APPENDIX VIII

SUMMARY OF FISH RESOURCES

SUMMARY OF FISH RESOURCES IN THE FRASER, HOMATHKO, AND KINGCOME RIVERS IN THE AREA OF TFL 43: SCOTT PAPER LIMITED

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1. INTRODUCTION

The following sections provide background information on fish resources in the areas encompassed by Scott Paper Limited's Tree Farm Licence (TFL) 43. These areas incorporate tree farming lands for broadleaf trees within watersheds of the Fraser, Homathko, and Kingcome rivers along the southern mainland coast of British Columbia (see Map Atlas).

The objective of this review is to provide an overview of available information on fish populations for inclusion in a five year Management Plan covering the period 1995-1999, and to evaluate the sensitivity of fish resources in each of the cutting blocks. The review focuses on key species, primarily salmon and trout, that are important in commercial, sport, and Native fisheries in British Columbia.

The following sections are organized to include a summary of available information on specific fish habitat uses within TFL 43, including the timing and locations of spawning, size of spawning populations, timing of migrations, and any information on rearing or overwintering habitats. Additional general information is also provided on commercial, sport, and Native fisheries in the region, as well as any existing or proposed Salmonid Enhancement Program activities occurring within the general areas of TFL 43.

Information for this review was assembled from relevant sections of the previous Management Plan (Zallen and Faulkner 1989), with the major purpose of incorporating any more recent information that would augment the data base provided in the previous document. Information sources for the previous study (Zallen and Faulkner 1989) were from data supplied by the Department of Fisheries and Oceans (DFO), including technical publications and personal contacts with representatives within each of the DFO Management Areas, and several

research publications and unpublished consultant's reports covering the study watersheds. Most of the changes in this report involved updating records of salmon escapements and data on fish harvests, as well as a review of any more recent studies relevant to the area.

As indicated in previous reports, the information base covering the Fraser River areas of TFL 43 is much more extensive than for the Homathko and Kingcome rivers, as a result of its large size and the historical importance of the Fraser River in British Columbia fisheries. A range of data sources exist for the Fraser River, including comprehensive summaries of fish populations (such as Hoos and Packman 1974, Northcote 1974), DFO technical publications (Farwell et al 1987; McDonald 1991; Fraser et al 1982), and numerous unpublished reports (Winsby 1986; Kellerhals et al 1987; Beniston et al 1986; Zallen and Boyd 1986).

In contrast, information for the Homathko River is limited to DFO salmon escapement summaries, observations by DFO personnel, and investigations conducted in relation to potential hydroelectric generation (Bengeyfield et al 1984). Information for the Kingcome River is even more limited, restricted to one overview by Schultz International (1982), observations by DFO District Officers, and unpublished DFO file information.

2. FRASER RIVER

2.1 Description of the Study Area

The Fraser River is the largest river system in British Columbia, extending a total distance of 450 kilometres, with a drainage area 230,000 km^2 (Fraser et al 1982). The lower Fraser Block of TFL 43 extends over a portion of the lower River, located within the gravel reach of the Fraser River in the vicinity of Chilliwack. The area extends from Yaalstrick Island upstream to Cheam View Siding, and encompasses four distinct tree farming areas (see Map Atlas):

A. Small Islands mid channel north of Shefford Slough.

B. Small islands near the mouth of the Harrison River and a parcel of river margin land near Bateson Slough.

C. Several islands in the vicinity of Greyell Slough.

D. Several large islands and river margin lands extending upriver from Highway 9 bridge (Agassiz-Rosedale), including Herrling Island, south and east of the Seabird Island Indian Reserve and islands due west of Cheam View Siding.

2.2 Species Present

Northcote (1974) reported that thirty eight species of freshwater fish inhabit the lower Fraser River system below Hope, including anadromous populations that migrate to and from the sea during their life history, as well as semi-migratory and resident species, some of which exhibit marked migratory movements within the Fraser River system. Anadromous species in the Fraser River system that are found in TFL 43 include major populations of all five species of Pacific salmon: sockeye (*Oncorhynchus nerka*), chum (*O. keta*), pink (*O. gorbuscha*),

chinook (*O. tshawytscha*), and coho (*O. kisutch*); and two species of trout: steelhead (*Salmo gardneri*) and coastal cutthroat (*S. clarki*).

Semi-migratory species with recreational importance include rainbow trout (*S. gardneri*), mountain whitefish (*Prosopium williamsoni*), white sturgeon (*Acipenser transmountanus*), and Dolly Varden char (*Salvelinus malma*). There are also many species of coarse fish present in the system, such as squawfish (*Ptychocheilus oregonensis*), dace (*Rhinichthys* sp.), and shiners (*Richardsonius balteatus*), which are not utilized in Fraser River fisheries, but are potentially important components of the Fraser River food webs.

The following sections describe the important life history characteristics for each of the major species identified above, emphasizing important habitats that exist within the area of TFL 43.

As detailed below, the mainstem Fraser River is important as a migratory corridor for all of the key species, and in addition provides spawning habitat for pink and chum salmon. Chinook salmon is the dominant salmonid species that utilizes the mainstem areas for summer rearing. A summary of salmon escapements to various areas of the Fraser River system are provided in Table 1 and Figure 1, with detailed escapement summaries for the total Fraser system and the Harrison River included in Appendices A and B.

2.2.1 Pink Salmon

Pink salmon is the most abundant Pacific salmon species in British Columbia, and populations returning to spawn in the Fraser River system have exceeded three million fish since 1979 (Andrew and Webb 1987). This species is unique among the other salmon species in the regularity of its two year spawning cycle, and in the Fraser system virtually all

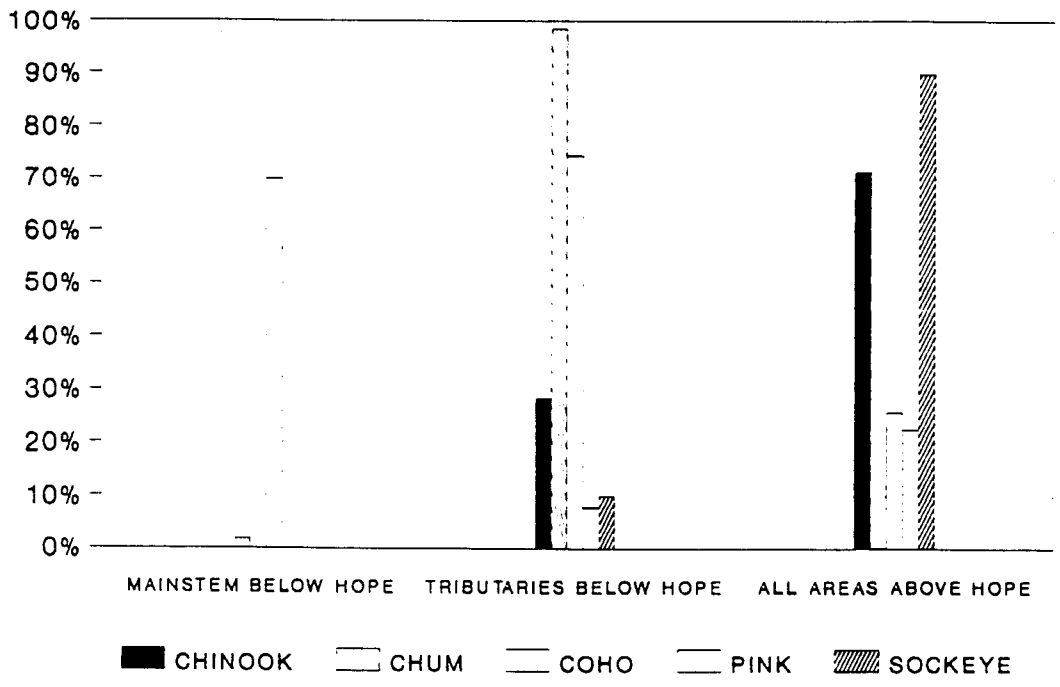


FIGURE 1: DISTRIBUTION OF SALMON SPAWNERS IN THREE GENERAL AREAS OF THE FRASER RIVER SYSTEM FOR THE PERIOD 1981-1985. (DATA FROM TABLE 1)

TABLE 1

AVERAGE ESCAPEMENTS OF SALMON TO THE FRASER RIVER SYSTEM
FROM 1951 - 1985
(Adapted from Farwell et al., 1987)

PERIOD	CHINOOK	CHUM	COHO	PINK*	SOCKEYE**	TOTAL
TOTAL SYSTEM						
1951-60	56,170	130,501	70,726	1,660,434	1,355,906	3,273,737
1961-70	47,409	322,042	76,476	1,520,566	1,260,421	3,226,914
1971-80	66,207	338,906	65,016	2,174,953	1,221,431	5,439,603
1981-85	83,676	510,954	58,211	5,193,524	1,902,622	7,748,987
MAINSTREAM AREAS BELOW HOPE:						
1951-60	0	118,918	0	916,429	0	1,035,347
1961-70	0	64,327	0	661,736	0	726,063
1971-80	0	3,550	0	876,466	0	880,016
1981-85	0	8,503	0	3,620,237	0	3,628,740
TRIBUTARIES BELOW HOPE:						
1951-60	10,640	118,609	48,053	510,795	127,636	815,733
1961-70	9,808	264,148	55,207	437,354	130,920	897,437
1971-80	20,882	338,196	49,005	308,385	192,221	908,689
1981-85	23,968	502,257	43,233	407,852	191,219	1,168,723
AREAS ABOVE HOPE:						
1951-60	36,530	N/R	22,673	233,210	1,228,270	1,520,683
1961-70	37,601	25	21,269	421,476	1,129,501	1,609,872
1971-80	45,325	N/R	16,011	990,102	1,029,210	1,189,648
1981-85	59,708	194	14,978	1,165,434	1,711,403	6,440,804

N/R: No record for survey period.
* Pink Salmon: Odd-numbered years only.
** Sockeye Salmon: Refers to stocks above and below Lytton, not Hope.

pink salmon return to spawn in odd-numbered years. This species does not rear in freshwater, and salmon fry migrate seaward soon after emergence in the early spring. Young pink salmon are therefore not present within TFL 43, except during the spring period of downstream migration following odd-numbered year spawning.

Pink salmon consistently use areas within TFL 43 for spawning, including the lower mainstem of the Fraser River between Chilliwack and Hope, as well as the Harrison River (Figure 1). The population of pink salmon in this region appear to have been increasing, with over seven million and twelve million fish recorded for the 1989 and 1991 runs, respectively (Appendix A). Since 1979, 40 to 81% of these returning adults to the Fraser have been estimated to spawn in the lower Fraser mainstem areas, and there has been an increase in the percentage of pinks using this area for spawning since 1971 (Table 2). Pink salmon spawning in the Harrison River, another area partially encompassed by TFL 43, has represented 3 to 8% of the spawning population during this period (Table 2).

Pink salmon migrations generally consist of two distinct runs. The early run usually arrives in the lower Fraser River (Glen Valley) during mid-September and spawns during late September through early October. These fish primarily utilize areas in the mainstem lower Fraser, as well as the Thompson and Seton/Anderson rivers (above the Fraser Canyon). A later run spawns principally in the Harrison, Vedder and other Fraser River tributaries during the latter part of October (Aro and Shepard 1967).

The spawning areas utilized by pink salmon in the lower Fraser mainstem have not been summarized in detail, although Saxvik (1978) completed a detailed enumeration of pink salmon spawning in various sub-areas of the mainstem during 1977. Ward (1959) had indicated that

TABLE 2

PERCENT DISTRIBUTION OF PINK SALMON SPAWNERS USING THE LOWER FRASER RIVER MAINSTEM AND THE HARRISON RIVER SINCE 1971
(Adapted from Kellerhals et al., 1987)

SPAWNING AREA	1971	1973	1975	1977	1979	1981	1983	1985
Lower Fraser River Mainstem	50.6	43.8	23.0	31.6	42.9	50.3	71.5	81.4
Harrison River	5.9	12.0	13.5	5.6	7.7	7.1	3.2	6.9

the major mainstem spawning areas extend from the Sumas River confluence to Jones Creek, and this general observation is consistent with the detailed carcass surveys undertaken in 1977 (Saxvik 1978), where highest densities of carcasses were found between the Agassiz-Rosedale Bridge and Cheam Island. However, fisheries personnel experienced in the Fraser system indicated that pink salmon spawning is generally very widespread throughout the mainstem, changes with each run, and it is not obvious which specific areas within the mainstem are consistently important spawning grounds (Kellerhals et al 1987). Furthermore, if pink salmon escapements to the Fraser River remain at relatively high levels, it is speculated that they will utilize more extensive areas of the river for spawning, including less preferred peripheral areas (Winsby 1986).

Water depths do not generally appear to be a major determinant in the choice of spawning areas. In the Thompson River, pink salmon were observed over a wide range of depths (0.5-5 m), and some spawning was documented in areas which subsequently became dewatered over the winter low-flow period (Beniston and Lister 1984). Similarly, observations in the Fraser mainstem indicated that pink salmon utilize both shallow and relatively deep areas of the river for spawning (up to 8 m) (P.Saxvik, pers. comm., In: Kellerhals et al 1987).

As indicated earlier, pink salmon fry migrate seaward in April and May, immediately after emergence from the spawning gravels, and studies by Levy et. al. (1982) indicate that pink fry are present in the tidal channels of the Fraser River estuary from early March to mid-June with peak abundance occurring during April.

The available information, therefore, suggests that areas of the Fraser and Harrison rivers within TFL 43 are used extensively for spawning by early and late runs of pink salmon during odd numbered years.

However, juvenile pink salmon do not rear in these areas, since they migrate directly to sea after emergence.

2.2.2 Chum Salmon

The chum salmon resources which utilize the Fraser River and its tributaries represent a significant portion of the total chum population in British Columbia. For example, Palmer (1972) estimated that the Fraser River fish normally constitute over 30% of the total commercial chum salmon catch that enters Johnson Strait from Queen Charlotte Sound. A large percentage of these fish use both the lower mainstem of the Fraser River and its tributary streams (Stave, Chilliwack, Vedder, and Harrison rivers) for spawning (Palmer 1972; Zallen and Farwell 1985). Although estimates during the periods 1951-60 and 1961-70 indicate a relatively large proportion of chum salmon utilizing mainstem spawning areas within the area of TFL 43, more recent estimates suggest that less than 2% of the spawning escapement utilizes these areas (Table 1; Figure 1).

Returning adult chum salmon are known to migrate upstream in the Fraser River during the period August through mid-January (Palmer, 1972), with spawning in the Fraser River mainstem occurring primarily from late October through December. Two periods of intensive spawning may occur during mid-November and mid-December (Zallen and Farwell 1985).

The locations of chum salmon spawning in the mainstem Fraser River have been documented during several investigations (Palmer 1972; and Zallen and Farwell 1985). Unlike pink salmon, described earlier, locations of chum salmon spawning are more readily identified, since they tend to concentrate in relatively discrete locations near shore. Wahleach Slough (Herrling Island), within Area D of TFL 43, is the most heavily utilized

area for chum salmon spawning. Although other key areas where concentrations of fish have been observed include:

LEFT (SOUTH) BANK	RIGHT (NORTH) BANK
Mouth of the Coquihalla River	Upstream of Hope Bridge
Bristol Island	Johnson Slough
Hope Airport	N.E. of Agassiz Bridge
Upstream of Hunter Creek	
Between Hunter and Jones creeks	
Downstream end of Peter's Island	
* Below Jones Hill	
* Greyell Slough	
* Gill Island Bars	

* Within TFL 43

In addition to these areas below Hope, aerial surveys and Native gillnet catches have also documented some spawning chum salmon upstream of Hope as far as North Bend, although these populations represent only a minor proportion of the mainstem population (Zallen and Farwell 1985)

In general, the areas where chum salmon concentrate appear to be relatively near shore, including side channels or tributary mouths. Often these areas are associated with some groundwater or subsurface flows (Zallen and Farwell 1985; Bengeyfield et al 1984; Martin and Zallen 1986).

Chum salmon, like pink salmon, do not rear in fresh water, and they begin their downstream seaward migration following emergence, usually during March to early June. The peak occurrence of juveniles documented near Mission, occurs between April and May (Northcote 1974), and Levy et al (1982) indicate fry presence in the Fraser River estuary tidal channels from March 1 to June 15, with peak abundance from late March to mid May.

Based on the above information, the Fraser River mainstem, within TFL 43, and particularly Wahleach Slough, represents important habitat for chum salmon migrations and spawning. These areas are not utilized during the summer months for juvenile rearing.

2.2.3 Chinook

The Fraser River below Hope is an important area for chinook salmon production, but virtually all of the spawning occurs in tributary systems. For example, estimates of chinook spawners by Farwell et al (1987) indicate that for the period 1981-85, approximately 30% of the average annual escapement to the Fraser system utilized tributary systems below Hope, primarily in the Harrison River but also many of the smaller tributaries (Figure 1). Based on escapements from 1981-85, the total population of chinook spawning in the Fraser River averaged approximately 84,000 (Farwell et al 1987). Chinook salmon are presently considered to be threatened salmon species and increased escapements since 1980 reflect the focus of intensive management programs and enhancement programs aimed at increasing the size of spawning chinook salmon stocks (Appendix A).

Chinook salmon spawning migrations in the Fraser River are generally characterized by three distinct runs (Fraser et al 1982). The earliest run begins as early as March, but occurs primarily during June and July, and represents chinook destined for tributary systems above Hope. A second run, with peak numbers during August is represented by chinook salmon that spawn in the North and South Thompson rivers, and the last run, usually dominant during September and October, represents the Harrison River population, the dominant stock below Hope.

The degree to which chinook salmon rear in freshwater varies, depending on the stock. A substantial number of chinook fry emigrate

directly to sea following emergence, and appear to originate from the late run population (November), probably from the Harrison River. These fish migrate downstream from mid-March to mid-May (Fraser et al 1982). Other chinook may also migrate during their first year, as underyearling fish, after 60-150 days in freshwater.

Finally, another segment of the chinook population remains in freshwater habitats over winter and migrate to sea in their second spring, with peak migrations coinciding with high flows during May (Fraser et al 1982). These chinook utilize mainstem Fraser River habitats, including areas within TFL 43. During the spring and summer, these chinook juveniles appear to be the dominant salmonid species in the mainstem of the Fraser between the Sumas River and Hope, usually representing over 80 percent of the populations sampled (Zallen and Boyd 1986; Beniston et al 1986).

These juvenile chinook utilize a wide variety of habitats in the mainstem over the summer, and are found along virtually all shoreline areas, including almost all gravel bars. However during high flow periods (May/June), they appear to be concentrated in backwater areas or low velocity zones along heavily vegetated banks (Zallen and Boyd 1986; Beniston et al 1986). Highest densities occur during the June-August period. For most of the summer these fish are concentrated to within a few (<10 m) of the shoreline. Later in the summer, as these fish grow they may utilize deeper, swifter river habitats further from shore.

There is very limited information on overwintering in the mainstem. They have been documented to be present in a variety of habitats, including the interstices of cobble shorelines (Whelen and Slaney 1986), rip-rap (Beniston et al 1986; Zallen and Boyd 1986; C. Rice, pers. comm.), or in deep pools (>5m) (Zallen and Boyd 1986). It was observed in recent sampling efforts that overwintering chinook seem to prefer

covered habitats where some flow is evident, and they avoid areas of dead water, such as stranded water in side channels.

The areas of TFL 43, therefore, are important for chinook salmon migrations, juvenile rearing and, to some degree,overwintering. These areas are not utilized for chinook spawning.

2.2.4 Sockeye Salmon

The Fraser River system is one of the most important rivers for sockeye salmon production in the world (Norhtcote, 1974), but, with the exception of the Harrison River run, most of the spawning and rearing activities for this species occur outside of the areas in TFL 43 (Figure 1). Average escapements to the Fraser system for the period 1981-85 averaged approximately two million fish, although the numbers vary considerably depending on the year class of sockeye spawning in a particular year (Table 1). Based on the 1981-85 average, approximately 9% utilize the Harrison River, with less than 1% utilizing other tributaries below Lytton. The remainder of the fish spawn in Tributaries above Lytton (Farwell et al 1987). During some years, however, when low numbers of spawners return to tributaries in the upper Fraser, escapements to areas below Lytton may represent as much as 25% of the total escapement. As indicated in Figure 1, sockeye do not generally spawn in the Fraser River mainstem (Northcote 1974).

The timing of adult migrations depends, to some degree, on the spawning stock. Most runs through the lower Fraser mainstem begin in late May or June, peak mid-July and August, and continue to mid-September (Northcote 1974). The Harrison River run generally occurs later, however, primarily during October and November (Aro and Shepard 1967).

After emergence the following spring, most sockeye rear in lakes for one year or more prior to seaward migration. One exception to this pattern, however, is the Harrison River sockeye stock, where the progeny outmigrate directly to the sea as fry (Northcote, 1974). Sockeye smolts (usually one year old) move seaward during April and May.

With respect to the mainstem area within TFL 43, the foregoing information suggests that these areas primarily represent a migratory corridor for sockeye salmon, during their upstream spawning migrations during the fall and downstream juvenile migrations during Spring.

2.2.5 Coho Salmon

Significant numbers of coho are produced from the Fraser system below Hope, however this species does not extensively utilize the mainstem habitats in TFL 43 for spawning or rearing. Farwell et al (1987) indicate that for the period 1981-85, 74% of the estimated total Fraser River escapement (approximately 58,000 fish) has utilized tributary systems below Hope (Table 1, Figure 1). Coho spawn in more than 150 tributaries of the Fraser River, with major runs to the Lillooet, Chilliwack, and Harrison rivers (Farwell et al 1987).

Coho salmon adults migrate upstream from approximately mid-July through December, but spawning in some tributaries can continue throughout the winter period (Northcote 1974; Fraser et al 1982).

Coho salmon generally spend at least one year in tributary streams before moving downstream as smolts between mid-April and mid-June, and they have not been documented in any significant numbers in the mainstem Fraser River within TFL 43 (Beniston et al 1986; Zallen and Boyd 1986).

The mainstem river areas within TFL 43 act primarily as a migratory corridor for coho salmon during both upstream spawning and downstream juvenile migrations.

2.2.6 Steelhead

Steelhead is the anadromous form of rainbow trout, and is one of the most highly-prized sport species in British Columbia. Unlike salmon, steelhead spawn during the spring, with fry emerging later during the spring and early summer. There are no summaries of steelhead escapements for the Fraser system below Hope, but several tributaries important for steelhead production occur in this area, including the Coquihalla, Pitt, Chilliwack, and Harrison rivers (Northcote 1974).

Adult steelhead generally enter spawning streams during either the summer or winter period, as two distinct runs. The first migration generally occurs between June to September (the summer run), while the later occurs during November and April (the winter run). Summer run fish generally will remain in tributary systems until spawning occurs the following spring, while winter run fish spawn soon after reaching their tributary systems in the early spring. Most of the young rear in fresh water for three or four years, although a few individuals migrate downstream within the first year. The period of downstream migration usually coincides with the downstream movement of juvenile salmon in the spring, probably during the period April to early-June (Northcote 1974).

On the basis of the above information, the Fraser River areas of TFL 43 are important primarily as a migratory corridor for steelhead during upstream and downstream migrations.

2.2.7 Cutthroat

Both anadromous and resident cutthroat trout occur in the Fraser River, and are believed to use tributaries of the Fraser below Hope for spawning and rearing, although some individuals are probably present to some degree in the mainstem river areas throughout the year. There are no summaries of population estimates for the lower Fraser system. Upstream migrations of anadromous cutthroat trout generally occur during the late fall, with fish entering tributaries for spawning during the period from early December through mid March (B. Land, pers. comm. In: Martin and Zallen 1986). Juvenile trout may either proceed downstream after emergence or rear upstream in tributaries for up to three years (Northcote 1974). Resident cutthroat are also present to some degree in many tributary streams as well as the Fraser mainstem, although there is little documentation of their abundance.

Apart from migrations through the mainstem areas of TFL 43, cutthroat trout do not appear to extensively spawn or rear in habitats within these areas.

2.2.8 Other species

As indicated earlier, other fish species also utilize the Fraser River system for migration, spawning, and rearing. However, information on these species is more limited, compared to information for salmon and trout, due to the fact that most studies have focused on these latter species. Dolly Varden char occur in the Fraser River and many tributaries, and some forms are anadromous, like coastal cutthroat trout. However Dolly Varden appear to be much less abundant than cutthroat trout (Northcote 1974). This species, like salmon, spawns during the fall and winter (Scott and Crossman 1973). Mountain whitefish are also present in very low numbers in the Fraser River mainstem below Hope, and do not appear to represent a significant proportion of the fish populations in either the mainstem river or its tributaries. This species also spawns in the fall.

White sturgeon are present in the Fraser River below Hope and along coastal waters near the mouth of the River. The populations of this species are poorly documented, but they are believe to ascend the Fraser at the time of the Eulachon run (April) and spawn in the river, possibly in the lower Fraser Canyon, during the spring and early summer. A downstream migration of juveniles is believed to occur in July and August (Northcote 1974).

Eulachon (*Thaleichthys pacificus*) are present in the river, but are believed to only migrate upstream as far as Mission each spring to spawn, and Longfin smelt (*Spirinchus thaleichthys*) are known to migrate through the lower Fraser between October and December, and also spawn upstream in mainstem, but probably in areas below TFL 43. Young smelt are believed to migrate seaward to rear in the channels of the Fraser River delta (Northcote 1974). Surf smelt (*Hypomesus*

pretiosus) spawn and rear only in the lower river channels, and probably do not extend into the areas of TFL 43.

2.3 Fraser River Fisheries

2.3.1 Commercial Fishery

The Fraser River is one of the most important areas for commercial fishing in British Columbia, however all of the harvests within the river are taken in the Georgia Strait troll fishery and terminal gill net fishery in areas downstream of TFL 43 near mouth of the Fraser River (Management Area 29-from the mouth of the Fraser upstream to the Mission bridge). The most sought after commercial species in the Fraser River are sockeye, followed by pink, chum, chinook, and coho (IEC Beak 1983).

2.3.2 Sport Fishery

The Fraser River mainstem within TFL 43 supports an important sport fishery, and the major species caught are coho and chinook salmon, cutthroat, steelhead and rainbow trout, Dolly Varden char, mountain whitefish, and white sturgeon (IEC Beak 1983).

Most of the angling occurs off of mainstem gravel bars in the area between Hope and Mission, and fishing activities are most concentrated during the late summer and fall period, August through November (Figures 2 and 3; Table 3). Unpublished creel surveys conducted by DFO indicate that some important areas occur within TFL 43. These include Englebrich and Queens Island where 40-50 anglers may be present on a typical weekend day, as well as other areas where several anglers consistently fish. The most intensively utilized fishing site near TFL 43 is at a location known as Bowman's, downstream of Chilliwack

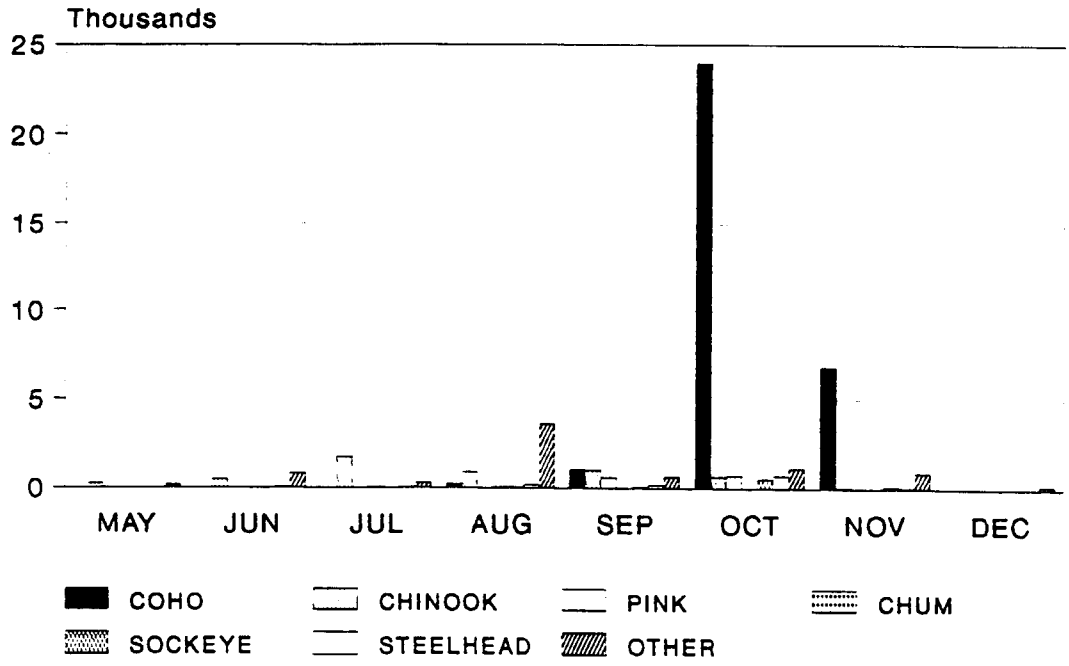


FIGURE 2: DISTRIBUTION OF SPORT CATCH IN THE LOWER FRASER RIVER DURING 1987.

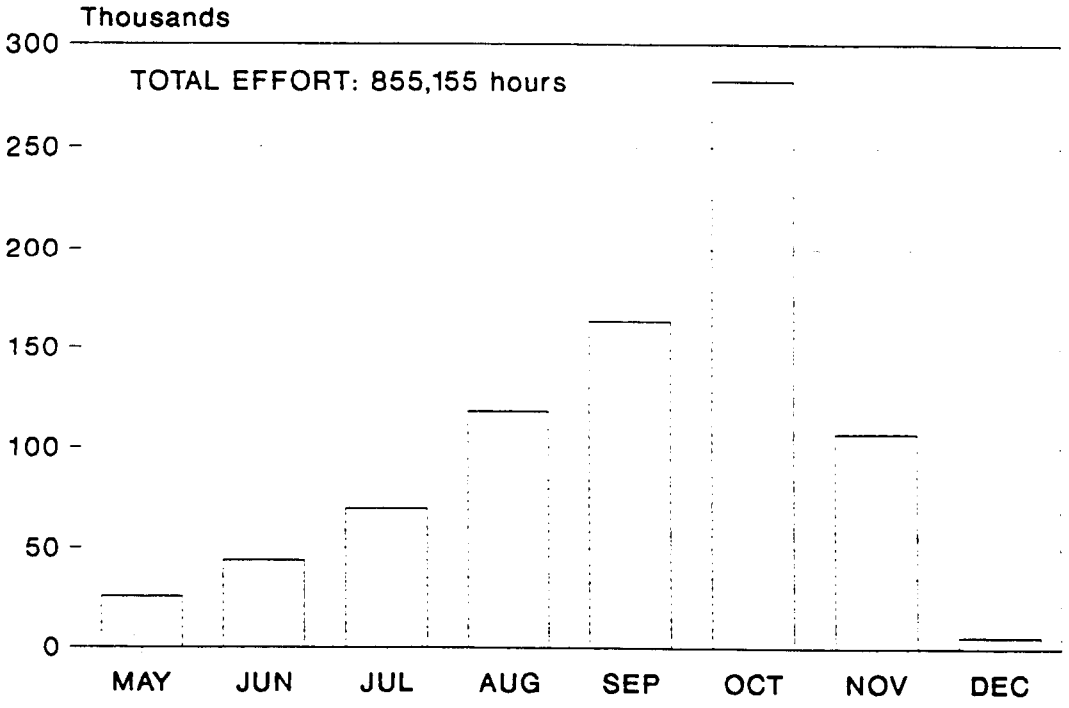


FIGURE 3: DISTRIBUTION OF SPORT FISHING EFFORT IN THE LOWER FRASER RIVER DURING 1987.

TABLE 3
CREEL SURVEY RESULTS FOR THE LOWER FRASER FROM 1985 - 1988
(From: Shubert 1988)

	EFFORT (Hours)	CO	CH	PK	CM	SK	ST	OTHER	TOTAL
1985									
Sept.	242,013	2,165	688	3,997	428	0	171	0	7,449
Oct.	202,867	8,950	432	3,563	243	0	725	0	13,908
Nov.	59,112	2,167	9	5	21	0	86	0	2,288
Dec.	3,902	0	69	0	0	0	0	0	69
TOTAL	506,210	13,282	1,887	7,565	692	0	982	0	24,408
1986									
May	25,408	0	171	0	0	0	57	328	556
June	33,304	0	209	0	0	0	150	294	653
July	75,311	11	1,510	0	0	0	59	171	1,751
Aug.	131,646	50	2,016	0	0	15	10	296	2,387
Sept	177,052	1,606	3,518	7	55	14	189	1,236	6,625
Oct.	252,037	10,389	1,354	0	623	5	974	1,474	14,819
Nov.	61,554	3,532	18	0	124	0	46	286	4,006
Dec.	8,119	272	0	0	34	0	0	144	450
TOTAL	764,429	15,860	8,796	7	836	34	1,487	4,229	31,249
1987									
May	25,453	0	211	0	0	0	9	186	406
June	43,674	0	446	0	0	0	59	805	1,310
July	69,453	0	1,754	0	16	0	27	281	2,078
Aug.	117,942	202	903	0	43	13	142	3,641	4,944
Sept.	163,132	1,051	1,033	586	0	13	161	647	3,491
Oct.	282,165	23,955	638	700	0	538	708	1,130	27,669
Nov.	106,698	6,797	38	0	0	98	53	899	7,885
Dec.	5,402	10	0	0	0	0	0	175	185
TOTAL	855,155	32,009	5,045	1,286	59	662	1,257	7,764	48,082
1988									
May	21,100	0	19	0	0	0	8	232	259
June	33,914	0	300	0	0	0	45	426	771
July	106,330	23	2,613	0	0	156	17	74	2,883
Aug.	97,334	355	1,909	0	0	77	26	507	2,874
Sept.	134,143	1,036	2,163	0	10	74	141	496	3,920
Oct.	244,424	7,559	1,027	0	161	0	409	914	10,770
TOTAL	651,526	8,973	8,031	0	171	307	646	2,649	20,777

Notes: 1. CO: Coho CH: Chinook PK: Pink CM: Chum SK: Sockeye ST: Steelhead
OTHER: Cutthroat, Whitefish, Burbot, Sturgeon
2. 1988 data was cited as preliminary and subject to change.

TABLE 4

NUMBERS OF SALMON AND STEELHEAD CAPTURED IN THE FRASER RIVER INDIAN FOOD FISHERY IN THE FRASER RIVER (MISSION TO HOPE) AND THE HARRISON RIVER (1987-1991)

SPECIES	FRASER MAINSTEM (Mission to Hope)		HARRISON RIVER		TOTAL FRASER
	Average Number (Range)	%	Average Number (Range)	%	Average Number (Range)
Chinook	4,577 (1,502- 6,331)	32	4 (0-19)	<1	14,170 (5,983-17,885)
Sockeye	145,036 (86,407-252,686)	25	240[1]	<1	574,249 (416,044-809,304)
Pink	41,627 (29,547-54,580)[2]	51	267[1]	<1	82,246 (70,514-103,782)
Coho	9,497 (4,077-17,376)	50	268[1]	<1	19,105 (9,386-38,524)
Chum	8,862 (4,922-14,944)	50	194[1]	<1	17,555 (12,785-26,312)
Steelhead	442 (127-945)	36	0	<1	1,237 (284-2,504)
TOTAL	210,041	30	N/A[3]	<1	708,562

1: Records only for 1987 fishery.
2: Average and range for odd years only.
3: N/A Not Applicabe because of only limited data.

Mountain, where up to 70 anglers are typically present during a weekend day during the fall.

2.3.3 Native Fishery

Native domestic fisheries have been summarized by McDonald (1992), and indicate that a significant native domestic fishery exists in the Fraser River downstream of Hope. Since 1987, an average of 30% of the total Indian food fishery from the Fraser River was obtained between Mission and Hope (Table 4). The fishery in the area of Mission to Hope concentrates on Sockeye salmon. However, catches of coho, pink, and chum salmon represent a much greater proportion of the total harvest compared to sockeye, averaging over 50% of the Fraser River catch between 1987 and 1991 (Table 4).

Fishing is done by gillnets set from shore on both shores of the River, and activities can occur all year. Chinook salmon are harvested beginning in May, sockeye beginning in July, with pink, chum, and coho harvests occurring after August. Most of the fishing effort is targeted on sockeye, and therefore most effort occurs during the period July through November. Steelhead are intercepted in the fishery throughout the year, but primarily during the period September to June (McDonald 1988, 1992).

2.4 Enhancement Programs

The Fraser River within the general area of TFL 43 has been the focus of numerous programs associated with the Salmonid Enhancement Program, including the development of the Chehalis and Chilliwack hatcheries, and spawning channels on Weaver and Jones creeks. The Department of Fisheries and Oceans also stocks Cheam Lake with coho salmon juveniles each year (J. Kambeitz pers. comm.). Other areas

investigated for possible enhancement programs have included areas near Nicomen and Hopedale sloughs (near the Vedder River) and other areas near Chilliwack (Lister et al 1980 and Lill and Tautz 1983, cited in IEC Beak 1983). All of these existing or proposed facilities, however, are located outside mainstem areas within TFL 43, but specific locations vary from year to year depending on which projects are active.

However, there are a number of smaller projects undertaken by local communities and Native groups conducted largely under the direction of Community Advisors or within the Small Projects Branch of the Salmonid Enhancement Program. Community programs cover both the north and south banks of the Fraser River, and approximately 400 projects are active in the lower Fraser River that include activities such as debris clearing at the mouths of creeks, incubators in tributaries, and gravel placement in some streams (J. Kambeitz pers. comm.). Other small projects include development of some side channels and back sloughs (G. Logan pers. comm.), and incubation and release of coho to tributaries of Elk Creek through the Center Creek Juvenile Correction facility. Although most of these projects occur in tributaries to the Fraser River, some may occur in side channel areas or at the mouths of creeks within the area of TFL 43.

Scott Paper Limited has also undertaken the development of two spawning channels adjacent to Wahleach Slough, within the mainstem side channel near Herrling Island. These two spawning channels, each approximately 5 x 100m, have been used consistently over the last five years by several hundred chum salmon (K. Stenerson, pers. comm.).

3.0 HOMATHKO RIVER

3.1 Description of the Study Area

The Homathko River flows into Bute Inlet on the mainland coast of British Columbia, approximately 300 km northwest of Vancouver. The drainage basin is approximately 5830 km^2, approximately 21% of which is glaciated. The river drains headwaters and lakes on the Chilcotin Plateau, descends through narrowing mountain valleys and steep confined canyons in the Coast Mountain Range, eventually entering the lower Homathko Valley downstream of Waddington Canyon (Bengeyfield et al 1984). The areas of TFL 43 within the Homathko Valley all occur downstream of Waddington Canyon, from the mouth of the River extending approximately 35 km upstream, near Scar Creek (see Map Atlas). One tributary near the mouth of the Homathko River, Cumsack Creek, is also significant, in that its entire channel lies within TFL 43.

Because of the large proportion of glacially-fed tributaries, seasonal flows and suspended sediment loads in the river are highest between May and September, with peak flows in July of approximately 700 m^3/s. Temperatures during the summer rarely exceed 10^0C (Bengeyfield et al 1984).

3.2 Species Present

The Homathko River and its tributaries primarily support four species of Pacific salmon, chinook, coho, chum, and pink, as well as steelhead, rainbow trout, cutthroat trout, and Dolly Varden char.

Bengeyfield et al (1984) documented that areas of the Homathko mainstem below Waddington Canyon, and largely within TFL 43 provide significant spawning habitat for chinook salmon (96-99% of total spawning habitat) and chum salmon (86-98% of total spawning habitat). Rearing for chinook salmon, Dolly Varden char, and to a lessor degree, coho also occurs in the mainstem river.

In comparison, tributaries of the Homathko generally provide significant spawning and rearing habitat for coho salmon, steelhead, cutthroat trout and Dolly Varden char. Cumsack Creek was reported in these studies to provide extensive low-gradient wetland areas, particularly important for juvenile coho salmon production. It appeared from these studies that chinook salmon and chum salmon do not utilize tributary streams to a significant degree.

The Homathko estuary is limited to approximately 385 hectares of sand flats at the head of Bute Inlet (Choromanski and Mcdonald 1989). Juvenile salmonids are present in these areas to some degree, and studies by Bengeyfield et al 1984 and Choromanski and Macdonald (1989) indicate that juveniles are present along these shores from April to June, coinciding with the period of general downstream juvenile migrations from the Homathko River.

Escapements for the Homathko River and Cumsack Creek are recorded in Appendices C and D, with five year averages summarized in Table 5. Chum salmon are the dominant salmonid species present, with estimated escapements of over 30,000 fish. In contrast, chinook, coho, and pink salmon have each averaged less than 5,000.

The following sections outline some of the detailed information available for each of the major salmonid species in the Homathko watershed.

TABLE 5

FIVE YEAR AVERAGE ESCAPEMENTS OF SALMON TO THE HOMATHKO RIVER FROM 1951 - 1985
(Adapted from: Marshall et al 1977)

PERIOD	CHINOOK	COHO	CHUM	PINK	STEELHEAD	TOTAL
1955-60	5,270	4,700	17,940	3,800	3,130	34,840
1961-65	1,587	3,500	4,300	1,500	UNK	10,887
1966-70	2,830	2,880	2,220	1,500	UNK	9,430
1971-75	2,470	2,430	18,730	1,125	UNK	24,755
1976-80	3,140	2,600	30,200	N/O	UNK	35,940
1981-85	1,740	7,175	23,691	N/O	UNK	32,606
1986-90	4,813	2,133	8,000	N/O	UNK	14,946

UNK: No counts recorded.
N/O: No observations during survey.
1986-1990: Coho salmon only observed during three years

Additional information, describing the general life history of these species was provided earlier for the Fraser River (Section 2).

3.2.1 Pink Salmon

Pink salmon spawning in the Homathko usually occurs during even years, in contrast to the odd year pattern described for the Fraser River. The even year estimates of pink salmon spawning escapements have ranged from 1,500 to 7,500 prior to 1974. However, from 1974 to 1980 no escapements were recorded for this species (Marshall et al 1977). Pink salmon spawning still occurs in Cumsack Creek, with estimates of 1,000-2,000 spawners (J. Trent pers. comm.; Marshall et al, 1977).

Pink salmon spawning migrations begin in August, with peak spawning activity occurring in September. Spawning is usually completed by the end of September (Marshall et al 1984). When present, pink salmon have been observed spawning within the area of TFL 43 in the mainstem of the Homathko River from its mouth to approximately 19 km upstream.

As described for the Fraser River, pink salmon juveniles do not rear in freshwater. Instead, fry move directly to the ocean following emergence.

3.2.2 Chum Salmon

The annual escapement of chum salmon to the Homathko River appears to have fluctuated over a wide range since 1947, and this may be a reflection of infrequent counts during the spawning period. Estimates of chum escapements in 1983 based on juvenile trapping compared favourably with average escapements recorded by DFO, and indicated a spawning population of approximately 20-25,000 fish (Bengeyfield et al 1984).

Chum salmon migrate upstream and spawn beginning in October, with peak activity occurring during the second week of November. Spawning is usually completed by early December (Bengeyfield et al 1984). Specific sites of chum salmon spawning are documented in Bengeyfield et al (1984). Spawning occurs in the mainstem Homathko upstream to Waddington Canyon, approximately 45 km upstream of the River mouth. Important spawning habitat occurs throughout TFL 43, primarily in the side channel habitat near Smith, Brew, and Whitemantle creeks.

These side channels tended to range in width from 2 to 30 m, with gradients of <0.5 to 1.0 percent (Bengeyfield et al, 1984). In areas where main channel spawning occurred, it usually took place along the channel margins or in areas outside of the main flow (Bengeyfield et al 1984).

Chum salmon fry generally move downstream during April and May enroute to estuary and ocean rearing habitats (Bengeyfield et al, 1984).

3.2.3 Chinook Salmon

Estimates of chinook salmon populations documented in yearly escapement records appear to indicate a decreasing population since 1947, and the average numbers shown in Table 5 suggest that since the period 1955-60, stocks have fluctuated between 1,600 to 3,100. More recent estimates of chinook stocks by Bengeyfield et al (1984), calculated from a downstream trapping program, were consistent with the historical escapement estimates suggesting a spawning population of approximately 3,000 individuals.

Observations by District Fisheries Officers indicate that spawning activities for chinook salmon may encompass the period from July through October, with peak spawning in early September (Marshall et al

(1977). Bengeyfield et al (1984) also observed that the timing of chinook spawning activities during two different years in the Homathko appeared to peak during September, although major spawning periods extended through the month.

Virtually all of the chinook salmon spawning occurs in the mainstem, and to some degree in side channels, with virtually no spawning activities in tributaries. Major spawning areas for chinook occur within TFL 43, primarily between Brew Creek and Waddington Canyon.

Chinook salmon juveniles rear during the summer along shores in both main channel and side channel habitats. Similar to their observed presence in the Fraser River (Section 2.1.3), rearing studies in the Homathko River indicate that juvenile chinook were the most abundant species in mainstem habitats during the summer. No overwintering studies have been conducted in the Homathko system, however information from the Fraser River suggests that some individuals migrate out of system as underyearlings, while others remain overwinter to migrate out of the system the following spring.

3.2.4 Coho Salmon

Average annual coho escapements to the Homathko system during the period from 1975 to 1980 have averaged 2,600 Table 5, however, estimates by Bengeyfield et al (1984), calculated from a downstream trapping program, suggest that coho escapements have been significantly underestimated, mainly because of their tendency to utilize a large number of small tributaries for spawning. The study reported that based on the numbers of downstream migrating smolts, the calculated adult coho escapement to the Homathko River may be over 15,000 fish.

Coho salmon arrive in the Homathko River during August and appear to begin spawning in September. Peak spawning activities occur during October to early November and are virtually complete by December, although some spawning has been observed as late as mid-January (Bengeyfield et al 1984).

Spawning areas for coho occur primarily in tributaries as far upstream as Waddington Canyon, although some coho spawn in the mainstem and in small side channels. Despite the extensive use of tributary streams, coho are only able to utilize the lower 500 to 1,000 m of these channels, since most of these streams have velocity barriers or obstructions that block access to areas further upstream. At least half of the spawning population appears to utilize only five tributaries, including Grizzly, Smith, and three unnamed tributaries located at 16, 29, and 34 km from the river mouth. All of these major tributaries enter the Homathko within TFL 43. The most concentrated spawning activities were observed in a tributary of Smith Creek. Cumsack Creek, another tributary encompassed by TFL 43, is also an important area for coho spawning.

Coho rearing occurs primarily in tributary streams, rather than in mainstem river habitats, and Bengeyfield et al (1984) observed that 32

of 55 tributaries surveyed in the lower Homathko supported rearing coho populations. Coho juveniles occur in the Homathko estuary for a portion of the spring and summer, but these are primarily coho smolts migrating out of the system. Rearing areas include Smith and Grizzly creeks.

3.2.5 Sockeye Salmon

Escapements records for the Homathko River suggest that spawning populations of sockeye salmon are not generally present, although some isolated individuals were observed in the mainstem during studies in 1982 and 1983 (Bengeyfield et al 1984).

3.2.6 Steelhead Trout

Although annual escapements of steelhead have been reported to be approximately 400-500, Bengeyfield et al (1984) captured only 4 adults and 85 juveniles in two years of investigation on the river, suggesting that they are not generally abundant. Steelhead were present both in the mainstem of the Homathko and in seven of the tributaries.

As indicated earlier, steelhead generally spawn from January to May (Section 2.2.6), and spawning activities are believed to occur in both the Homathko mainstem and in clear tributaries downstream of Waddington Canyon (Cleugh et al, 1979, cited in Bengeyfield et al, 1984). Bengeyfield et al (1984) observed spawning or redds in three clear tributaries that indicated spawning probably occurred during mid-April to early May.

In addition to steelhead, rainbow trout are present in the system, but these non-anadromous populations are considered to occur above Waddington Canyon, outside of areas within TFL 43.

3.2.7 Cutthroat Trout

Cutthroat trout are present throughout the lower mainstem of The Homathko and in 17 tributaries to the lower river, below Waddington Canyon. Both resident and anadromous cutthroat trout occur in the Homathko, although the latter are probably more common (Bengeyfield et al 1984). Spawning was not observed during the two year study by Bengeyfield et al (1984), however it is believed to occur primarily in the mainstem during the spring (April through May, Section 2.2.7). Rearing studies indicated that low gradient tributaries with marshes and slack water habitats are the most important areas for cutthroat trout production. Cumsack Creek is a major cutthroat trout stream in the Homathko system.

3.2.8 Dolly Varden char

Dolly Varden char are widely distributed and abundant throughout the Homathko system. The lower Homathko population in the area of TFL 43, below Waddington Canyon, probably represents a separate mixed stock of anadromous and resident fish (Bengeyfield et al 1984). Dolly Varden char generally spawn during late October, but may occur from September through November. Spawning appears to occur in many of the tributaries, covering a wide range of habitat types, the most typical being small, clear streams. Rearing Dolly Varden juveniles appear to utilize almost all of the habitat types in the area, including deep slow pools, marsh areas, log jams, riffles and fast flowing plunge pools. Anadromous individuals probably migrate downstream during the spring.

3.2.9 Other Species

Other species documented in the Homathko River during the studies by Bengeyfield et al (1984) were Longnose sucker (*Catostomus catostomus*),

River lamprey (*Lampetra ayresi*), Three-spine stickleback (*Gasterosteus aculeatus*), Sculpins (*Cottidae*), Eulachor (*Thaleichtys pacificus*), redside shiner (*Richardsonius balteatus*), and starry flounder (*Platichthys stelatus*).

3.3 Fisheries

3.3.1 Commercial Fisheries

A commercial fishery for salmon occurs in Bute Inlet, however no commercial fishing activities are permitted within the area encompassed by TFL 43 (J. Trent pers. comm.).

3.3.2 Sport Fisheries

Because of the remote and inaccessible setting of the Homathko River, there is virtually no sport fishery in the area. The lower section of Cumsack Creek is a popular angling stream for loggers stationed at the Homathko River camps, and is considered to be the best fishing area for cutthroat trout in the lower Homathko River (Bengeyfield et al 1984). Some angling also occurs by fly-in fishermen (J. Trent pers. comm.)

At present, the Homathko River system is entirely closed to salmon fishing in an effort to protect chinook salmon stocks (J. Trent pers. comm.).

3.3.3 Native Food Fishery

One indian reserve is located at the mouth of the Homathko River, but it has been uninhabited for a number of years. There has not been any documented native food fishery in the Homathko River for at least 10 years (J. Lamb pers. comm.), however eulachon are reported to be

harvested to some degree in the Homathko estuary (J. Trent pers. comm.)

3.4 Enhancement Programs

No fisheries enhancement programs have been proposed for the Homathko River (George Bates pers. comm.). The Department of Fisheries and Oceans had proposed blasting a large rock in Waddington Canyon to provide access for salmon to upstream areas, however this proposal was rejected due to the danger and cost involved in the blasting proposal (IEC Beak 1983).

The Homathko River and Cumsack Creek are designated sites for broodstock collection for a proposed hatchery on the Southgate River, a nearby river system entering Bute Inlet. However, there are no immediate plans for development of this facility (J. Trent pers. comm.).

4.0 KINGCOME RIVER

4.1 Description of the Study Area

Kingcome River flows south into Kingcome Inlet, approximately 400 km northwest of Vancouver (see Map Atlas). Like the Homathko River, described above, the Kingcome River receives a large amount of input from glacial melt and probably exhibits a similar pattern of runoff, namely peak flows and elevated suspended sediment levels during the summer months. The River is approximately 50 km long, with a drainage area of approximately 900 km^2. Major tributaries of the Kingcome River include the Atlatzi River and Creek, Clear River, Sequilla River, Gatsalla River, and Three Mile Creek. Anadromous fish are believed to extend upstream to approximately 4 km above Lahlah Creek.

The Kingcome Block of Scott Paper Ltd.'s TFL 43 is situated in the lower regions of this system, below the Gatsala River downstream to approximately 12 km upstream from the Kingcome estuary. Within this region, TFL 43 is comprised of three separate blocks (see Map Atlas).

Most of the area is uninhabited, however a small settlement, Kingcome Village, is located approximately 4 km upstream of the mouth of the river, and active logging occurs in the valley, with a camp located at the river mouth. The estuary of the Kingcome River possess extensive sand and mudflats. Log sorting and dumping occurs in a small portion of this area (Schultz 1982).

4.2 Species Present

The Kingcome River supports significant populations of four salmon species, which include pink (both odd and even year runs), coho, chum,

and chinook (Table 6; Appendix E). Although sockeye were reported in this system prior to 1974, there have only been a few instances since 1974 where sockeye spawning was observed. There is no indication within the available information to suggest why sockeye are now virtually absent from the system. Steelhead have also been observed in the system, and cutthroat trout are captured by anglers. Apart from DFO escapement surveys and other observations by DFO personnel, there have not been any studies to describe habitat uses within the Kingcome River watershed or more detail on other species present.

Undoubtedly other species are present, and given its proximity to a similar glacial system, the Homathko River, similar species, such as Dolly Varden char, and other coarse fish species likely occur in the Kingcome River.

4.2.1 Chinook salmon

Chinook salmon primarily utilize areas of the mainstem, as well as the Clear and Atlatzi tributaries (DFO 1988). The numbers of spawning chinook utilizing the Kingcome River system has been estimated to range from 230 to 3,930, based on 5-year averages from 1950 (Table 6). Given the likelihood that chinook utilize turbid mainstem areas for spawning, the above wide range in observed spawners may reflect the difficulty in observing chinook. Chinook salmon spawning occurs from July through mid-October. No information on rearing habitats is available for this system, but chinook salmon juveniles probably utilize mainstem areas for rearing, as they do in the Fraser and Homathko rivers (Sections 2 and 3). Chinook juveniles probably migrate out of the system as underyearling or yearling fish during the Spring (April and May).

TABLE 6

FIVE YEAR AVERAGE ESCAPEMENTS OF SALMON TO THE KINGCOME RIVER
(FROM 1950-1992)
(From: Kostiuk pers comm.and DFO 1994)

PERIOD	CHINOOK	CHUM	SOCKEYE	PINK	COHO	TOTAL
1950-54	2,540	27,000	3,500	20,200	17,700	70,940
1955-59	3,930	11,200	2,840	11,400	31,000	60,370
1960-64	2,650	13,500	2,000	13,700	16,000	47,850
1965-69	1,050	8,900	420	4,440	16,700	31,510
1970-74	1,500	27,800	1,500	63,500	11,900	106,200
1975-79	960	18,300	18	65,860	4,780	89,918
1980-84	230	4,533	30	12,440	1,367	18,600
1985-89	476	3,443	5	61,500[1] 8,616[2]	996	66,420[3]
1990-92	280	2,845	0	115,750[1] 3,000[2]	1,164	120,139[3]

1. Even year runs
2. Odd year runs
3. Average based on even year escapements of pink salmon

Note: Average numbers include only years where numbers were recorded and do not include years marked as "U/N" (Unknown) or "N/R" (No Record).

4.2.2 Coho Salmon

Coho populations are reported to be present throughout the system, but the Atlatzi and Clear rivers represent major spawning areas (Schultz 1982). Escapement observations to the Kingcome since 1970 have indicated average numbers of 1,300-12,000 spawners. Most recent observations, 1990-92, documented an average of 1,164 fish (DFO 1987, 1994). As described for the Homathko River, it is possible that coho escapement observations also significantly underestimate the total coho numbers present. Coho are reported to arrive in the system as early as June, with spawning occurring during August and September and ending in November (DFO 1988). During the 1986 spawning survey, coho were reported to still be entering tributaries early in January (DFO 1986).

Rearing for coho has not been documented in the system, but is probably similar to the Homathko in that most rearing probably occurs near the mouth of the river and in tributaries, in low gradient areas. As in other systems, most juvenile coho probably rear for one year before migrating out of the system during the spring and early summer (Section 3.2.4).

4.2.3 Chum salmon

Chum salmon spawning has been documented primarily in the mainstem of the Kingcome River and in the Clear and Atlatzi rivers. The population of chum has varied considerably, with maximum average escapements for periods from 1970 ranging from 1,688 (1985-87) to 27,800 (1970-75). The most recent surveys (1990-1992) recorded an average of 2,845 spawners (DFO 1987, 1994). Chum salmon are reported to arrive during September, spawn during October and November, ending during December. As described earlier, chum salmon do not rear in freshwater,

and migrate out of the system the following spring, primarily during April and May.

4.2.4 Pink Salmon

Unlike the Fraser and Homathko systems described earlier, pink salmon runs to the Kingcome River have been documented during both odd and even years, although the even year runs have historically had higher recorded escapements. Major spawning areas for pink salmon are reported to be in the Clear and Atlatzi rivers, but pink spawning has also been observed in the mainstem. The average numbers of pink salmon in the system for periods from 1970 to 1985 are reported to range from 12,440 to 115,750 (Table 6). DFO (1994) report 31,500 spawners for the most recent, 1992, run. Pink salmon arrive during early August, with most spawning occurring during September. Spawning is reported to be virtually complete by October.

As in the Fraser and Homathko systems, pink salmon do not rear in freshwater, and juveniles migrate out of the system as fry during the spring (April and May).

4.2.5 Steelhead

Very little information exists describing steelhead abundance in the Kingcome River. They have been reported in early escapement records, prior to 1965, but no observations are listed in these records since that time. However, some estimates of steelhead stocks in the system were recorded in snorkel surveys by the B.C. Ministry of Environment in 1987 (M. Lirette, pers. comm.). These surveys indicated that approximately 500 winter-run adults may utilize the Atlazi River, entering the system primarily in April and May to spawn soon after. The Clear River possesses a summer-run population of approximately 200 adults and represents the most important summer-run population in the mainland region between Loughborough and Seymour inlets. Summer-run fish enter the system mainly during June and July, and remain to spawn the following spring. Juveniles may utilize areas in both the Kingcome River mainstem and tributaries for rearing, but are probably more abundant in the clear water tributaries.

Hoodas Creek, which enters the Kingcome near its mouth, is reported to support extensive coastal cutthroat trout populations (I. McDougall, pers. comm.).

4.3 Fisheries

Both sport fishing and Native domestic fishing occur in the Kingcome River and its tributaries, associated with the settlements at the mouth of the River, however there is no formal documentation of catches in both of these fisheries. The Kingcome Band uses set gillnets to capture chum and coho salmon near the mouth of the Kingcome, however only a few nets are set for periods of one to two weeks in the Fall (G. Kostiuk pers. comm.)

Limited sport fishing, primarily for cutthroat trout and coho salmon, is done by loggers and a few fly-in fisherman in the lower areas of the river and in tributaries. The area is closed to chinook salmon fishing (G. Kostiuk pers. comm.; K. Bertrand pers. comm.).

4.4 Enhancement Programs

Enhancement activities primarily aimed at increasing coho salmon stocks have been completed in the Kingcome system, based upon several observations that useable habitat existed upstream of natural blockages on several tributaries (DFO 1988, Schultz 1982). One fish ladder, constructed in 1979, is currently in operation on the Atlatzi River. This structure has successfully provided access to several kilometres of spawning grounds that have been utilized by coho, as well as chinook and pink salmon. A small project initiated by the Kingcome Band, consists of a small hatchery operated intermittently for coho and chum salmon near the mouth of the river. In 1987 25,000 coho eggs were incubated (DFO 1987). The project was not a sanctioned DFO as a Salmonid Enhancement Project, and is no longer operational (K. Bertrand pers. comm., G. Bates pers. comm.). One elementary school is currently involved in the incubation and subsequent release of coho fry to streams in the area (G. Bates pers. comm.).

5. SUMMARY OF IMPORTANT HABITATS WITHIN TFL 43

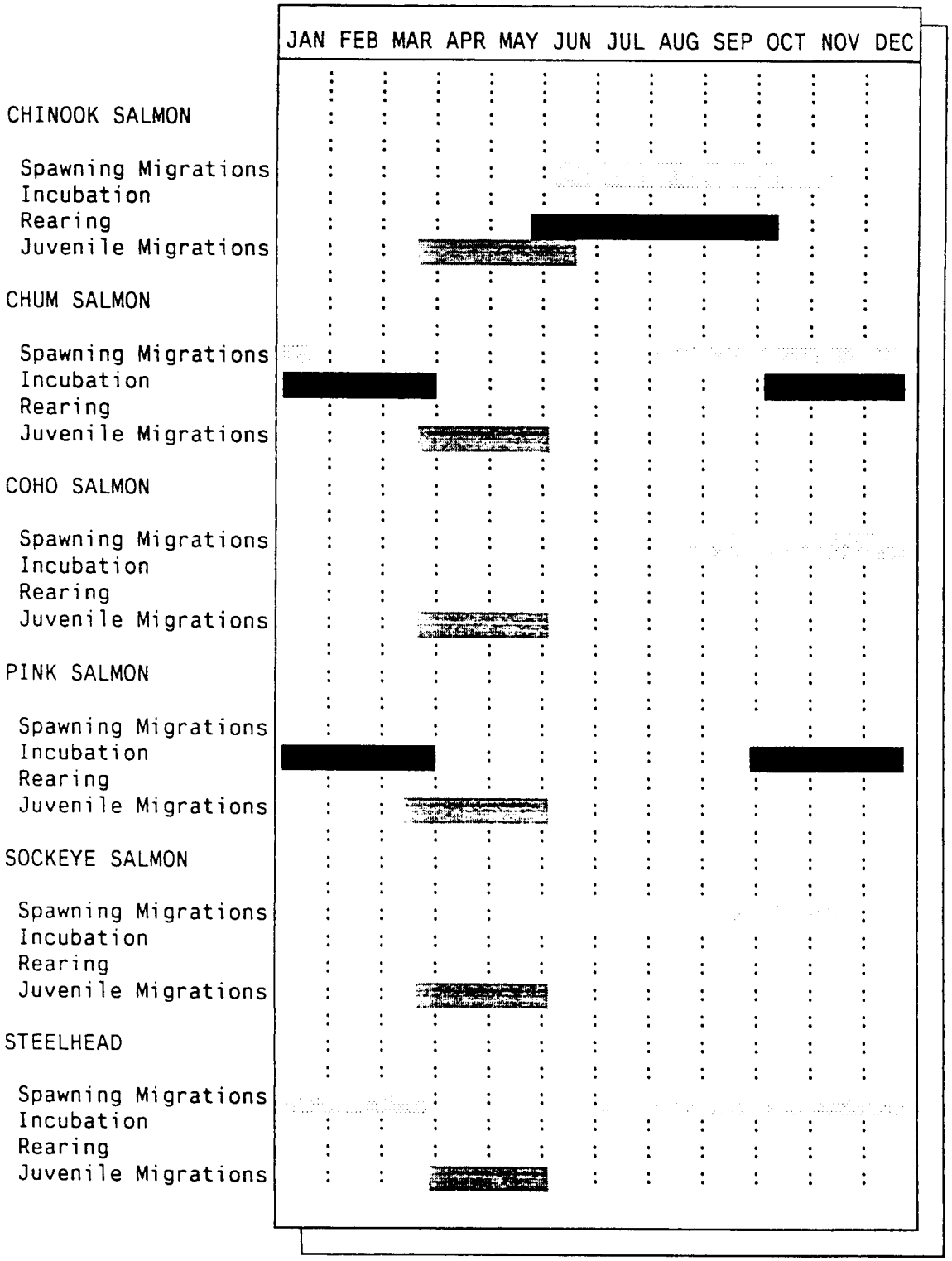
On the basis of the information presented above, all of the watercourses within TFL 43 represent Class A drainages, in accordance with recently established Coastal Fisheries Forestry Guidelines (B.C. Ministry of Forests et al 1993). This designation indicates that anadromous salmonids or moderate to high levels of resident sports fish are present in all of the rivers, and it may be necessary to design compensating or mitigating measures to offset any unavoidable effects that forest harvesting may have on these systems. As a result, Scott Paper Limited has established a policy of (1) maintaining site-specific harvesting practices that minimize any effects on fish populations, and (2) reviewing the sensitivities of specific areas with all relevant agency personnel prior to finalizing cutting plans for all cut blocks.

To provide an overview of the sensitivity of each river in TFL 43, the following sections summarize the important species, habitat uses, fisheries, and enhancement programs that occur within the Fraser, Homathko, and Kingcome rivers, respectively.

5.1 Fraser River

A summary of important life history events for major species in the Fraser River mainstem within TFL 43 is shown in Figure 4. The mainstem areas of TFL 43 are utilized as a migratory corridor for all of the anadromous species in the system, including chinook, chum, coho, pink, and sockeye salmon and steelhead. Anadromous cutthroat trout and Dolly Varden char also migrate through these areas. Upstream migrations of salmon can occur from June through December, depending on the species and the particular stock origin. Downstream migrations

FIGURE 4
FRASER RIVER: SUMMARY OF IMPORTANT LIFE HISTORY EVENTS
FOR MAJOR SPECIES WITHIN THE AREAS OF TFL 43



generally coincide with periods of peak flow, primarily during April and May.

The area of TFL 43 is utilized for spawning by chum and pink salmon, and therefore eggs may be present in mainstem habitats through the winter.

Chinook salmon are the dominant salmon species that rears in the mainstem areas of TFL 43 during the summer, and juveniles occur along virtually all of the shoreline areas during this period. Some areas of the mainstem, such as deep pools, debris accumulations, and rocky shores are utilized for chinook overwintering.

Other species, such as cutthroat trout, Dolly Varden char, mountain whitefish, white sturgeon and numerous coarse fish species are also present in low numbers throughout the mainstem areas during the summer and winter.

There are no commercial fishing activities in the area of TFL 43, however sport fishing, mainly from gravel bars, and Native gillnet fishing occurs at various locations in TFL 43.

Numerous enhancement programs occur in the Fraser system, but other than Scott Paper's own projects adjacent Wahleach Slough, most are located outside of TFL 43. Some small community projects or others operated directly by the Salmonid Enhancement Program, such as side channel developments or debris clearing at tributary mouths, may occur at localized areas within TFL 43.

5.2 Homathko River

A summary of important life history events for major species in the Homathko River within TFL 43 is shown in Figure 5. The mainstem areas of TFL 43 are utilized as a migratory corridor for Chinook, chum, coho, and pink salmon and steelhead. Anadromous cutthroat trout and Dolly Varden char also migrate through these areas. Upstream migrations of salmon can occur from July through December, depending on the species and the particular stock origin. Downstream migrations generally coincide with periods of high flow in the spring, primarily during April and May.

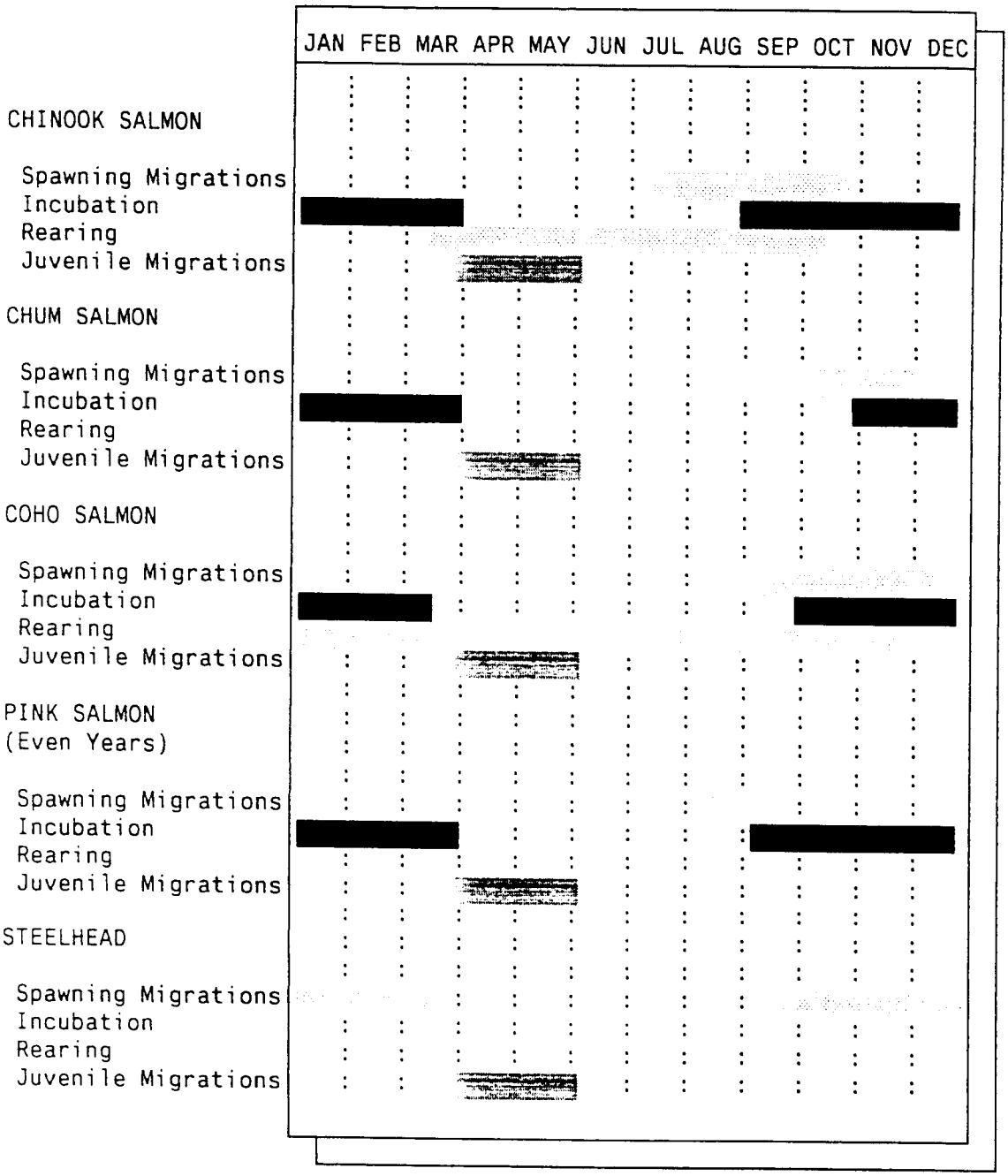
The area of TFL 43 in the Homathko Mainstem is utilized for spawning mainly by Chum and Chinook salmon. Pink salmon and coho salmon utilize areas of Cumsack Creek, within TFL 43.

Chinook salmon are the dominant salmon species that rears in the mainstem areas of TFL 43 during the summer, and juveniles occur along virtually all of the shoreline areas during this period. Dolly Varden char and some coho salmon juveniles have been documented to rear in these areas.

There are no commercial fishing activities in the area of TFL 43, however very limited sport fishing for cutthroat trout, occurs primarily in Cumsack Creek. There is no active Native fishery within TFL 43.

No enhancement programs exist in the Homathko system.

FIGURE 5
HOMATHKO RIVER: SUMMARY OF IMPORTANT LIFE HISTORY EVENTS
FOR MAJOR SPECIES WITHIN THE AREAS OF TFL 43



5.3 Kingcome River

A summary of important life history events for major species in the Kingcome River within TFL 43 is shown in Figure 6. The mainstem areas of TFL 43 are utilized as a migratory corridor for all of the anadromous species in the system, including chinook, chum, coho, and pink salmon and steelhead. Anadromous cutthroat trout and Dolly Varden char also migrate through these areas and utilize tributary systems. Upstream migrations of salmon can occur from July through December, depending on the species. Downstream migrations generally occur during April and May.

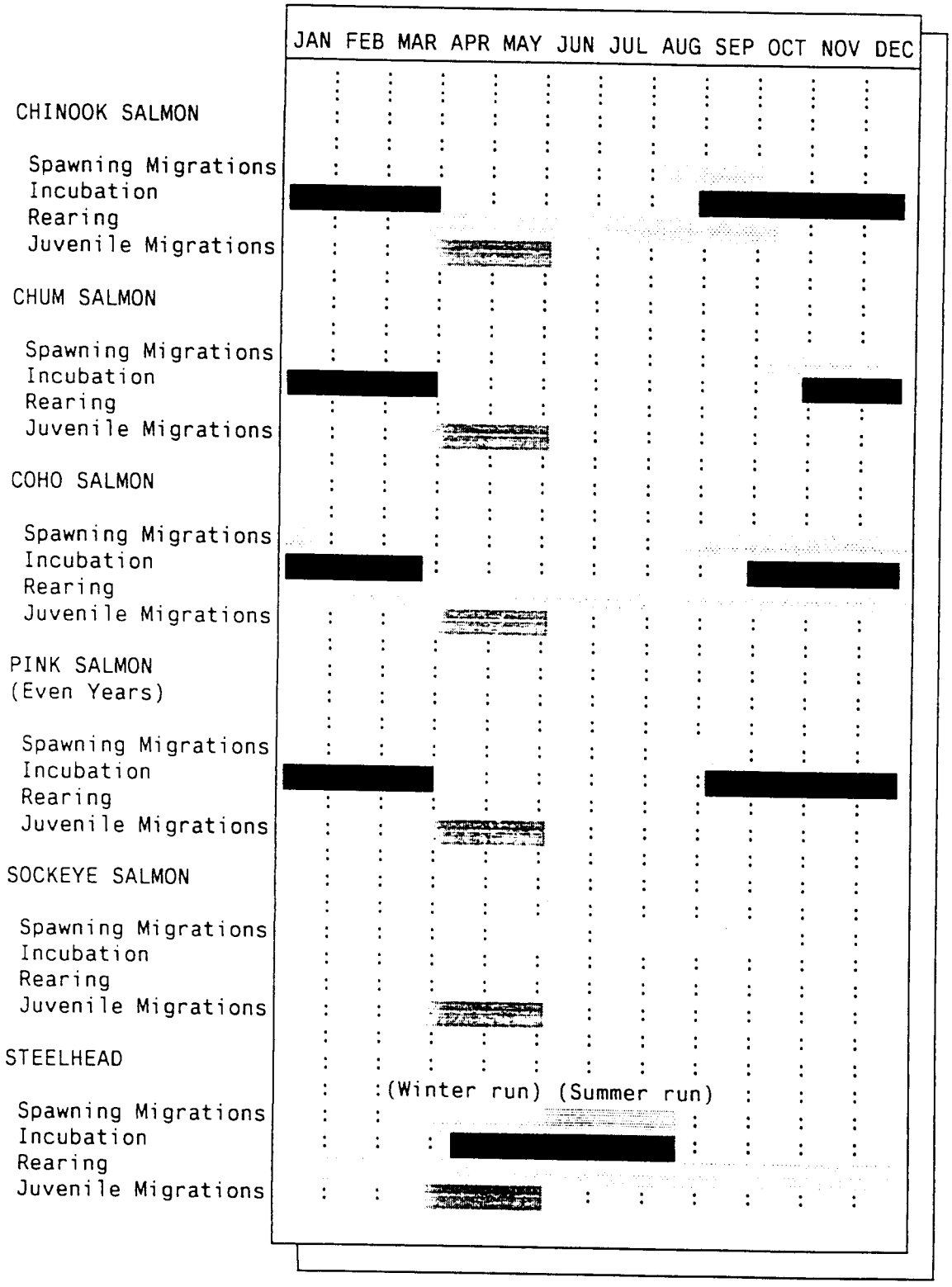
The area of TFL 43 is utilized for spawning by chinook and chum salmon.

No information on fish rearing in TFL 43 is available, but conditions are probably similar to the Homathko River. Therefore chinook salmon is probably the dominant salmon species that rears in the mainstem areas of TFL 43 during the summer, and juveniles may occur along virtually all of the shoreline areas during this period. Dolly Varden char and some coho salmon juveniles may also rear in these areas.

There are no commercial fishing activities in the area of TFL 43, however limited sport fishing for trout and coho is done by loggers and a few fly-in anglers. Limited Native gillnet fishing occurs near the mouth of the river during the Fall.

Enhancement programs occur outside of TFL 43, and include a fish ladder on Atlatzi Creek and an intermittently operated Native hatchery on Three Mile Creek.

FIGURE 6
KINGCOME RIVER: SUMMARY OF IMPORTANT LIFE HISTORY EVENTS
FOR MAJOR SPECIES WITHIN THE AREAS OF TFL 43



REFERENCES

Andrew and Webb. 1987. Review and assesment of adult pink salmon enumeration programs on the Fraser River. Unpublished report prepared by ESSA Environmental and Social Systems Analysts Ltd. for Department of Fisheries and Oceans.

Aro, K.V. and M.P. Shepard. 1967. Salmon of the North Pacific Ocean-Part IV: Spawning populations of North Pacific Salmon-5. Pacific Salmon in Canada. International North Pacific Fisheries Commission. Bulletin Number 23.

Bates, G. pers. comm. Enhancement biologist, Department of Fisheries and Oceans, Nanaimo.

B.C. Ministry of Forests, B.C. Ministry of Environment, Federal Department of Fisheries and Oceans, Council of Forest Industries. 1988. British Columbia, Coastal Fisheries Forestry Guidelines. 113 p.

Bengeyfield, B., D.B. Lister, O. Fleming and D. Burt. 1984. Preliminary fisheries inventory and assessment in the Homathko River system. Unpublished report prepared by ESL Environmental Sciences Limited, Vancouver, B.C. for B.C. Hydro, Vancouver.

Beniston, R.J., D.B. Lister and G.J. Naito. 1986. CN twin track project environmental design program-juvenile salmonid rearing studies, Fraser River, 1984-86. Prepared by D.B. Lister and Associates LTd. for CN Rail, Edmonton.

Beniston, R.J. and D.B. Lister. 1984. Study of 1983 pink salmon spawning in the Thompson River relative to the CN twin tracking program. Unpublished report prepared by D.B. Lister and Associates Ltd.for CN Rail, Edmonton, Alberta

Bertrand, K. pers. comm. Department of Fisheries and Oceans District Fisheries Officer, Alert Bay.

Cleugh, T.R., C.C. Graham and S.Z. Robertson. 1979. Background information for the proposed Homathko-Chilko-Taseko Hydroelectric Development. Department of Fisheries and Oceans Internal Report. 51 pp. (Cited in: Bengeyfield et al 1984).

Choromanski, E.M. and J.S. Macdonald. Physical parameters and fish sampling data from Homathko River estuary, Bute Inlet in 1987, 1988.

Department of Fisheries and Oceans. 1987. Unpublished file information; annual report of salmon streams and spawning population-Kingcome River.

Department of Fisheries and Oceans. 1988. Unpublished stream information summary for the Kingcome River, DFO/MOEP Fish Habitat Inventory and Information Program.

Department of Fisheries and Oceans. 1986. Unpublished file information; annual report of salmon streams and spawning population-Kingcome River.

Farwell, M.K., N.D. Schubert, K.H. Wilson and C.R. Harrison. 1987. Salmon escapements to streams entering Statistical Areas 28 and 29, 1981 to 1985. Canadian Data Report of Fisheries and Aquatic Sciences, New Westminster 601: 166 p.

Fraser, F.J., P.J. Starr and A. Fedorenko. 1982. A review of the chinook and coho salmon of the Fraser River. Canadian Technical Report of Fisheries and Aquatic Sciences 1126: 130 p.

Hopwo, L. pers. comm. Department of Fisheries and Oceans, Nanaimo, B.C.

Hoos, L.M. and G.A. Packman. 1974. The Fraser River Estuary. Status of Environmental Knowledge to 1974. Special Estuary Series No. 1. Environment Canada Pacific Region. 518 p.

IEC Beak. 1983. Fisheries literature review for Fraser and Homathko blocks of Scott Paper Ltd. T.F.L. #43. Unpublished report prepared for Scott Paper Limited, New Westminster.

Joyce, M. pers. comm. Department of Fisheries and Oceans, New Westminster, B.C.

Kambeitz, J. pers. comm. Community Advisor for Department of Fisheries and Oceans Salmonid Enhancement Program. New Westminster.

Kellerhals, R., M. Miles, and M. Zallen. 1987. Effects of gravel mining on salmonid resources of the lower Fraser River. Unpublished report prepared Kellerhals Engineering Services Ltd. for Habitat Management Division, Department of Fisheries and Oceans, New Westminster.

Kostiuk, G. pers. comm. Department of Fisheries and Oceans, Distsrict Fisheries Officer, Campbell River.

Lamb J. pers. comm. Department of Fisheries and Oceans, Nanaimo.

Land, B. pers. comm. B.C. Ministry of Environment and Parks, Abbotsford. (Cited in: Martin and Zallen 1986)

Levy, D.A. and T.G. Northcote. 1982. Juvenile salmon residency in a march area of the Fraser River Estuary. Can. J. Fish. Aquat. Sci. 39: 270-276.

Lill, A.F. and A. Tautz. 1983. Opportunities for salmonid enhancement projects in British Columbia and the Yukon. Salmonid Enhancement Program, Department of Fisheries and Oceans. (Cited in: IEC Beak 1983)

Linette, M. pers. comm. Steelhead biologist. B.C. Ministry of Environment, Nanaimo.

Lister, D.B., D.E. Marshall, and D.G. Hickey. 1980. Chum salmon survival and production at seven improved groundwater-fed spawning areas. Department of Fisheries and Oceans Canadian Manuscript Report of Fisheries and Aquatic Sciences 1595: 58 p. (Cited in: IEC Beak 1983).

Logan, G. pers. comm. Department of Fisheries and Oceans Salmonid Enhancement Program, Small Projects. Vancouver.

Marshall, D.E., R.F. Brown, V.D. Chahley and D.G> Demontier. 1977. Preliminary catalogue of salmon streams and spawning escapements of Statistical Area 13 (Campbell River). Department of Fisheries and Oceans. PAC/D-77-1.

Martin, L. and M. Zallen. 1986. Feasibility study Sumas River drainage, Abbotsford, B.C. Vol. 3-Environmental evaluation. Unpublished report prepared by ESL Environmental Sciences Limited, Vancouver, B.C.for Ministry of Agriculture and Fisheries, Agricultural Engineering Branch, Abbotsford, B.C.

McDonald, A.L. 1988. The Indian food fishery of the Fraser River: 1987 summary. Canadian Data Report of Fisheries and Aquatic Sciences, New Westminster 690: 113 p.

McDonald, A.L. 1992. The Indian food fishery of the Fraser River: 1991 Summary. Canadian Data Report of Fisheries and Aquatic Sciences, New Westminster 876: 86 p.

McDonald, A.L. pers. comm. Biologist. Department of Fisheries and Oceans, New Westminster, B.C..

McDougall, I. pers. comm. Biologist. B.C. Ministry of Environment, Nanaimo.

Northcote, T.G. 1974. Biology of the lower Fraser River: a review. Westwater Research Centre, University of British Columbia. Tech. Rep. 3: 94 p.

Palmer, R.N. 1972. Fraser River chum salmon. Department of Fisheries and Oceans Technical Report 1972-1.

Rice, C. pers. comm. Fisheries consultant to Department of Fisheries and Oceans during 1988 on Fraser River.

Saxvik, P. 1978. Studies of 1977/78 pink salmon spawning and incubation in the Fraser River between Ruby Creek and Sumas River. Internal unpublished report by the International Pacific Salmon Fisheries Commission.

Schubert, N.D. pers. comm. Department of Fisheries and Oceans, New Westminster, B.C.

Schultz International Limited. 1982. Kwakiutl District, salmon bearing stream inventory. Unpublished report prepared for Kwakiutl District Council, Alert Bay.

Stenerson, K. pers. comm. Woodlands Manager. Scott Paper Limited, New Westminster, B.C.

Trent, J. pers. comm. Department of Fisheries and Oceans District Fisheries Officer. Campbell River.

Whelen, M.A. and T.L. Slaney. Late winter sampling of juvenile salmonids in the Fraser River. Unpublished report prepared by Aquatic Resources Limited for Department of Fisheries and Oceans, West Vancouver Laboratory.

Winsby, M. 1986. Study of salmon spawning in peripheral areas of the lower Fraser River, B.C. Unpublished report prepared by Hatfield Consultants Limited for Habitat Management Unit Department of Fisheries and Oceans, New Westminster, B.C.

Zallen, M. and J. Boyd. 1986. Investigations of habitat preferences by juvenile chinook salmon in the Fraser River mainstem - Floods-Hope area. Unpublished report prepared by ESL Environmental Sciences Limited for BC Ministry of Transportation and Highways, Design and Surveys Branch.

Zallen, M. and M. Farwell. 1985. Description and evaluation of the 1984 survey of chum salmon spawning in the Fraser River mainstem. Unpublished report prepared by ESL Environmental Sciences Limited for Department of Fisheries and Oceans, New Westminster, B.C.

APPENDIX A
SALMON ESCAPEMENTS TO FRASER RIVER

YEAR	CHINOOK	CHUM	SOCKEYE	PINK	COHO
1951	40,000	172,825	606,262	200	61,926
1952	124,295	177,825	846,935	25	137,827
1953	78,620	138,725	1,295,135	N/R	103,978
1954	53,875	86,375	2,447,802	N/R	60,629
1955	41,200	110,700	383,266	N/R	104,126
1956	26,550	33,125	873,031	N/R	46,106
1957	43,725	84,705	1,662,011	2,242,867	56,034
1958	71,654	89,450	3,867,190	N/R	78,033
1959	51,935	152,325	949,405	1,078,000	48,884
1960	29,794	263,775	628,024		49,440
1961	33,649	172,775	1,250,087	1,092,561	73,636
1962	47,775	180,225	1,624,004		157,137
1963	43,424	214,225	1,601,559	1,954,038	106,413
1964	54,975	325,475	426,459		97,360
1965	41,115	186,075	852,271	1,194,099	69,876
1966	37,839	430,825	1,919,286		76,252
1967	51,454	215,473	1,353,640	1,831,269	35,672
1968	44,486	823,450	626,706		43,606
1969	56,290	391,825	1,006,972	1,530,913	55,563
1970	63,085	292,600	1,943,221		71,095
1971	59,533	295,420	747,523	1,804,952	118,277
1972	48,334	431,150	830,128		52,093
1973	81,457	272,955	1,181,093	1,754,361	67,377
1974	76,799	354,590	1,757,575		82,298
1975	80,168	192,745	990,716	1,367,114	72,299
1976	44,342	340,921	823,453		50,615
1977	80,156	360,340	1,113,453	2,387,811	82,404
1978	72,705	259,189	2,514,318		87,301
1979	62,685	314,582	1,407,828	3,560,654	64,795
1980	55,888	436,565	848,320		46,644
1981	61,641	322,682	1,442,675	4,488,356	47,837
1982	66,011	370,545	4,024,261		56,970
1983	60,670	549,331	975,901	4,631,621	43,692
1984	83,655	930,084	931,671		127,799
1985	146,404	656,038	2,138,600	6,460,716	106,431
1986	32,720	318,410	47,085		478,147
1987	120,376		1,913,750	3,223,534	73,088
1988	140,783		1,418,299		61,203
1989	153,065		3,107,000	7,288,000	86,064
1990	280,141		6,081,000		44,640
1991	175,588		3,325,000	12,943,000	40,007
1992	222,550		1,120,174		N/A
1993*	3,300		6,430,018	10,800,000	
1994	4,240		3,132,626		
1995	6,000		1,752,254	7,291,110	
1996	6,500		2,910,305		
1997			4,260,954	2,900,000	
1998			4,427,679		

*Data from this year onwards appended to M. Zallen and K. Needham report, January 1994

APPENDIX B

SALMON ESCAPEMENTS TO HARRISON RIVER

YEAR	CHINOOK	CHUM	SOCKEYE	PINK	COHO
1951	1,500	35,000	17,145	N/R	N/R
1952	75,000	35,000	25,794	N/R	N/R
1953	15,000	75,000	21,328	75,000	N/O
1954	15,000	35,000	28,800		N/O
1955	7,500	35,000	5,595	75,000	N/O
1956	3,500	15,000	2,586		N/O
1957	3,500	35,000	3,812	585,798	N/O
1958	16,500	35,000	14,701		N/O
1959	18,000	60,000	27,885	110,311	N/O
1960	3,500	50,927	17,280		N/O
1961	5,000	18,223	42,778	168,137	N/O
1962	2,000	43,231	8,162		N/O
1963	113,500	58,616	22,287	645,476	N/O
1964	6,000	89,387	2,202		200
1965	8,500	45,265	15,034	69,213	N/R
1966	9,000	164,520	32,672		N/R
1967	7,500	68,320	20,577	64,576	75
1968	7,500	228,949	5,391		1,500
1969	7,500	102,686	15,006	96,390	1,500
1970	7,500	117,100	12,675		1,500
1971	15,000	116,450	3,790	73,881	3,500
1972	15,000	144,000	1,399		1,500
1973	25,000	52,000	3,060	196,150	1,500
1974	35,000	111,800	16,920		1,500
1975	15,000	22,300	5,987	180,052	1,500
1976	7,500	111,800	5,130		750
1977	25,000	175,700	2,246	126,782	2,500
1978	15,000	128,300	19,747		1,500
1979	15,000	103,100	45,706	269,858	750
1980	10,000	89,400	5,092		1,500
1981	20,000	128,000	3,193	314,519	400
1982	22,000	86,000	9,189		1,000
1983	6,000	155,000	4,239	146,014	N/R
1984	15,000	212,000	1,267		2,500
1985	50,000	295,000	5,097	438,022	3,000
1986	35,000	165,000	7,290		N/R
1987	79,693	21,847	5,297	1,028,892	N/R
1988	35,116		1,544		N/R
1989	74,685		2,934	687,000	N/R
1990	177,375		4,515		N/R
1991	90,638		14,640	964,000	N/R
1992	130,310		313		N/R
1993*			3,265		N/R
1994			9,575		N/R
1995			16,760		N/R
1996	36,865		15,379		N/R
1997	70,514		1,418		N/R
1998			4,496		N/R

*Data from this year onwards appended to M. Zallen and K. Needham report, January 1994

APPENDIX C

SALMON ESCAPEMENTS TO HOMATHKO RIVER

YEAR	CHUM	PINK	COHO	CHINOOK	STEELHEAD	SOCKEYE
1947	75,000	7,500	7,500	15,000	400	
1948	35,000	3,500	7,500	3,500	400	
1949	7,500	3,500	3,500	7,500	750	
1950	7,500	750	3,500	7,500	750	
1951	15,000	7,500	7,500	7,500	400	
1952	35,000	1,500	15,000	3,500	750	
1953	15,000	7,500	3,500	7,500	750	
1954	75,000	400	7,500	7,500	200	
1955	3,500	3,500	1,500	3,500	200	
1956	200	200	3,500	7,500	7,500	
1957	75,000	400	7,500	3,500	1,500	
1958	3,500	200	7,500	7,500	400	
1959	7,500	7,500	3,500	7,500		
1960	3,500	N/O	3,500	3,500		
1961	3,500	N/O	3,500	1,500		
1962	3,500	1,500	3,500	3,500		
1963	3,500	N/O	3,500	3,500		
1964	7,500	1,500	3,500	7,500		
1965	400	N/O	3,500	3,500		
1966	3,500	1,500	3,500	3,500		
1967	3,500	N/O	3,500	3,500		
1968	3,500	1,500	3,500	3,500		
1969	200	N/O	400	1,500		
1970	3,500	1,500	3,500	3,500		
1971	1,500	N/O	3,500	3,500		
1972	75,000	750	1,500	3,500		
1973	7,500	75	1,500	1,500		
1974	7,500	N/O	3,500	3,500		
1975	3,500	N/O	1,500	3,500		
1976	7,500	N/O	3,500	1,500		
1977	35,000	N/O	3,500	7,500		
1978	50,000	N/O	2,000	3,000		
1979	10,000	N/O	2,500	2,500		
1980	45,000	N/O	3,000	1,200		
1981	1,250	N/O	0	1,000		
1982	60,000	N/O	10,000	3,000		
1983	24,900	N/O	15,500	3,300		50
1984	10,000	N/O	200	200		
1985	1,000	N/O	0	0		
1986	15,000	N/O	6,000	7,500		
1987	2,500	N/O	0	9,700		
1988	13,500	N/O	150	1,200		
1989	2,000	N/O	N/O	N/O		
1990	7,000	N/O	250	850		
1991	8,500	N/O	400	N/O		
1992	15,000	N/O	N/O	N/O		
1993*		N/O	400	350		
1994		N/O				
1995		N/O	500	500		
1996		N/O	400	800		
1997	100	N/O	1,500	2,000		100

*Data from this year onwards appended to M. Zallen and K. Needham report, January 1994

APPENDIX D

SALMON ESCAPEMENTS TO CUMSACK CREEK

YEAR	CHINOOK	CHUM	PINK	COHO	SOCKEYE
1947	400	7,500	7,500	3,500	
1948	750	1,500	3,500	750	
1949	75	1,500	750	400	
1950	200	1,500	1,500	1,500	
1951	750	3,500	3,500	400	
1952	200	1,500	1,500	400	
1953	400	1,500	3,500	200	
1954	200	1,500	200	75	
1955	400	750	200	200	
1956	400	750	25	75	
1957	200	3,500	200	400	
1958	750	1,500	25	200	
1959	200	750	200	400	
1960	200	400	25	400	
1961	200	400	N/O	400	
1962	200	750	25	750	
1963	200	750	N/O	750	
1964	N/O	N/O	N/O	N/O	
1965	200	N/O	N/O	750	
1966	200	750	N/O	750	
1967	25	75	N/O	N/O	
1968	UNK	UNK	UNK	200	
1969	N/O	N/O	N/O	75	
1970	25	25	N/O	N/O	
1971	N/O	N/O	N/O	400	
1972	N/O	N/O	N/O	200	
1973	N/O	N/O	N/O	200	
1974	N/O	N/O	N/O	1,500	
1975	N/O	N/O	N/O	1,500	
1976	N/O	N/O	N/O	2,500	
1977	N/O	N/O	N/O	1,500	
1978	N/O	N/O	N/O	1,500	
1979	N/O	N/O	N/O	2,000	
1980	N/O	N/O	N/O	1,000	
1981	N/R	N/R	N/R	N/R	
1982	N/R	N/R	N/R	N/R	
1983	N/R	N/R	N/R	N/R	
1984	N/R	N/R	N/R	N/R	
1985	N/R	N/R	N/R	N/R	
1986	N/R	N/R	N/R	N/R	
1987	N/R	N/R	N/R	N/R	
1988	N/O	N/O	N/O	500	
1989	N/R	N/R	N/R	N/R	
1990	N/R	N/R	N/R	N/R	
1991	N/R	N/R	N/R	N/R	
1992	N/R	N/R	N/R	N/R	
1993*					
1994					
1995					
1996					
1997					

*Data from this year onwards appended to M. Zallen and K. Needham report, January 1994

APPENDIX E

SALMON ESCAPEMENTS TO KINGCOME RIVER

YEAR	CHINOOK	CHUM	SOCKEYE	PINK	COHO
1947	N/R	N/R	N/R	N/R	N/R
1948	N/R	15,000	400	750	750
1949	N/R	U/N	UNK	U/N	UNK
1950	750	15,000	3,500	7,500	3,500
1951	3,500	15,000	3,500	7,500	7,500
1952	1,500	75,000	3,500	75,000	35,000
1953	7,500	15,000	3,500	3,500	35,000
1954	200	15,000	3,500	7,500	7,500
1955	7,500	3,500	3,500	3,500	15,000
1956	7,500	7,500	200	3,500	75,000
1957	3,500	15,000	3,500	7,500	35,000
1958	400	15,000	3,500	35,000	15,000
1959	750	15,000	3,500	7,500	15,000
1960	750	7,500	1,500	15,000	7,500
1961	0	15,000	0	3,500	15,000
1962	1,500	15,000	1,500	35,000	15,000
1963	3,500	15,000	3,500	7,500	7,500
1964	7,500	15,000	3,500	7,500	35,000
1965	400	3,500	200	3,500	15,000
1966	750	7,500	400	7,500	15,000
1967	3,500	15,000	1,500	3,500	35,000
1968	400	15,000	0	7,500	15,000
1969	200	3,500	0	200	3,500
1970	1,500	15,000	1,500	25,000	20,000
1971	750	1,500	0	7,500	3,500
1972	750	35,000	0	75,000	15,000
1973	1,500	42,500	0	20,000	12,000
1974	3,000	45,000	UNK	190,000	9,000
1975	1,500	8,000	UNK	9,000	7,500
1976	1,500	50,000	UNK	275,000	7,500
1977	750	7,500	UNK	25,000	3,500
1978	1,000	18,000	UNK	20,000	5,000
1979	50	8,000	18	300	400
1980	32	10,000	UNK	20,000	3,000
1981	20	UNK	UNK	6,000	UNK
1982	450	3,300	N/O	24,000	150
1983	400	N/O	30	10,000	950
1984	250	300	N/O	22,000	N/O
1985	150	375	N/O	9,850	700
1986	30	N/O	N/O	31,000	150
1987	1,500	3,000	N/O	7,000	3,000
1988	200	10,000	N/O	92,000	600
1989	500	400	5	9,000	530
1990	300	N/O	N/O	200,000	1,000
1991	526	5,000	N/O	3,000	1,600
1992	316	690	N/O	31,500	891
1993*		6		125	308
1994		766		20,500	600
1995		3,541		1,450	
1996		338		45,600	307
1997				500	200

*Data from this year onwards appended to M. Zallen and K. Needham report, January 1994