | 68.1 | 55.2 |
| | | | | 22 | | F | 68.7 | 55.9 |
| | | | | 22 | | F | 60.0 | 49.0 |
| | | | | 26 | | M | 67.4 | 55.4 |
| Pastuch Ck. | 9 | 2 | 7 | Sept. 26 | | M | 70.6 | 55.2 |
| | | | | 29 | | M | 59.2 | 47.4 |
| | | | | 29 | | M | 59.4 | 46.4 |
| | | | | 30 | | M | 58.5 | 46.2 |
| | | | | Oct. 4 | | M | 60.8 | 48.6 |
| | | | | 5 | | M | 69.2 | 55.3 |
| | | | | 6 | | M | 67.5 | 54.2 |
| | | | | 7 | | M | 67.5 | 54.4 |
| | | | | 11 | | F | 71.2 | 58.6 |
| | | | | 11 | | M | 66.9 | 51.6 |
| | | | | 13 | | F | 62.3 | 52.1 |
| | | | | 13 | | F | 61.8 | 51.2 |
| | | | | 18 | | F | 73.7 | 52.2 |
| | | | | 18 | | F | 65.4 | 53.0 |
| | | | | 19 | | M | 72.8 | 57.2 |
| Cowichan R. Side Channel | 10 | 2 | 7 | Sept. 29 | | F | 68.8 | 54.8 |
| | | | | Oct. 7 | | M | 64.8 | 54.2 |
| | | | | 13 | | F | 65.8 | 55.2 |
| | | | | 13 | | F | 64.8 | 53.7 |
| | | | | 18 | | M | 67.3 | 54.0 |
| | | | | 20 | | M | 58.8 | 47.6 |
| | | | | 21 | | F | 71.4 | 57.9 |
| | | | | 21 | | M | 69.1 | 54.8 |

APPENDIX 33 (cont.)

| Tagging Location | C.W.T. Code $D_1$ | Ag | $D_2$ | Recovery Date | Age[a] | Sex | Length(cm) Nose-Fork | Postorbital-Hypural |
|---|---|---|---|---|---|---|---|---|
| Mesachie Creek. | 7 | 2 | 7 | Sept. 26 | | M | 67.8 | 53.0 |
| | | | | 29 | | F | 63.6 | 52.1 |
| | | | | 30 | | F | 62.7 | 50.4 |
| | | | | Oct. 4 | | M | 69.3 | 54.0 |
| | | | | 4 | | M | 60.6 | 47.9 |
| | | | | 4 | | M | 66.7 | 51.2 |
| | | | | 5 | | M | 56.5 | 45.9 |
| | | | | 5 | | M | 58.6 | 48.0 |
| | | | | 13 | | F | 72.6 | 59.4 |
| | | | | 18 | | M | 77.9 | 52.9 |
| | | | | 19 | | F | 62.0 | 51.2 |
| | | | | 19 | | M | 67.1 | 54.5 |
| | | | | 21 | | M | 71.4 | 59.4 |
| | | | | 21 | | F | 62.0 | 51.1 |
| | | | | 22 | | M | 68.3 | 54.4 |
| | | | | 22 | | F | 75.7 | 61.0 |
| | 8 | 2 | 7 | Sept. 26 | $4_3$[c] | M | 62.3 | 49.2 |
| | | | | 28 | | M | 71.6 | 58.3 |
| | | | | 28 | | F | 66.4 | 55.4 |
| | | | | 29 | | F | 68.9 | 55.4 |
| | | | | 29 | | M | 68.7 | 54.6 |
| | | | | 30 | | F | 68.1 | 53.5 |
| | | | | Oct. 4 | | F | 67.7 | 53.2 |
| | | | | 5 | | F | 56.9 | 47.1 |
| | | | | 5 | | M | 64.6 | 52.3 |
| | | | | 5 | | M | 61.8 | 50.4 |
| | | | | 7 | | F | 61.5 | 52.0 |
| | | | | 7 | | M | 63.7 | 53.2 |
| | | | | 11 | | M | 71.4 | 56.0 |
| | | | | 11 | | M | 62.8 | 50.2 |
| | | | | 11 | | F | 73.1 | 59.0 |
| | | | | 13 | | F | 67.4 | 54.3 |
| | | | | 13 | | F | 63.5 | 52.5 |
| | | | | 18 | | F | 61.7 | 50.2 |
| | | | | 18 | | F | 71.4 | 57.8 |
| | | | | 18 | | F | 67.6 | 52.1 |
| | | | | 19 | | F | 69.0 | 56.3 |
| | | | | 20 | | F | 65.7 | 53.6 |
| | | | | 21 | | F | 64.0 | 52.3 |
| | | | | 21 | | F | 64.8 | 52.5 |
| | | | | 21 | | F | 69.5 | 56.0 |
| | | | | 21 | | F | 65.8 | 52.5 |
| | | | | 26 | | M | 74.1 | 58.4 |
| | 13 | 2 | 7 | Sept. 26 | | M | 67.0 | 51.8 |
| | | | | 28 | | F | 64.5 | 53.6 |
| | | | | 28 | | M | 63.4 | 51.4 |
| | | | | 29 | | M | 62.7 | 50.2 |
| | | | | Oct. 4 | | M | 60.4 | 47.1 |
| | | | | 4 | | M | 69.5 | 55.6 |
| | | | | 4 | | M | 66.1 | 52.4 |
| | | | | 4 | | F | 65.4 | 52.4 |

APPENDIX 33 (cont.)

| Tagging Location | C.W.T. Code $D_1$ | Ag | $D_2$ | Recovery Date | Age[a] | Sex | Length(cm) Nose-Fork | Postorbital-Hypural |
|---|---|---|---|---|---|---|---|---|
| Mesachie Creek | 13 | 2 | 7 | Oct. 11 | | F | 59.6 | 47.9 |
| | | | | 13 | | F | 67.5 | 56.4 |
| | | | | 13 | | F | 65.1 | 54.6 |
| | | | | 18 | | F | 65.9 | 53.8 |
| | | | | 18 | | F | 70.2 | 57.1 |
| | | | | 18 | | F | 73.5 | 59.5 |
| | | | | 18 | | F | 69.9 | 56.0 |
| | | | | 18 | | M | 58.0 | 46.7 |
| | | | | 19 | | F | 61.9 | 50.7 |
| | | | | 19 | | M | 69.3 | 54.5 |
| | | | | 19 | | F | 58.5 | 49.0 |
| | | | | 20 | | F | 70.3 | 54.4 |
| | | | | 21 | | F | 68.7 | 56.8 |
| | 11 | 2 | 5 | Sept. 28 | | F | 61.1 | 51.5 |
| | | | | 29 | | M | 66.8 | 53.3 |
| | | | | 29 | | F | 65.4 | 52.6 |
| | | | | 30 | | M | 63.6 | 50.5 |
| | | | | Oct. 4 | | F | 58.2 | 46.6 |
| | | | | 4 | | M | 62.1 | 48.7 |
| | | | | 5 | | M | 67.3 | 54.4 |
| | | | | 6 | | F | 61.7 | 50.5 |
| | | | | 11 | | F | 63.8 | 51.4 |
| | | | | 11 | | M | 62.0 | 48.4 |
| | | | | 18 | | F | 61.8 | 50.8 |
| | | | | 18 | | M | 71.8 | 56.0 |
| | | | | 18 | | M | 67.3 | 52.7 |
| | | | | 20 | | F | 63.6 | 50.9 |
| | | | | 20 | | M | 70.7 | 55.8 |
| | | | | 21 | | F | 65.3 | 52.7 |
| | | | | 21 | | F | 67.2 | 54.3 |
| | | | | 21 | | F | 67.4 | 53.4 |
| | | | | 22 | | F | 63.0 | 51.1 |
| | | | | 26 | | M | 65.0 | 53.0 |
| Kelvin Creek | 3 | 2 | 7 | Sept. 23 | | - | 67.3 | 56.6 |
| | | | | 26 | | F | 65.1 | 52.5 |
| | | | | 28 | | F | 62.8 | 51.0 |
| | | | | 28 | | F | 65.2 | 53.5 |
| | | | | 29 | | F | 67.5 | 54.2 |
| | | | | 29 | | M | 61.4 | 47.8 |
| | | | | 30 | | M | 60.1 | 48.2 |
| | | | | 30 | | F | 59.6 | 48.8 |
| | | | | 30 | | M | 66.8 | 52.8 |
| | | | | 30 | | M | 58.4 | 45.5 |
| | | | | Oct. 4 | $4_3$[c] | F | 65.9 | 51.2 |
| | | | | 4 | | F | 63.8 | 51.5 |
| | | | | 4 | | M | 47.8 | 37.6 |

APPENDIX 33 (cont.)

| Tagging Location | C.W.T. Code $D_1$ | Ag | $D_2$ | Recovery Date | Age[a] | Sex | Length(cm) Nose-Fork | Postorbital-Hypural |
|---|---|---|---|---|---|---|---|---|
| Kelvin Creek | 3 | 2 | 7 | Oct. 4 | | F | 59.7 | 47.1 |
| | | | | 4 | | M | 59.6 | 47.5 |
| | | | | 5 | | M | 67.3 | 53.2 |
| | | | | 6 | | F | 63.8 | 52.3 |
| | | | | 6 | | M | 73.4 | 58.7 |
| | | | | 6 | | F | 63.4 | 51.9 |
| | | | | 13 | | M | 72.6 | 58.5 |
| | | | | 18 | | M | 76.3 | 57.1 |
| | | | | 18 | | F | 75.7 | 53.9 |
| | | | | 18 | | F | 55.7 | 44.6 |
| | | | | 19 | | F | 62.3 | 51.1 |
| | | | | 19 | | M | 74.9 | 58.5 |
| | | | | 20 | | F | 65.4 | 53.4 |
| | | | | 20 | | F | 67.5 | 54.9 |
| | | | | 26 | | M | 69.5 | 55.5 |
| | 4 | 2 | 7 | Sept. 22 | | M | 68.2 | 55.0 |
| | | | | 23 | | M | 52.7 | 44.6 |
| | | | | 23 | | F | 67.2 | 54.3 |
| | | | | 26 | | M | 44.6 | 36.2 |
| | | | | 28 | | M | 73.3 | 59.0 |
| | | | | 28 | | F | 65.3 | 51.9 |
| | | | | 28 | | F | 66.4 | 53.9 |
| | | | | 29 | | M | 65.6 | 51.1 |
| | | | | 29 | | M | 57.9 | 45.3 |
| | | | | 29 | | M | 53.4 | 42.1 |
| | | | | 30 | | M | 66.0 | 53.4 |
| | | | | 30 | | F | 54.5 | 43.9 |
| | | | | 30 | | M | 54.8 | 42.6 |
| | | | | 30 | | M | 67.6 | 53.5 |
| | | | | Oct. 4 | | F | 59.6 | 47.6 |
| | | | | 4 | | F | 66.4 | 52.4 |
| | | | | 4 | | M | 67.2 | 51.7 |
| | | | | 4 | | F | 56.9 | 46.1 |
| | | | | 5 | | F | 64.6 | 53.5 |
| | | | | 7 | | F | 65.8 | 55.2 |
| | | | | 13 | | F | 61.6 | 51.7 |
| | | | | 19 | | F | 62.7 | 51.5 |
| | | | | 21 | | F | 63.7 | 52.1 |
| - | No pin | | | Sept. 26 | | M | 64.1 | 48.7 |
| | | | | 28 | | F | 65.0 | 53.1 |
| | | | | 28 | | F | 67.3 | 55.2 |
| | | | | 28 | | F | 65.6 | 52.8 |
| | | | | 30 | | M | 62.7 | 48.2 |
| | | | | 30 | | F | 57.0 | 46.5 |
| | | | | 30 | | F | 72.1 | 56.4 |
| | | | | Oct. 4 | | M | 60.8 | 47.3 |
| | | | | 11 | | M | 68.1 | 54.1 |
| | | | | 13 | | F | 62.4 | 52.2 |

APPENDIX 33 (cont.)

| Tagging Location | C.W.T. Code $D_1$ Ag $D_2$ | Recovery Date | Age[a] | Sex | Length(cm) Nose-Fork | Length(cm) Postorbital-Hypural |
|---|---|---|---|---|---|---|
| - | No pin | Oct. 18 | | F | 63.3 | 51.0 |
| | | 19 | | M | 70.6 | 54.6 |
| | | 19 | | F | 65.6 | 53.4 |
| | | 19 | | M | 61.8 | 49.3 |
| | | 20 | | F | 66.6 | 54.8 |
| | | 20 | | F | 67.3 | 53.9 |
| | | 20 | | F | 66.0 | 53.6 |
| | | 21 | | M | 75.2 | 61.3 |
| | | 21 | | F | 68.9 | 58.3 |
| | | 22 | | M | 68.8 | 54.5 |
| | | 26 | | M | 66.9 | 53.8 |
| | | 27 | | F | 69.5 | 56.8 |
| | Lost | Sept. 30 | | F | 55.1 | 44.5 |
| | | Oct. 5 | | F | 63.5 | 52.7 |
| | | 5 | | F | 68.7 | 56.8 |
| | | 21 | | F | 68.9 | 54.7 |
| | | 22 | | M | 61.8 | 50.1 |

Summary:

| | |
|---|---|
| C.W.T. Recoveries | 177 |
| No pins | 22 |
| Lost pins/head | 5 |
| Total no. of marked coho checked | 204 |

[a]Coho age $3_2$ from C.W.T.

[b]Coho scale read as age $3_2$; tagged in 1975.

[c]Coho scale read as age $4_3$; tagged in 1976.

APPENDIX 34 RECOVERY DATA FOR ADIPOSE-CLIPPED COHO SALMON FROM THE COWICHAN-KOKSILAH SPAWNING GROUND DEAD RECOVERY,

| 1976 Recovery Location | Date Recovered | Tagging[b] Location | C.W.T.[a] Code $D_1$ | Ag | $D_2$ | Sex | Length(cm) Nose-Fork | Postorbital-Hypural |
|---|---|---|---|---|---|---|---|---|
| Rotary Park Pools | Jan. 5 | RP | 9 | 2 | 5 | F | 54.9 | 43.8 |
| | 24 | RP | 10 | 2 | 5 | M | 63.0 | 48.0 |
| | 31 | RP | 9 | 2 | 5 | F | 66.1 | 51.5 |
| | 31 | RP | 10 | 2 | 5 | F | 64.9 | 52.1 |
| | Feb. 2 | RP | 9 | 2 | 5 | F | 63.9 | 51.1 |
| | 2 | RP | 9 | 2 | 5 | M | 49.2 | 38.4 |
| | 4 | RP | 10 | 2 | 5 | M | 64.7 | 48.3 |
| | 7 | RP | 9 | 2 | 5 | M | 65.6 | 51.1 |
| | 11 | RP | 9 | 2 | 5 | M | 64.8 | 47.6 |
| | 11 | RP | 9 | 2 | 5 | F | 52.7 | 41.9 |
| | 11 | RP | 9 | 2 | 5 | F | 57.1 | 45.9 |
| Cowichan R. (Section 1) | Dec. 14 | | No pin | | | M | 71.7 | 55.9 |
| | 14 | RP | 9 | 2 | 5 | F | 59.7 | 47.9 |
| | Jan. 3 | RP | 10 | 2 | 5 | F | 65.0 | 51.8 |
| | 13 | RP | 10 | 2 | 5 | M | 63.2 | 50.1 |
| | 13 | | No pin | | | M | 72.8 | 54.8 |
| | 13 | CS ch | 14 | 2 | 5 | M | 70.0 | 53.0 |
| | 18 | | No pin | | | F | 63.5 | 50.4 |
| | 21 | RP | 9 | 2 | 5 | M | 65.5 | 50.3 |
| | 26 | | No pin | | | M | 77.4 | 60.0 |
| | 31 | RP | 9 | 2 | 5 | F | 60.4 | 48.6 |
| Cowichan R. (Section 2) | Dec. 29 | RP | 10 | 2 | 5 | F | 66.0 | 53.8 |
| | Jan. 13 | RP | 9 | 2 | 5 | F | 60.5 | 47.6 |
| | 13 | RP | 10 | 2 | 5 | F | 60.9 | 53.6 |
| | 18 | RP | 10 | 2 | 5 | F | 70.0 | 55.0 |
| | 21 | RP | 10 | 2 | 5 | M | 67.0 | 51.5 |
| Cowichan R. ( Section 3) | Dec. 2 | RP | 10 | 2 | 5 | – | – | – |
| | 2 | CS ch | 14 | 2 | 5 | – | – | – |
| | 21 | RP | 9 | 2 | 5 | F | 56.5 | 45.7 |
| | Jan. 3 | RP | 9 | 2 | 5 | F | 61.5 | 50.9 |
| | 3 | CS ch | 14 | 2 | 5 | F | 65.7 | 52.2 |
| | 7 | RP | 10 | 2 | 5 | F | 62.7 | 48.6 |
| | 7 | RP | 10 | 2 | 5 | F | 71.5 | 56.9 |
| | 13 | RP | 9 | 2 | 5 | F | 68.0 | 53.4 |
| | 13 | CS ch | 14 | 2 | 5 | M | 76.5 | 58.0 |
| | 21 | | No pin | | | M | 45.6 | 37.1 |
| | 21 | CS ch | 14 | 2 | 5 | F | 65.2 | 52.4 |
| Cowichan R. (Section 4) | Dec. 3 | | No pin | | | F | 57.4 | 44.1 |
| Robertson R. | Dec. 22 | P | 6 | 2 | 5 | F | 62.8 | 48.8 |

| | | |
|---|---|---|
| Summary: | No. of C.W.T. recoveries | 33 |
| | No. of no pins | 6 |
| Total | No. of marked coho checked | 39 |

APPENDIX 34 (cont.)

1977

| Recovery Location | Date Recovered | Tagging[b] Location | C.W.T.[a] Code $D_1$ | Ag | $D_2$ | Sex | Length(cm) Nose-Fork | Postorbital-Hypural |
|---|---|---|---|---|---|---|---|---|
| Rotary Park Pools | No date | RP | 5 | 2 | 7 | M | | 46.8 |
| | | | No pin | | | F | 53.0 | 42.0 |
| | | CS ch | 10 | 2 | 7 | M | 70.0 | 52.0 |
| | | RP | 6 | 2 | 7 | F | | 50.5 |
| | | RP | 6 | 2 | 7 | M | 71.5 | 55.0 |
| | Dec. 21 | | No pin | | | F | | 40.6 |
| | 21 | | No pin | | | F | | 53.7 |
| | Jan. 6 | | No pin | | | M | 52.4 | 42.3 |
| | 13 | RP | 6 | 2 | 7 | M | | 42.0 |
| | 19 | | No pin | | | M | 68.0 | 51.3 |
| | 25 | RP | 6 | 2 | 7 | F | | 51.0 |
| | 25 | | No pin | | | F | | 49.2 |
| | 25 | RP | 6 | 2 | 7 | M | | 45.2 |
| Cowichan Side Channel | Dec. 20 | CS ch | 14 | 2 | 5[c] | M | 75.1 | 56.2 |
| Kelvin Ck. | Nov. 1 | K | 3 | 2 | 7 | M | 74.5 | 56.2 |
| | Dec. 5 | K | 4 | 2 | 7 | | | |
| | Dec. 6 | K | 4 | 2 | 7 | M | | 46.7 |
| | 21 | K | 4 | 2 | 7 | F | | 52.7 |
| Pastuch Ck. | Dec. 5 | M | 11 | 2 | 5 | F | | 52.9 |
| | 12 | M | 8 | 2 | 7 | M | | 55.9 |
| | 12 | | No pin | | | M | | 56.4 |
| | 22 | | No pin | | | F | | 50.3 |
| | 22 | | No pin | | | F | | 57.7 |
| | Jan. 17 | | No pin | | | F | 49.2 | |
| Mesachie Ck. | Nov. 22 | M | 8 | 2 | 7 | F | 62.5 | 56.4 |
| | 24 | M | 13 | 2 | 7 | M | | 53.5 |
| | 24 | M | 8 | 2 | 7 | | | 53.3 |
| | 24 | M | 8 | 2 | 7 | M | | 47.2 |
| | 28 | M | 13 | 2 | 7 | F | | 54.6 |
| | 28 | M | 7 | 2 | 7 | F | | 53.3 |
| | 28 | M | 11 | 2 | 5 | | 47.1 | 36.5 |
| | 28 | M | 11 | 2 | 5 | F | | 48.1 |
| | 28 | M | 11 | 2 | 5 | M | | 51.0 |
| | 28 | M | 7 | 2 | 7 | F | | 55.2 |
| | 28 | M | 8 | 2 | 7 | F | | 52.4 |
| | 30 | M | 8 | 2 | 7 | F | | 53.3 |
| | 30 | M | 8 | 2 | 7 | M | 72.1 | 52.3 |
| | 30 | M | 8 | 2 | 7 | F | | 52.5 |
| | Dec. 6 | M | 8 | 2 | 7 | F | | 45.8 |
| | 8 | M | 13 | 2 | 7 | M | | 51.5 |
| | 22 | M | 11 | 2 | 5 | F | | 50.9 |
| | 22 | M | 9 | 2 | 7 | F | | 49.5 |
| | 28 | M | 8 | 2 | 7 | F | | 50.0 |

APPENDIX 34 (cont.)

1977

| Recovery Location | Date Recovered | Tagging[b] Location | Wire Code $D_1$ | Ag | $D_2$ | Sex | Length(cm) Nose-Fork | Postorbital-Hypural |
|---|---|---|---|---|---|---|---|---|
| Mesachie Ck. | Jan. 3 | M | 13 | 2 | 7[d] | M | | 54.5 |
| | 18 | | No pin | | | F | 53.3 | |
| | 23 | M | 13 | 2 | 7 | F | | 46.6 |
| Half Way Ck. | Dec. 12 | M | 8 | 2 | 7 | F | | 43.3 |
| | 14 | M | 8 | 2 | 7 | M | 62.1 | 46.6 |
| | 20 | M | 11 | 2 | 5 | F | | 52.4 |
| | 20 | M | 11 | 2 | 5 | F | | 53.7 |
| | 20 | M | 11 | 2 | 5 | F | | 54.2 |
| | 20 | M | 11 | 2 | 5 | F | 67.4 | 52.4 |
| Glenora Ck. | Nov. 1 | K | 3 | 2 | 7 | | | 33.8 |
| | 9 | K | 4 | 2 | 7 | F | 63.5 | 57.1 |
| | 9 | K | 3 | 2 | 7 | M | | 61.6 |
| | 16 | K | 4 | 2 | 7 | F | 60.3 | 46.6 |
| | 17 | K | 3 | 2 | 7 | F | | 38.2 |
| | 17 | K | 3 | 2 | 7 | F | | 48.5 |
| | 17 | K | 3 | 2 | 7 | M | 69.9 | 52.0 |
| | 17 | M | 8 | 2 | 7 | M | | 50.6 |
| | 17 | K | 3 | 2 | 7 | F | | 55.0 |
| | 21 | K | 3 | 2 | 7 | F | 59.0 | 47.2 |
| | 21 | K | 3 | 2 | 7 | F | | 56.5 |
| | 21 | K | 3 | 2 | 7 | F | | 46.7 |
| | 22 | K | 4 | 2 | 7 | M | | 51.3 |
| | 30 | K | 3 | 2 | 7 | F | | 53.6 |
| | Dec. 7 | K | 3 | 2 | 7 | F | | 56.4 |
| | 16 | K | 3 | 2 | 7 | F | | 56.3 |
| Robertson R. | Nov. 8 | P | 9 | 2 | 7 | M | 48.9 | |
| Robertson 1A | Nov. 15 | | | lost | | M | 77.0 | 57.5 |
| | Nov. 24 | M | 8 | 2 | 7 | F | 50.2 | 61.2 |
| | 24 | M | 11 | 2 | 5 | F | 63.0 | 50.3 |
| | 24 | M | 11 | 2 | 5 | F | 64.1 | 51.3 |
| | 24 | M | 8 | 2 | 7 | F | | 54.4 |
| | 24 | M | 8 | 2 | 7 | F | | 55.0 |
| | 24 | CS ch | 10 | 2 | 7 | F | | 54.0 |
| | 24 | M | 8 | 2 | 7 | F | | 55.0 |
| | 29 | M | 13 | 2 | 7 | F | 64.0 | 50.4 |
| | 29 | M | 11 | 2 | 5 | F | | 50.6 |
| | 30 | M | 8 | 2 | 7 | F | 61.3 | 47.6 |
| | Dec. 5 | M | 11 | 2 | 5 | F | 68.2 | 52.4 |
| | 5 | M | 8 | 2 | 7 | M | 62.4 | 47.6 |
| | 5 | M | 11 | 2 | 5 | F | | 41.2 |
| | 5 | RP | 5 | 2 | 7 | F | 62.4 | 49.4 |
| | 19 | M | 11 | 2 | 5 | F | 63.3 | 48.8 |
| | 19 | – | pin lost | | | M | | 57.9 |
| | 22 | RP | 5 | 2 | 7 | F | | 48.6 |
| | 22 | M | 13 | 2 | 7 | F | | 56.3 |
| | 22 | M | 7 | 2 | 7 | M | | 53.7 |

APPENDIX 34 (cont.)

1977

| Recovery Location | Date Recovered | Tagging Location | Wire[a] Code $D_1$ | Ag | $D_2$ | Sex | Length(cm) Nose-Fork | Postorbital-Hypural |
|---|---|---|---|---|---|---|---|---|
| | Jan. 3 | - | lost | | | F | | 54.0 |
| | Jan. 9 | M | 8 | 2 | 7 | M | | 57.4 |
| | 12 | - | lost | | | M | | 46.9 |
| | 12 | M | 11 | 2 | 5 | M | | 52.9 |
| | 12 | M | 8 | 2 | 7 | M | | 49.7 |
| | 18 | M | 8 | 2 | 7 | F | | 58.7 |
| | 18 | M | 8 | 2 | 7 | F | | 50.2 |
| | 18 | CS ch | 10 | 2 | 7 | F | | 56.7 |
| | 18 | M | 11 | 2 | 5 | F | | 50.4 |
| | 18 | M | 8 | 2 | 7 | F | | 50.5 |
| | 18 | M | 7 | 2 | 7 | F | | 52.6 |
| Cowichan R. | Dec. 19 | | No | pin | | - | | 56.1 |
| (Section 1) | 19 | RP | 6 | 2 | 7 | F | | 54.3 |
| | Jan. 10 | | No | pin | | F | | 48.6 |
| | 10 | M | 8 | 2 | 7 | M | | 53.8 |
| | 10 | K | 4 | 2 | 7 | F | | 57.9 |
| | 10 | RP | 6 | 2 | 7 | F | | 57.5 |
| | 10 | | No | pin | | M | | 51.5 |
| | 10 | M | 13 | 2 | 7 | M | | 50.8 |
| | 10 | M | 8 | 2 | 7 | M | | 55.6 |
| | 10 | M | 8 | 2 | 7 | F | | 56.1 |
| | 11 | | No | pin | | M | | 54.3 |
| | 11 | M | 8 | 2 | 7 | M | | 56.2 |
| | 11 | RP | 6 | 2 | 7 | F | | 55.0 |
| | 18 | M | 7 | 2 | 7 | M | | 55.7 |
| | 25 | RP | 6 | 2 | 7 | F | | 50.3 |
| | 25 | | No | pin | | F | | 46.3 |
| Cowichan R. | Dec. 28 | RP | 5 | 2 | 7 | F | | 52.0 |
| (Section 2) | 28 | RP | 5 | 2 | 7 | F | | 53.7 |
| | 28 | M | 13 | 2 | 7 | M | | 47.2 |
| | 28 | M | 11 | 2 | 7 | M | | 53.3 |
| | 28 | RP | 5 | 2 | 7 | M | | 50.0 |
| | 28 | M | 7 | 2 | 7 | M | | 52.4 |
| | Jan. 4 | | No | pin | | F | | 52.8 |
| | 4 | M | 8 | 2 | 7 | F | | 56.9 |
| | 12 | M | 11 | 2 | 5 | F | | 46.9 |
| | 20 | RP | 6 | 2 | 7 | F | | 45.2 |
| | 20 | | No | pin | | F | | 48.2 |
| | 20 | RP | 5 | 2 | 7 | F | | 53.1 |

APPENDIX 34 (cont.)

1977

| Recovery Location | Date Recovered | Tagging Location | Wire Code $D_1$ | Ag | $D_2$ | Sex | Length(cm) Nose-Fork | Postorbital-Hypural |
|---|---|---|---|---|---|---|---|---|
| Cowichan R. | Jan. 13 | CS ch | 10 | 2 | 7 | M | | 51.4 |
| (Section 3) | 13 | RP | 5 | 2 | 7 | M | | 52.5 |
| | 13 | RP | 5 | 2 | 7 | M | | 54.0 |
| | 16 | M | 13 | 2 | 7 | F | | 50.3 |
| | 16 | | No pin | | | F | | 47.2 |
| | 23 | CS ch | 10 | 2 | 7 | M | | 55.1 |
| | 26 | P | 9 | 2 | 7 | M | | 47.6 |
| | 26 | P | 9 | 2 | 7 | F | | 46.5 |
| Cowichan R. | - | CS ch | 10 | 2 | 7 | F | | 59.0 |
| (Section 4) | - | CS ch | 10 | 2 | 7 | F | | 53.8 |
| | Dec. 5 | RP | 6 | 2 | 7 | M | | 47.0 |
| | 29 | RP | 5 | 2 | 7 | F | | 53.0 |
| | Jan. 17 | | No pin | | | F | | 47.2 |
| Cowichan R. (Section 7) | Jan 26 | | | lost | | F | | 50.5 |

[a]Age $3_2$ from C.W.T.

[b]Tagging Location R.P. - Rotary Park Pools
CS ch - Cowichan R. side channel
K. - Kelvin Ck.
M. - Mesachie Ck.
P. - Pastuch Ck.

[c]Scale age read as $3_2$; tagged in 1975.

[d]Scale age read as $4_3$; tagged in 1976.

Summary:

| Recovery Location | NUMBERS C.W.T. | No pins | Lost pins | Total marks |
|---|---|---|---|---|
| Rotary Park Pools | 7 | 6 | 0 | 13 |
| Cowichan side channel | 1 | 0 | 0 | 1 |
| Kelvin Creek | 4 | 0 | 0 | 4 |
| Pastuch Creek | 2 | 4 | 0 | 6 |
| Mesachie Creek | 21 | 1 | 0 | 22 |
| Robertson River | 1 | 0 | 0 | 1 |
| Robertson 1A | 27 | 1 | 4 | 31 |
| Half Way Creek | 6 | 0 | 0 | 6 |
| Glenora Creek | 16 | 0 | 0 | 16 |
| Cowichan River | 32 | 9 | 1 | 42 |
| Totals | 117 | 20 | 5 | 142 |

## Date Due

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