The 1978, 1980, 1982 and 1984 Returns of Even Year Pink Salmon Stocks to the Johnstone Strait Study Area

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The total return of pink salmon to the Johnstone Strait Study Area for the 1978 - 1984 even year cycle declined from 2.4 million in 1978 and 2.6 million in 1980, to only 0.8 million in 1982 and 0.6 million in 1984. These returns represent a below average mean return to escapement ratio of 1.4:1. Commercial pink catches in the Study Area also declined from 1.3 million in 1978 and 1.2 million in 1980, to only 0.2 million in 1982 and 1984. These catches represent stock exploitation of 25.3% to 56.2%. The number of days fishing during the pink and sockeye fishery declined, while the effectiveness of the fleet increased. Harvesting of pink salmon generally peaked around the end of July and beginning of August. Most of the annual pink harvest (83 - 87%) came from Area 12, and the majority of annual catch (73 - 85%) was taken by seines.

Pink escapements declined from 1.0 million in 1978 and 1.4 million in 1980, to 0.6 million in 1982 and 0.4 million in 1984. The latter two values were well below the estimated optimum of 1.5 million for the Study Area. Only the Bond to Knight sub-area showed adequate escapements during the study period.

The total catch of sockeye in the Study Area commercial fishery for 1978, 1980, 1982 and 1984 was 3.5 million, 1.1 million, 1.8 million and 1.2 million respectively. Majority of the sockeye catches consisted of the Fraser River stocks which showed total returns during the respective years of 9.5 million, 3.1 million, 13.9 million and 5.9 million. Harvesting of sockeye salmon generally peaked around mid-August. As with the Study Area pinks, most of the annual sockeye harvest (63 - 71%) came from Area 12, and the majority of annual catch (76 - 91%) was taken by seines.

Sockeye escapements to the Study Area increased from 17,100 in 1978 and 31,400 in 1980, to 75,900 in 1982 and 54,100 in 1984. This increasing trend was due mainly to the increasing escapement of the Nimpkish stock as a result of protective measures introduced in 1980.

Key words: pink salmon, Johnstone Strait Study Area, fishery, escapement, sockeye salmon.

RÉSUMÉ

Gould, A.P., A.P. Stefanson and L. Hop Wo. 1988. The 1978, 1980, 1982 and 1984 returns of even year pink salmon stocks to the Johnstone Strait Study Area. Can. Tech. Rep. Fish. Aquat. Sci. 1629: 53 p.

La remonte de saumons roses dans la zone d'étude du détroit de Johnstone pendant le cycle des années paires de 1978 à 1984 est passée de 2,4 millions en 1978 et de 2,6 millions en 1980 à seulement 0,8 million en 1982 et à 0,6 million en 1984. Ces remontes correspondent à un rapport moyen inférieur à la moyenne de la remonte par rapport à l'échappée de 1,4 : 1. Les prises comerciales de saumons roses dans la zone d'étude sont également passées de 1,3 million en 1978 et de 1,2 million en 1980 à seulement 0,2 million en 1982 et 1984. Ces prises correspondent à une exploitation du stock de 25,3% à 56,2%. Le nombre de journées de pêche pendant la période de pêche au saumon rose (et au saumon rouge) a diminué, tandis que l'efficacité de la flottille a augmenté. La capture du saumon rose est maximale vers la fin de juillet et le début du mois d'août. Presque toutes les prises annuelles de saumon rose (83-87%) provenaient de la zone 12, et la majorité des captures annuelles (73-85%) ont été effectuées à la senne.

Les échappées de saumon rose ont chuté, passant de 1,0 million en 1978 et 1,4 million en 1980 à 0,6 million en 1982 et 0,4 million en 1984. Les deux dernières valeurs sont bien en dessous de la valeur optimale estimée de 1,5 million pour la zone d'étude. On a relevé des échappées appropriées seulement dans la sous-zone Bond jusqu'à Knight pendant la période d'étude.

Les prises totales de saumon rouge dans la zone d'étude des pêches commerciales pour 1978, 1980, 1982 et 1984 étaient respectivement de 3,5 millions, 1,1 million, 1,8 million et 1,2 million. Presque tous les saumons rouges capturés provenaient des stocks du Fraser dont la remonte de saumons au cours de ces années s'est élevée à 9,5 millions, 3,1 millions, 13,9 millions et 5,9 millions. C'est en général vers la mi-août que les captures de saumon rouge atteignaient leur valeur maximale. Comme dans le cas de la zone d'étude des saumons roses, presque toutes les prises annuelles de saumon rouge ont été effectuées (63-71%) dans la zone 12, et la majorité des prises annuelles (76-91%) ont été effectuées à la senne.

Les échappées de saumon rouge vers la zone d'étude sont passées de 17 100 en 1978 et de 31 400 en 1980 à 75 900 en 1982 et à 54 100 en 1984. Cette tendance à la hausse était due surtout à l'échappée croissante du stock de la Nimpkish découlant des mesures de protection introduites en 1980.

Mots-clés: saumon rose, zone d'étude du détroit de Johnstone, pêches, échappée, saumon rouge.

INTRODUCTION

The even year pink salmon stocks in the Johnstone Strait Study Area have been analyzed and reported bi-annually since 1962. This report is one of a series which combines and condenses the catch and escapement information, and the management considerations for the Study Area for the 1978, 1980, 1982 and 1984 seasons. Also included is a review of the Study Area sockeye stocks and the Fraser River sockeye catches in Johnstone Strait.

The Johnstone Strait Study Area contains the largest interception fishery in British Columbia. It consists of the Johnstone Strait region and that portion of the Strait of Georgia north of the International Pacific Salmon Fishery Commission (IPSFC) Convention Area (Fig. 1). For management purposes, the Study Area is divided into Statistical Areas (Fig. 2) and sub-areas or management units (Fig. 3).

Approximately 60 streams contribute to the Study Area pink stocks. In contrast to the odd year cycle when some pink stocks enter the Johnstone Strait enroute to spawning streams outside the Study Area, all even year pink stocks spawn within the Study Area, north of the Mid-Vancouver Island and Loughborough to Bute Inlet sub-areas.

In addition to the Study Area pink stocks, a major segment of the Fraser River sockeye population has migrated through Johnstone Strait in recent years. The recent shift in the migration route of Fraser River sockeye through Johnstone Strait was coupled with an increase in fleet size and overall fishing efficiency in Johnstone Strait.

Sufficient exploitation of migrating sockeye through Johnstone Strait is a major consideration in the overall management plan for the Study Area. At the same time, protection of the Study Area pink salmon and Nimpkish sockeye must be considered in the overall Johnstone Strait management strategy.

FISHERY

SEASON REVIEWS

1978 Season

For 1978, an above average return of 4.6 million pink salmon was projected and was expected to be composed primarily of those stocks returning to Area 12 Mainland Inlets. In addition, the abundance of sockeye, mainly the Fraser River segment migrating via Johnstone Strait, was expected to total 1.5 million, based on the predicted total return of 6.5 million Fraser River sockeye. A summary of the 1978 season including days fished, gear counts, and major regulations is outlined for Areas 12 and 13 in Appendix 1.

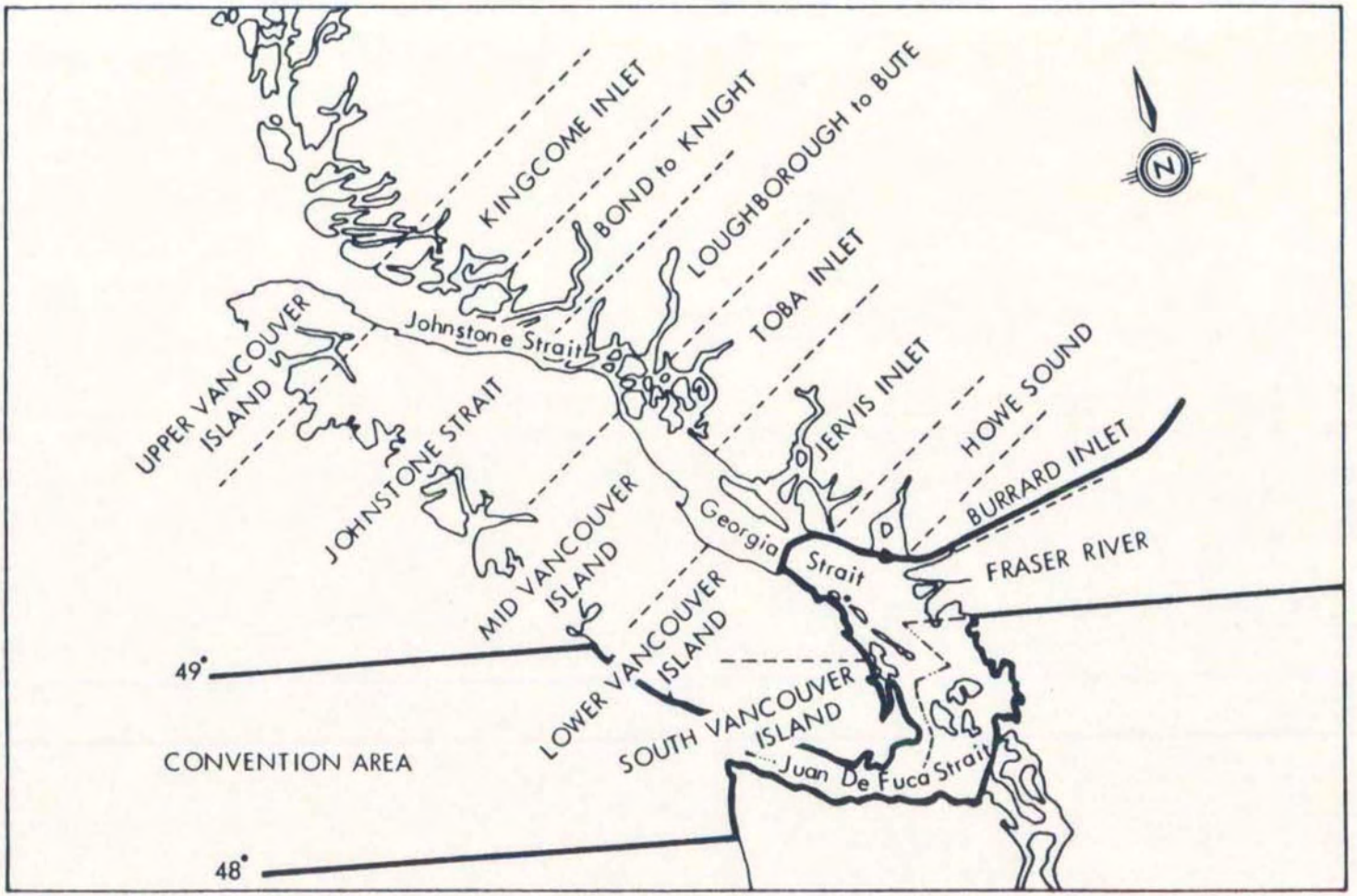


Fig. 1. The Johnstone Strait Study Area showing major pink salmon stock groups.

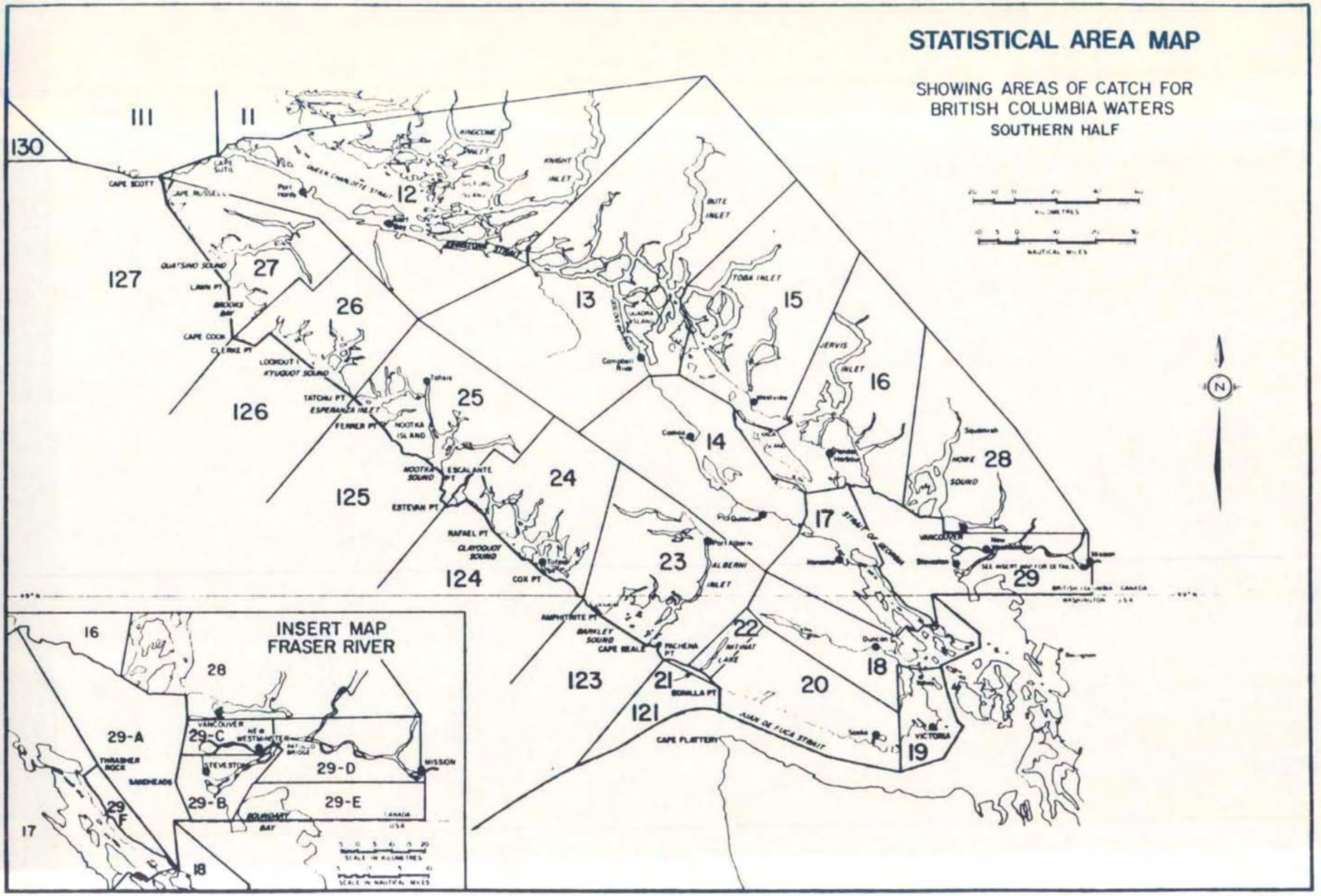
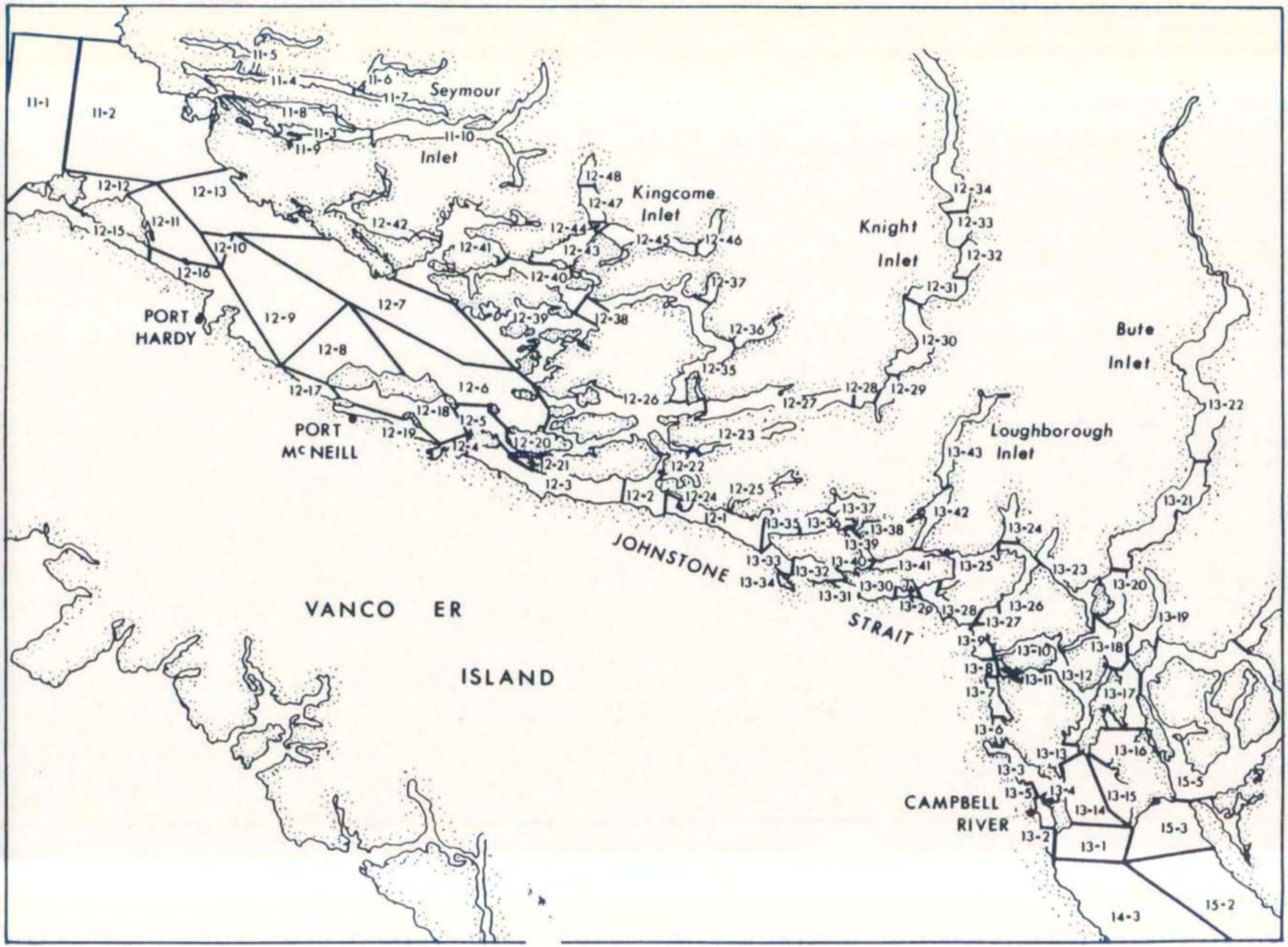


Fig. 2. Statistical Area map for the southern British Columbia showing Areas 11-16 and the Johnstone Strait Study Area.



showing statistical sub-areas or management units.

The 1978 catch of pink salmon within the Study Area totalled 1.3 million (Table 1). This was below the average catch for even year stocks (1.6 million) and also below the anticipated catch, largely due to a weaker than expected return of the Study Area pink salmon. A total of 3.5 million sockeye were taken (Table 2), mainly from stocks returning to the Fraser River. This catch was some 2.6 million greater than anticipated due to a much larger than expected diversion through Johnstone Strait (58%) and a larger than expected total return of the Fraser River stocks (9.5 million, IPSFC 1979).

1980 Season

For 1980, an above average return of 4.5 million pink salmon was projected and was expected to be composed primarily of those stocks returning to Area 12 Mainland Inlets. In addition, the abundance of sockeye, mainly the Fraser River segment migrating via Johnstone Strait, was expected to total 0.7 million, based on the predicted total return of 3.2 million Fraser River sockeye. A summary of the 1980 season including days fished, gear counts, and major regulations is outlined for Areas 12 and 13 in Appendix 2.

The 1980 catch of pink salmon within the Study Area totalled 1.2 million (Table 1). This was below the anticipated catch due to a weaker than expected return to escapement ratio and a concerted effort to increase escapements. A total of 1.1 million sockeye were taken (Table 2), mainly from stocks returning to the Fraser River. This catch was some 0.7 million greater than anticipated and was the result of a record high northern diversion rate of 70% (IPSFC 1981).

1982 Season

For 1982, a below average return of 1.2 million pink salmon was projected as a result of severe environmental damage in 1980 when up to 75% of the spawn was destroyed in some areas. Only the Mid-Vancouver Island and Bond to Knight Inlet stocks were expected to provide surplus return to escapement requirements. The abundance of sockeye, mainly the Fraser River segment migrating via Johnstone Strait, was expected to total about 5 million, based on the predicted total return of 10 million Fraser River sockeye. A summary of the 1982 season including days fished, gear counts, and major regulations is outlined for Areas 12 and 13 in Appendix 3.

The 1982 catch of pink salmon within the Study Area totalled just under 0.2 million (Table 1). This was slightly less than anticipated due to a concerted effort to increase escapements. A total of 1.8 million sockeye were taken (Table 2), mainly from stocks returning to the Fraser River. This catch was lower than predicted, despite a greater than expected total return of Fraser River sockeye (13.9 million), and was due to a much smaller northern diversion rate (22%) than anticipated (IPSFC 1983).

1984 Season

For 1984, a below average return of 1.5 million pink salmon was projected. In addition, the abundance of sockeye, mainly the Fraser River segment migrating via Johnstone Strait, was expected to total 1.3 million,

Table 1. Pink salmon catch by gear and area, Johnstone Strait Study Area, 1978-1984 (even years).[a]

YEAR	GILLNET	SEINE	TROLL	TOTAL
1978				
Area 11	11,794	0	58,464	70,258
Area 12	111,382	1,017,511	49,142	1,178,035
Area 13	4,001	88,978	2,692	95,671
Area 14	0	0	2,709	2,709
Area 15	0	0	86	86
Area 16	37	252	341	630
Total	127,214	1,106,741	113,434	1,347,389
Percent by gear	(9.4)	(82.1)	(8.4)	(100.0)
1980				
Area 11	711	1	74,761	75,473
Area 12	189,618	802,623	48,018	1,040,259
Area 13	971	69,318	2,856	73,145
Area 14	9	0	47	56
Area 15	0	0	8	8
Area 16	85	3,746	31	3,862
Total	191,394	875,688	125,721	1,192,803
Percent by gear	(16.0)	(73.4)	(10.5)	(100.0)
1982				
Area 11	2,368	0	6,631	8,999
Area 12	10,007	147,229	6,009	163,245
Area 13	1,513	16,292	1,664	19,469
Area 14	92	189	80	361
Area 15	0	0	43	43
Area 16	315	2,040	55	2,410
Total	14,295	165,750	14,482	194,527
Percent by gear	(7.3)	(85.2)	(7.4)	(100.0)
1984				
Area 11	1,618	0	11,926	13,544
Area 12	25,682	163,582	2,076	191,340
Area 13	280	23,505	575	24,360
Area 14	403	0	1,634	2,037
Area 15	0	0	0	0
Area 16	290	453	9	752
Total	28,273	187,540	16,220	232,033
Percent by gear	(12.2)	(80.8)	(7.0)	(100.0)

[a]Source: British Columbia Catch Statistics, DFO;(see also Appendices 5-8).

Table 2. Sockeye salmon catch by gear and area, Johnstone Strait Study Area, 1978-1984 (even years).[a]

YEAR	GILLNET	SEINE	TROLL	TOTAL
1978				
Area 11	21,416	0	118,751	140,167
Area 12	250,104	2,078,952	86,234	2,415,290
Area 13	23,726	837,911	35,595	897,232
Area 14	27	0	2,985	3,012
Area 15	0	0	401	401
Area 16	4,783	30,878	2,322	37,983
Total	300,056	2,947,741	246,288	3,494,085
Percent by gear	(8.6)	(84.4)	(7.0)	(100.0)
1980				
Area 11	2,712	1,255	6,467	10,434
Area 12	56,998	624,575	7,277	688,850
Area 13	13,469	283,086	4,083	300,638
Area 14	9	0	438	447
Area 15	0	0	243	243
Area 16	4,872	84,916	889	90,677
Total	78,060	993,832	19,397	1,091,289
Percent by gear	(7.2)	(91.1)	(1.8)	(100.0)
1982				
Area 11	18,958	0	20,451	39,409
Area 12	207,863	956,838	21,279	1,185,980
Area 13	23,973	403,583	37,809	465,365
Area 14	1	0	2,562	2,563
Area 15	0	0	22	22
Area 16	5,726	102,120	19,078	126,924
Total	256,521	1,462,541	101,201	1,820,263
Percent by gear	(14.1)	(80.3)	(5.6)	(100.0)
1984				
Area 11	15,655	0	3,404	19,059
Area 12	244,441	639,698	2,795	886,934
Area 13	16,768	255,764	3,959	276,491
Area 14	59	15	933	1,007
Area 15	0	0	23	23
Area 16	12,254	51,381	1,346	64,981
Total	289,177	946,858	12,460	1,248,495
Percent by gear	(23.2)	(75.8)	(1.0)	(100.0)

[a]Source: British Columbia Catch Statistics, DFO; (see also Appendices 9-12).

based on the predicted total return of 3.2 million Fraser River sockeye. A summary of the 1984 season including days fished, gear counts, and major regulations is outlined for Areas 12 and 13 in Appendix 4.

The 1984 catch of pink salmon within the Study Area totalled just over 0.2 million (Table 1) and was below the anticipated catch. In addition, a total of 1.2 million sockeye were taken (Table 2), mainly from stocks returning to the Fraser River. This catch was greater than expected due to a greater than expected total return of the Fraser River sockeye (5.9 million). The northern diversion rate of Fraser River sockeye in 1984 was 31% (IPSFC 1985).

CATCH BY AREA AND STOCK GROUP

Percent catch of pink and sockeye salmon by area during the 1978 to 1984 period is shown below (calculated from Tables 1 and 2). Most of the annual pink (83 - 87%) and sockeye (63 - 71%) catches came from Area 12, with Area 13 providing a secondary catch contribution for both salmon species.

	% of Study Area pink catch			% of Study Area sockeye catch		
Year	Area 12	Area 13	Area 11	Area 12	Area 13	Area 16
1978	87.4	7.1	5.2	69.1	25.7	1.1*
1980	87.2	6.1	6.3	63.1	27.5	8.3
1982	83.9	10.0	4.6	65.2	25.6	7.0
1984	82.5	10.5	5.8	71.0	22.1	5.2

*Area 11 = 4.0%

The Bond to Knight pink salmon were the dominant stock group harvested in the Johnstone Strait Study Area in all the years considered, as confirmed by the escapement records (see Escapement section). The Fraser River sockeye were the dominant sockeye group harvested in the Study Area, contributing over 95% to the total sockeye catch (see Total Stock - Sockeye Salmon section).

CATCH BY GEAR

Annual catches by gear type are shown for each Statistical Area in Table 1 for pink salmon and Table 2 for sockeye salmon. Percent catch by gear for each species is summarized below.

	Pinks			Sockeye		
Year	Seine	Gillnet	Troll	Seine	Gillnet	Troll
1978	82.1	9.4	8.4	84.4	8.6	7.0
1980	73.4	16.0	10.5	91.1	7.2	1.8
1982	85.2	7.3	7.4	80.3	14.1	5.6
1984	80.8	12.2	7.0	75.8	23.2	1.0

Seine catches dominated the annual harvest of both pink and sockeye salmon in all the years considered, contributing up to 85% and 91% to the annual pink and sockeye catches respectively. Gillnets contributed up to 16% and 23% to the annual pink and sockeye catches respectively, while the troll gear generally contributed less than 10% to the annual catches of each species.

FISHING EFFORT

Weekly gear counts (seines and gillnets) and the number of days fishing are presented by Statistical Area for the 1978, 1980, 1982, and 1984 seasons in Tables 3-6 respectively. A summary of fishing effort, expressed as days fishing and catch/day in each of Areas 12 and 13, is presented for seines and gillnets in Table 7 and troll gear in Table 8.

The number of days fishing during the pink and sockeye net fishery declined significantly in recent years, from 28 - 37 days in 1978 to 20 - 24.5 in 1980, to 19 - 24.5 in 1982 and 14.4 - 18 in 1984 (Table 7). Total troll boat-days also declined from 3,715 (Area 12) and 2,973 (Area 13) in 1978 to 1,421 (Area 12) and 1,509 (Area 13) in 1984 (Table 8). The above fishing effort data were based on a 13-week period when the fleet was targeting on pink and sockeye salmon. Catches occurring beyond these dates were not considered in this analysis since the target species had shifted to chum salmon. While the number of days fishing declined from 1978 to 1984, the size of the net fleet remained generally the same during this period, as indicated by the gear counts for peak weeks of pink and sockeye catches in Area 12 (Table 9).

Table 3. Weekly gear counts (seine and gillnet) and days fished for Areas 11-13 and 16, 1978.

		AREA 11[a]		AREA 12[b]				AREA 13[b]					AREA 16			
		# VESSELS	# DAYS	# VESSELS		# DAYS		# VESSELS			# DAYS		# VESSELS		# DAYS	
WEEK	DATES	GN	GN	GN	SN	GN	SN	GN	SN	BUTE GN[c]	GN	SN	GN	SN	GN	SN
6/1	Jun 4-10															
6/2	Jun 11-17															
6/3	Jun 18-24	9	4	32	7	4	4	0	0		4					
6/4	Jun 25-J1		Closed	63	19	4	4	1	0		4		3		4	
7/1	Jul 2-08		Closed	25	33	4	4	6	21		3	3	4		2	
7/2	Jul 9-15		Closed	26	59	4	4	13	4		4	4	1		2	
7/3	Jul 16-22		Closed	87	83	4	4	12	18		4	4	Strike		2	
7/4	Jul 23-29	32	4	207	90	4	4	16	19	2	4	4	7		2	
7/5	Jul 30-A5	41	3	263	152	3	3	18	24	12	3	3	15	23	2	2
8/1	Aug 6-12	13	3	273	148	2	2	15	34	44	2	2	33	40	4	4
8/2	Aug 13-19	11	3	390	215	2	2	35	58	Closed	2	2	10	7	2	2
8/3	Aug 20-26	71	1	260	211	3	3	56	164	Closed	3	3	27	19	3	3
8/4	Aug 27-S2		Closed	67	44	1	1	55	329	Closed	1	1				
9/1	Sep 3-09		Closed			Closed	Closed			Closed	Closed	Closed				
9/2	Sep 10-16	6	2	105	312	2	2	60	199	Closed	2	2				
9/3	Sep 17-23	3	2	208	228	2	2	45	84	187	2	2				
9/4	Sep 24-30	NA	2	175	252	2	2	186	169	115	2	2				
10/1	Oct 1-07	2	1	280	211	1	1	246	220		1	1				
10/2	Oct 8-14	2	1	299	177	1	1	241	246		1	1				
10/3	Oct 15-21	1	1	152	125	1	1	115	184		1	1				
10/4	Oct 22-28					Closed	Closed				Closed	Closed				
10/5	Oct 29-N4			85	71	2	2	135	274		1	1				
	TOTAL		27			46	46				44	36			23	11

[a] Area 11 gear and days are from D. Rektal memo and are under review.

[b] Area 12 & 13 gear counts are from D. Anderson notes.

[c] Bute GN denotes the gillnet only fishery in Bute Inlet.

Table 4. Weekly gear counts (seine and gillnet) and days fished for Areas 11-14 and 16, 1980.

	AREA 11[a]		AREA 12				AREA 13				AREA 14				AREA 16			
	# VESSELS	# DAYS	# VESSELS		# DAYS		# VESSELS		# DAYS		# VESSELS		# DAYS		# VESSELS		# DAYS	
WEEK DATES	GN	GN	GN	SN	GN	SN	GN	SN	GN	SN	GN	SN	GN	SN	GN	SN	GN	SN
7/1 Jun 29-J5			54	23	2	2	5	8	2	2					3			
7/2 Jul 6-12			54	65	2	2	9	8	2	2								
7/3 Jul 13-19			31	30	2	2	8	8	2	2								
7/4 Jul 20-26			80	100	3	3	40	25	3	3								
7/5 Jul 27-A2			134	134	1	1	11	19	1	1								
8/1 Aug 3- 9			239	159	1.5	1	28	53	1.5	1					17	0	1	1
8/2 Aug 10-16	27	3.5	307	327	3.5	3	13	75	3.5	3					21	75	3	3
8/3 Aug 17-23	36	2.5	136	191	2.5	2	43	156	2.5	2					29	59	2	2
8/4 Aug 24-30	24	1.5	56	104	1.5	1	26	100	2.5	2					16	45	2	2
9/1 Aug 31-S6	6	1.5	75	97	1.5	1	32	73	1.5	1								
9/2 Sep 7-13	4	1.5	84	110	1.5	1	33	46	1.5	1								
9/3 Sep 14-20	4	1.5	309	189	1.5	1	93	136	1.5	1								
9/4 Sep 21-27	1	1	438	259	1	1	69	129	1	1								
10/1 Sep 28-04			418	234	1	1	312	257	1	1								
10/2 Oct 5-11					Closed	Closed			Closed	Closed								
10/3 Oct 12-18			413	118	1	1	253	265	1	1								
10/4 Oct 19-25																		
10/5 Oct 26-N1																		
11/1 Nov 2- 8																		
11/2 Nov 9-15																		
11/3 Nov 16-22											216	139	1	2				
11/4 Nov 23-29											63	22	0.4	3.75				
TOTAL		13			26.5	23			27.5	24			1.4	5.75			8	8

[a] Area 11 gear counts are under review.

Table 5. Weekly gear counts (seine and gillnet) and days fished for Areas 11-14 and 16, 1982.

		AREA 11[a]		AREA 12				AREA 13					AREA 14				AREA 16[c]			
		# VESSELS	# DAYS	# VESSELS		# DAYS		# VESSELS			# DAYS		# VESSELS		# DAYS		# VESSELS		# DAYS	
WEEK	DATES	GN	GN	GN	SN	GN	SN	GN	SN	BUTE GN[b]	GN	SN	GN	SN	GN	SN	GN	SN	GN	SN
7/1	Jun 27-J3																			
7/2	Jul 4-10		Closed	50	53	2.5	2	20	20		2.5	2								
7/3	Jul 11-17		Closed	55	53	2.5	2	12	23		2.5	2								
7/4	Jul 18-24		Closed	71	74	2.5	2	14	23		2.5	2								
7/5	Jul 25-31	97	2.5	186	136	2.5	2	10	33		2.5	2					10	4	2	2
8/1	Aug 1-07	14	1.5	30	89	1.5	1	10	22		1.5	1					4	9	2	2
8/2	Aug 8-14	21	2.5	300	251	2.5	2	9	36		2.5	2					56-65	2-62	3	3
8/3	Aug 15-21	28	2.5	267	184	2.5	2	20	93		2.5	2					10-5	8-48	7	7
8/4	Aug 22-28	NA	3.5	208	172	3.5	3	34	69		3.5	3					6-7	10-68	2	2
9/1	Aug 29-S4	14	1.5	111	90	1.5	1	35	67	54	1.5	1					40	125	1	1
9/2	Sep 5-11	21	1.5	244	256	1.5	1	13	54		1.5	1								
9/3	Sep 12-18	22	1.5	207	183	1.5	1	55	86		1.5	1								
9/4	Sep 19-25		Closed			Closed	Closed			250	Closed	Closed								
10/1	Sep 26-02	4	2.5	280	273	2.5	2	109	177	250	2.5	2								
10/2	Oct 3-09			331	277	1.5	1	54	147		1.5	1	33	0	1.5	0				
10/3	Oct 10-16			404	208	1.5	1	178	236		1.5	1	38	0	1.5	0				
10/4	Oct 17-23			115	142	1.5	1	110	260		1.5	1	179	0	2.5	0				
10/5	Oct 24-30												177	204	6	4.8				
11/1	Oct 31-06												250	0	2	0				
11/2	Nov 7-13												180	130	2	1.5				
11/3	Nov 14-20														Closed	Closed				
11/4	Nov 21-27												147	155	0.5	0.5				
	TOTAL		19.5			31.5	24.0				31.5	24.0			16.0	6.8			17	17

[a] Area 11 gear counts are from D. Rekdal deliveries/days and rounded.

[b] Bute Inlet fishery Sept 1-2 (1 day 4hrs), Sept 20-22 (2 days), and Sept 26-29 (2.5 days).

[c] Area 16 gear counts are from opening day and closing day.

Table 6. Weekly gear counts (seine and gillnet) and days fished for Areas 11-14 and 16, 1984.

		AREA 11		AREA 12				AREA 13				AREA 14				AREA 16			
		# VESSELS	# DAYS	# VESSELS		# DAYS		# VESSELS		# DAYS		# VESSELS		# DAYS		# VESSELS		# DAYS	
WEEK	DATES	GN	GN	GN	SN	GN	SN	GN	SN	GN	SN	GN	SN	GN	SN	GN	SN	GN	SN
7/1	Jul 01-07																		
7/2	Jul 08-14																		
7/3	Jul 15-21			125	40	1.5	1	10	23	1.5	1								
7/4	Jul 22-28			107	59	2.5	2	19	33	2.5	2					11	8	2.5	2
7/5	Jul 29-A4	52	2.5	196	144	2.5	2	14	26	2.5	2					19	9	2.5	2
8/1	Aug 05-11	21	3.5	240	168	3.5	3	18	70	3.5	3					22	34	4.5	4
8/2	Aug 12-18	13	2.5	144	187	2.5	2	11	80	2.5	2					7	8	2.5	2
8/3	Aug 19-25	29	2.5	162	119	2.5	2	18	68	2.5	2					24	17	2.5	2
8/4	Aug 26-S1	0	2	103	142	2	1.4	15	56	2	1.4					12	33	2	1.4
9/1	Sep 02-08					Closed	Closed			Closed	Closed								
9/2	Sep 09-15					Closed	Closed			Closed	Closed								
9/3	Sep 16-22			140	142	1	1	32	75	1	1								
9/4	Sep 23-29																		
10/1	Sep 30-06																		
10/2	Oct 07-13																		
10/3	Oct 14-20											650	Closed	1					
10/4	Oct 21-27											Closed	261[a]		2				
10/5	Oct 28-N3											465	Closed	1					
11/3	Nov 18-24											300	160	0.8	0.8				
	TOTAL		13			18	14.4			18	14.4			2.8	2.8	95	109	16.5	13.4

[a]Area 14 wk 10/4 seines opened 2 separate 1 day openings;gear=250+272 respectively, avg=261.

Table 7. Summary of net fishing effort for pink and sockeye salmon in Areas 12 and 13 of the Johnstone Strait Study Area, 1978–1984 (even years, W/E = week ending).[a]

YEAR	DAYS FISHING		GILLNET CATCH (X 1000)		SEINE CATCH (X 1000)		FLEET CATCH PER DAY[b] (X 1000)	
	GN	SN	PINK	SOCKEYE	PINK	SOCKEYE	PINK	SOCKEYE
1978 (W/E Jun 24 – W/E Sep 16)								
Area 12	37.0	37.0	111.3	249.0	1,086.1	2,077.5	32.4	62.9
Area 13	36.0	28.0	3.8	22.4	87.0	834.0	3.2	30.4
1980 (W/E Jun 28 – W/E Sep 20)								
Area 12	23.5	20.0	189.4	56.9	801.7	624.6	48.1	33.7
Area 13	24.5	21.0	0.9	12.8	62.2	283.0	3.0	14.0
1982 (W/E Jun 26 – W/E Sep 18)								
Area 12	24.5	19.0	10.0	207.6	146.9	956.8	8.1	58.8
Area 13	24.5	19.0	0.4	23.7	15.7	402.8	0.8	22.2
1984 (W/E Jun 30 – W/E Sep 22)								
Area 12	18.0	14.4	25.7	244.4	163.6	639.7	12.8	58.0
Area 13	18.0	14.4	0.3	16.8	23.5	255.8	1.6	18.7

[a] Source: British Columbia Catch Statistics, DFO.
[b] Average gillnet catch per day + average seine catch per day.

Table 8. Summary of troll fishing effort for pink and sockeye salmon in Areas 12 and 13 of the Johnstone Strait Study Area, 1978-1984 (even years, W/E = week ending).

YEAR	TROLL BOAT-DAYS FISHING[a]	CATCH[b] (IN PIECES)		AVERAGE CATCH PER BOAT-DAY	
		PINK	SOCKEYE	PINK	SOCKEYE
1978 (W/E Jun 24 - W/E Sep 16)					
Area 12	3,715	49,043	86,111	13.2	23.2
Area 13	2,973	2,566	35,057	0.9	11.8
1980 (W/E Jun 28 - W/E Sep 20)					
Area 12	2,592	47,979	7,273	18.5	2.8
Area 13	3,846	2,754	4,017	0.7	1.0
1982 (W/E Jun 26 - W/E Sep 18)					
Area 12	2,575	5,993	21,274	2.3	8.3
Area 13	2,897	1,642	37,795	0.6	13.0
1984 (W/E Jun 30 - W/E Sep 22)					
Area 12	1,421	2,076	2,795	1.5	2.0
Area 13	1,509	575	3,959	0.4	2.6

[a] Number of boats × number of days fishing; data from Pacific Biological Station catch data base.
[b] Source: British Columbia Catch Statistics, DFO.

Table 9. Gear counts (gillnet and seine) for weeks of peak catches of pink and sockeye in Area 12, 1978-1984 (even years).

	1978			1980			1982			1984			78-84
	GN	SN	TOTAL	GN	SN	TOTAL	GN	SN	TOTAL	GN	SN	TOTAL	AVERAGE TOTAL
PINK	207	90	297	80	100	180	186	136	322	196	144	340	285
(week)			(7/4)			(7/4)			(7/5)			(7/5)	
SOCKEYE	260	211	471	307	327	634	267	184	451	240	168	408	491
(week)			(8/3)			(8/2)			(8/3)			(8/1)	

The effectiveness of the fleet increased considerably from 1978 to 1984, as indicated by the mean annual seine and gillnet catch per day in Area 12 (Table 7), expressed as a percentage of the total (all gear) pink and sockeye harvest in Area 12 each season (Tables 1 and 2). In 1978 the net fleet caught per day fished 2.8% of the pink and 2.6% of the sockeye harvest in Area 12. In 1980 these figures rose to 4.6% for pinks and 4.9% for sockeye. In 1982 they increased to 5.0% for both pinks and sockeye, and in 1984 the figures peaked at 6.7% for pinks and 6.5% for sockeye.

Fishing effort in the Johnstone Strait Study Area, as reflected by the weekly catches in Area 12, generally peaked toward the end of July and beginning of August for pink salmon, and during mid-August for sockeye salmon (see also Stock Timing section).

STOCK TIMING

Pink Salmon

Pink run timing in the Study Area is primarily a feature of the strength of individual stocks exhibiting slightly different run timing through the fisheries. Run timing of the major pink stock groups through Area 12 is shown in Figure 4(see insert). Each major group can be identified in the fishery on the basis of timing, and the segregation of these stocks by sub-area is convenient for management purposes. Figure 4 illustrates the approximate timing of Study Area pink stocks as indicated by the weekly total pink catches in Area 12 where the majority of pinks are harvested (Appendices 5 - 8). During the study period, peak catches occurred generally in late July or early August. Timing for each season is discussed below.

The 1978 peak weekly catch of pink salmon in Area 12 totalled 413,462 and occurred during a four-day fishery of July 23 - 29 (Fig. 4, Appendix 5). This peak timing was about a week earlier than expected but similar to the 1972 - 1976 cycle years when the peak catch occurred two or three weeks earlier than in previous cycles. In the 1956 - 1970 cycle period, the average peak catches occurred around August 16 (Fig. 4, insert) and the earliest peak catch occurred in 1958 during the week ending August 9 (Anderson 1976). The earlier peak catches observed in 1972 - 1978 were the result of a greater abundance of the early Mainland Inlet stocks in Area 12.

The 1980 peak weekly catches of pink salmon in Area 12 occurred during the two weeks of July 20 - 26 and August 10 - 16 when 248,965 and 249,218 fish respectively were harvested (Fig. 4, Appendix 6). The earlier peak was similar to the 1972 - 1978 peak timing and represented returns of the more abundant Mainland Inlet stocks in Area 12. The later peak was similar to the average peak catch timing observed during the 1956 - 1970 cycle period, and represented largely the strong Bond to Knight Inlet stocks, as confirmed by the escapement records (see Escapement section).

The 1982 peak weekly catch of pink salmon in Area 12 totalled 74,901 and occurred during a two-day fishery of July 25 - 31 (Fig. 4, Appendix 7).

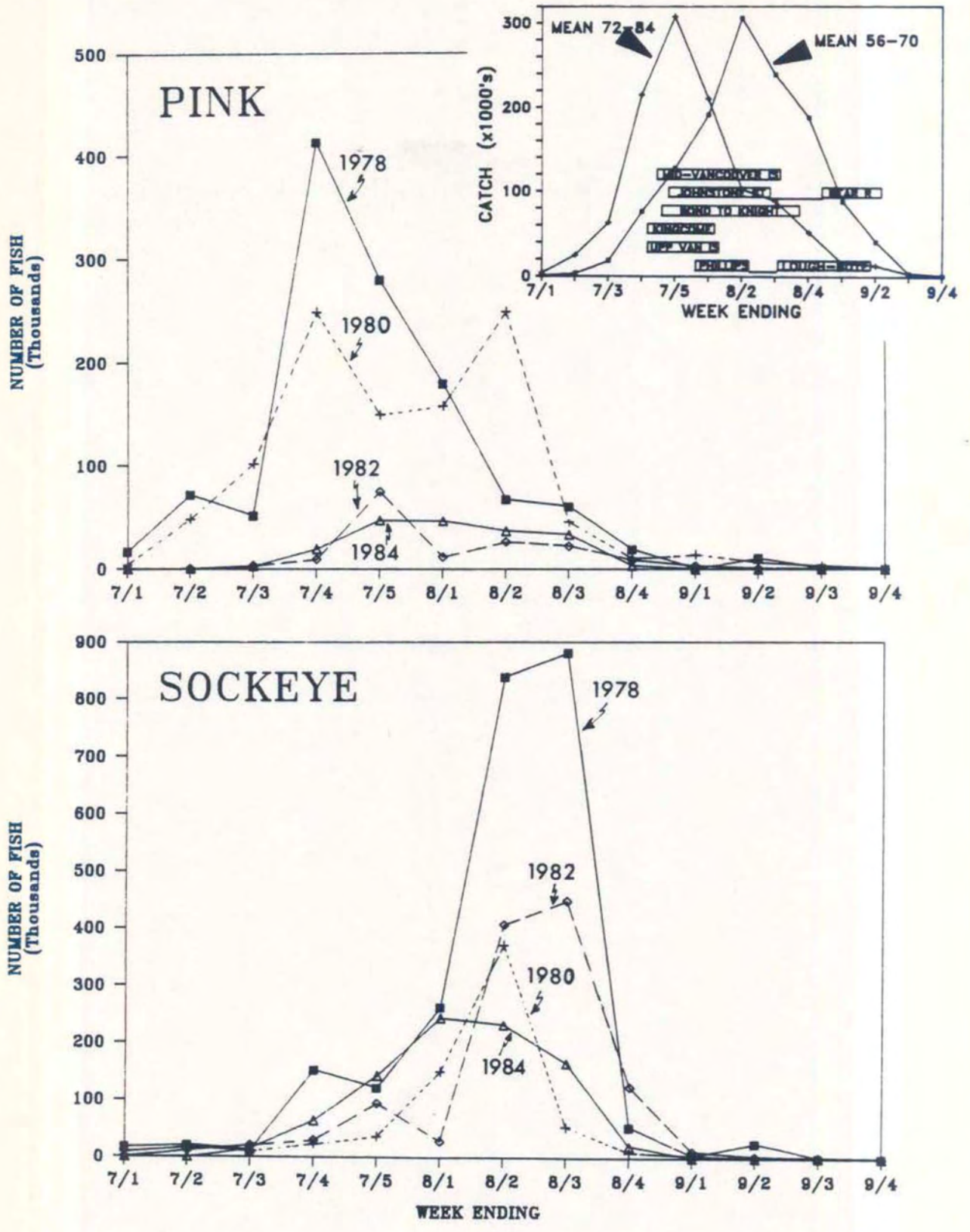


Fig. 4 Weekly total catches of pink salmon (top) and sockeye salmon (bottom) in Area 12 for 1978-1984 (even years). Insert shows mean weekly net catches of pinks in Area 12 during 1956-1970 and 1972-1984 (horizontal bars indicate timing of sub-area stocks).

The timing of this catch was similar to the 1972 - 1978 cycle period and was again the result of a greater abundance of the early Mainland Inlet stocks in Area 12.

The 1984 peak weekly catches of pink salmon in Area 12 occurred during the two weeks of July 29 - August 4 and August 5 - 11 when 47,596 and 46,458 fish respectively were harvested (Fig. 4, Appendix 8). This timing was about one week later than the peak timing for the 1978 - 1982 cycle years (Fig. 4) and was attributed largely to the passing of Upper Vancouver Island stocks in late July, and of Bond to Knight Inlet stocks in August. The dominance of the Bond to Knight Inlet stocks in 1984 was confirmed by the escapement records (see Escapement section).

Sockeye Salmon

The abundance and timing of Fraser River sockeye migrating through the Johnstone Strait Study Area are the primary factors influencing the activity of the fishery in this area. Large sockeye returns and a high northern diversion rate (up to 70% in 1980), accompanied by a political desire to harvest these stocks outside the Fraser River Convention Area, have escalated the fishery in the Johnstone Strait Study Area. The International Pacific Salmon Fisheries Commission is responsible for managing these stocks and their Annual Reports (IPSFC 1979, 1981,1983, 1985) describe the status of these runs in more detail. Consequently, the Fraser River sockeye were examined only briefly in this report.

Figure 4 illustrates the approximate run timing of sockeye, in relation to pink salmon, through the Study Area as indicated by the weekly total sockeye catches in Area 12 where the majority of sockeye are harvested (Appendices 9 - 12). During the study period, peak catches occurred generally around mid-August which is several weeks after the peak catches of pink salmon. The year-to-year variation in peak catch timing of sockeye was related to the strongly cyclical nature of the dominant Fraser River stocks which influenced the annual timing. These stocks were the late run Adams/Lower Shuswap stocks in 1978 and 1982, and the early run Chilko stocks in 1980 and 1984. Timing for each season is discussed below.

In 1978 the sockeye run was dominated by the Adams/Lower Shuswap stocks, a late summer run, and was expected to peak in Johnstone Strait by the last week of August. The actual peak timing of sockeye through Area 12 occurred during the two weeks of August 13 - 19 and August 20 - 26 when 838,796 and 880,725 sockeye respectively were harvested (Fig. 4, Appendix 9). This timing is similar to that observed for the 1970 and 1974 cycles.

In 1980 the sockeye run was dominated by the Chilko population which represents an early summer run, and was expected to peak in Johnstone Strait by the last week of July. The actual peak timing of sockeye through Area 12 occurred during the week of August 10 - 16 when 371,927 sockeye were harvested (Fig. 4, Appendix 10). This timing is approximately two weeks later than the last cycle year of 1976.

In 1982 the sockeye run was dominated by the late run Adams/Lower Shuswap stocks, and the peak catch in Area 12 occurred during the two weeks of August 9 - 14 and August 15 - 21 when 407,373 and 448,861 sockeye respectively were harvested (Fig. 4, Appendix 11). This timing seems consistent with the earlier timing in recent cycle years.

In 1984 the sockeye run was dominated by the early run Chilko stocks, and the peak catch in Area 12 occurred during the two weeks of August 5 - 11 and August 12 - 18 when 244,158 and 231,619 sockeye respectively were harvested (Fig. 4, Appendix 12). This timing is slightly earlier compared to the 1980 cycle year (Fig. 4).

Compared to the Fraser River stocks, the timing of the Study Area sockeye stocks has been defined much less precisely. However, initial studies involving analysis of scale samples from test fishing and Area 12 sockeye catches have indicated that the Nimpkish sockeye contribute to the Area 12 catch from mid-June until early August with a peak contribution during mid-to-late July.

ESCAPEMENT

PINK SALMON

Pink salmon escapements to the Johnstone Strait Study Area for the 1950 - 1984 cycle years are shown by sub-area in Figure 5 and Table 10, and by major stream in Appendix 13. Optimum escapements for each stream and sub-area are also included for comparison. Optimum escapements were derived from the highest recorded escapements since 1950, adjusted in some cases to account for new information. Estimates of optimum escapements have been increased for the Kakweiken River from 35,000 to 100,000, and Quinsam River from 3,500 to 7,500, as a result of the successful reproduction of larger populations of pink salmon in recent years. Currently, optimum escapement levels are being replaced by target levels which consider the current stock rebuilding schedules. During the management of the 1978 - 1984 fisheries, the optimum even year escapement of pink salmon to the Study Area was assessed at approximately 1.5 million (Table 10).

Between 1978 and 1984, a declining trend in the Study Area pink salmon escapements was observed, from 1,383,400 (90.3% of optimum) in 1980 to only 387,500 (25.3% of optimum) in 1984. The 1982 and 1984 escapements were the lowest since 1960. This declining trend was apparent in all the sub-areas of the Johnstone Strait Study Area, with the greatest decline observed in 1984 for the Kingcome Inlet and Loughborough to Bute stocks (Fig. 5).

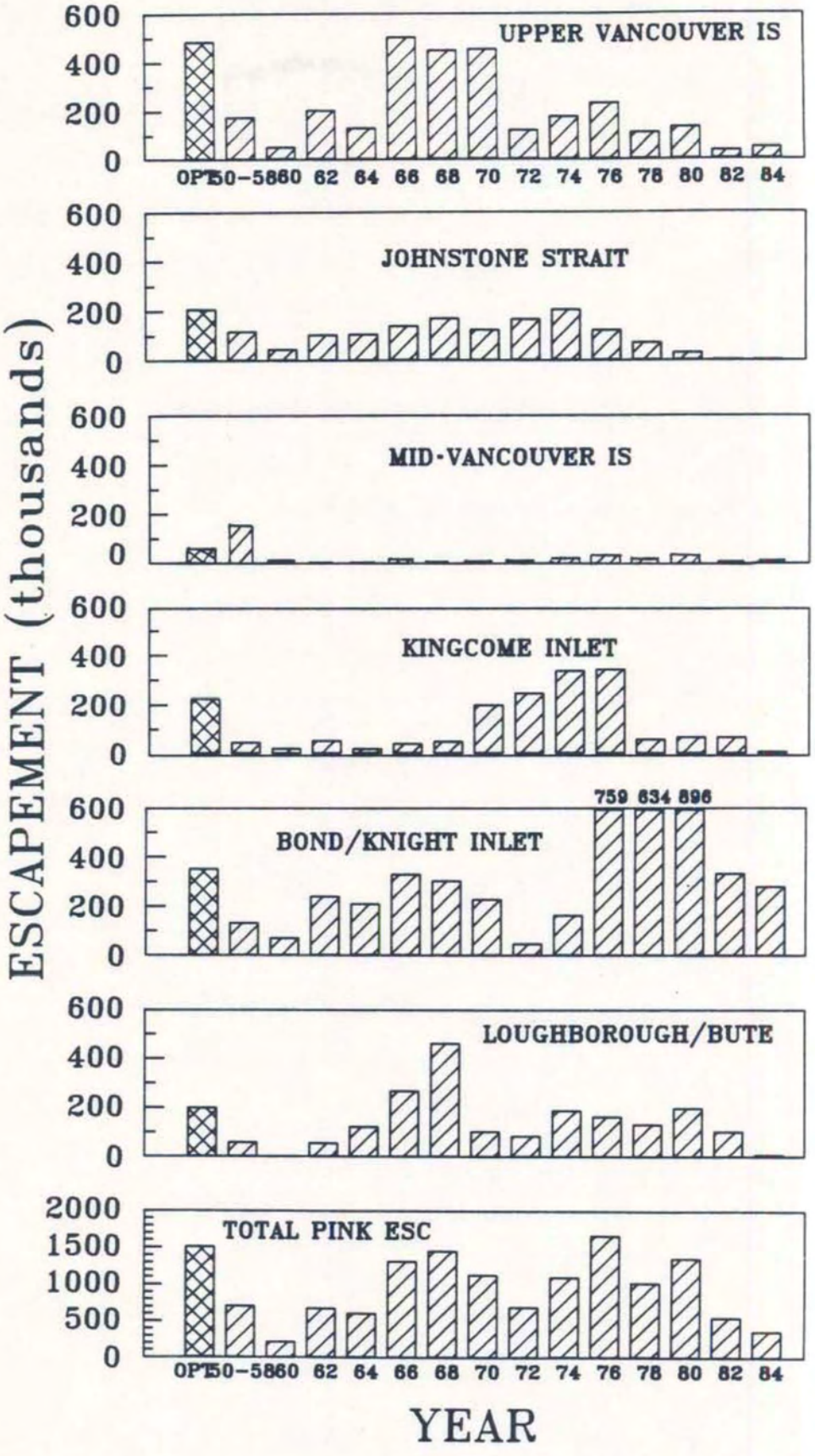


Fig. 5. Pink salmon escapements by sub-area to the Johnstone Strait Study Area for 1950-1984 cycle period (hatched bars indicate optimum escapement).

Table 10. Pink salmon escapements (in thousands) by sub-area to the Johnstone Strait Study Area, and percent of optimum escapement (in parentheses), 1950-1984 (even years).[a]

SUB AREA	OPTIMUM ESCAPEMENT	1984	1982	1980	1978	1976	1974	1972	1970	1968	1966	1964	1962	1960	50-58 AVERAGE
UPPER VANCOUVER IS	488.5	54.0 (11.1)	41.2 (8.4)	136.0 (27.8)	114.7 (23.5)	237.2 (48.6)	181.3 (37.1)	124.7 (25.5)	458.7 (93.9)	453.5 (92.8)	506.5 (103.7)	134.5 (27.5)	207.4 (42.5)	56.6 (11.6)	178.8 (36.6)
JOHNSTONE STRAIT	213.0	6.5 (3.1)	6.9 (3.3)	38.1 (17.9)	79.0 (37.1)	129.3 (60.7)	211.6 (99.4)	172.1 (80.8)	129.8 (61.0)	175.5 (82.4)	145.0 (68.1)	111.9 (52.5)	110.6 (51.9)	51.7 (24.3)	124.2 (58.3)
MID-VANCOUVER IS	38.9	13.5 (34.6)	3.7 (9.4)	36.4 (93.6)	19.4 (49.8)	45.3 (116.4)	23.5 (60.3)	20.7 (53.2)	17.2 (44.2)	15.2 (39.1)	27.9 (71.7)	7.5 (19.2)	8.9 (22.9)	16.1 (41.3)	167.8 (431.4)
KINGCOME INLET	228.5	13.2 (5.8)	72.2 (31.6)	72.0 (31.5)	62.7 (27.4)	347.9 (152.3)	342.9 (150.1)	251.7 (110.2)	204.4 (89.5)	55.2 (24.1)	46.0 (20.1)	26.1 (11.4)	57.9 (25.3)	27.0 (11.8)	51.4 (22.5)
BOND-KNIGHT	357.5	286.0 (80.0)	339.7 (95.0)	896.4 (250.8)	634.1 (177.4)	758.6 (212.2)	169.4 (47.4)	54.6 (15.3)	234.3 (65.5)	308.8 (86.4)	336.2 (94.0)	216.0 (60.4)	245.8 (68.7)	77.0 (21.5)	138.7 (38.8)
LOUGHBOROUGH-BUTE	206.4	14.3 (6.9)	110.0 (53.3)	204.4 (99.1)	138.6 (67.2)	170.3 (82.5)	195.6 (94.8)	90.8 (44.0)	109.4 (53.0)	468.8 (227.2)	275.5 (133.5)	129.4 (62.7)	62.3 (30.2)	5.2 (2.5)	65.2 (31.6)
GRAND TOTAL	1532.8	387.5 (25.3)	573.7 (37.4)	1383.4 (90.3)	1048.4 (68.4)	1688.5 (110.2)	1124.2 (73.3)	714.6 (46.6)	1153.8 (75.3)	1476.9 (96.4)	1337.1 (87.2)	625.3 (40.8)	692.8 (45.2)	233.5 (15.2)	726.1 (47.4)

[a] See Appendix 13 for details.

On a sub-area basis, the Bond to Knight Inlet represented the dominant stock group in each of the 1978 - 1984 cycle years, contributing up to 73.8% to the Study Area escapement in 1984 (Fig. 5, Table 10). This sub-area was also the only one that consistently received near optimum or above optimum escapements to its streams in recent years (Appendix 13). Of secondary importance to the 1978 - 1984 Study Area escapements were the Loughborough to Bute, Upper Vancouver Island and Kingcome Inlet sub-areas, in that order. The two remaining groups, Johnstone Strait and Mid-Vancouver Island, contributed the least to the overall escapement (Fig. 5). The individual sub-areas are discussed below in order of their importance as pink salmon producers during the 1978 - 1984 cycle period.

Bond to Knight sub-area

The Bond to Knight sub-area has been assessed for an optimum pink escapement of 357,500, the second highest among the Study Area regions after the Upper Vancouver Island. Unlike the other sub-areas, the Bond to Knight region has maintained healthy pink escapement levels (generally above 50% of the optimum escapement since 1962) and has been by far the major contributor to the Study Area pink stocks since 1976 (Fig. 5).

Escapements to this sub-area during the 1978 - 1984 cycle years averaged 539,100 and declined from 896,400 in 1980 (the highest escapement on record and 250.8% of optimum) to 286,000 in 1984 (80.0% of optimum). The 1978 - 1984 escapements represent 59.2 - 73.8% of the annual Study Area escapement.

The major contributing streams in this sub-area are the Ahnuhati, Glendale and Kakweiken Rivers. The substantial increase in pink production in the Bond to Knight sub-area since the early 1970s is due primarily to construction on the Kakweiken River system of a fishway which opened the upper river to pink spawning.

Loughborough to Bute sub-area

The Loughborough to Bute sub-area was assessed for an optimum pink escapement of 206,400. Escapements to this sub-area for the 1978 - 1984 cycle years averaged 116,800 and declined dramatically from 204,400 in 1980 (99.1% of optimum) to 14,300 in 1984 (6.9% of optimum and the lowest escapement since 1960). The 1978 - 1984 sub-area escapements represent 3.7 - 19.2% of the annual Study Area escapement.

Of the 20 major pink salmon streams in the Loughborough to Bute region, only seven to 11 had recorded escapements during the study period. Grassey and Wortley Creeks were the dominant pink producers in this sub-area in recent years, and the decline in their combined escapements from 100,000 in 1982 to only 9,000 in 1984 was the major reason for the recent severe decrease in escapement observed in this sub-area.

Upper Vancouver Island sub-area

The Upper Vancouver Island sub-area was assessed for an optimum pink escapement of 488,500, the highest among the Study Area regions. While this optimum was met in the 1966 - 1970 cycle years, escapements for the 1978 - 1984 period averaged only 86,500 and ranged from a high of 136,000 in 1980 (27.8% of optimum) to a low of 41,200 in 1982 (8.4% of optimum). The 1982 and 1984 escapements were the lowest since 1960. The 1978 - 1984 sub-area escapements represent 7.2 - 13.9% of the annual Study Area escapement.

The Keogh River remains the dominant producer in this sub-area. Escapements to those rivers in the northern portion of the region (Shushartie, Nahwitti and Stanby) remain critically low despite closures of Goletas Channel and those waters within the surfline between Cape Scott and Cape Sutil. Considering the depressed state of the Upper Vancouver Island stocks, it may be some time before the current protective closures are effective in rehabilitating these river systems.

Kingcome Inlet sub-area

The Kingcome Inlet sub-area was assessed for an optimum pink escapement of 228,500, the third highest among the Study Area regions. While this escapement was met and exceeded in the 1970 - 1976 cycle years, escapements for the 1978 - 1984 period averaged only 55,000 and ranged from 72,200 in 1982 (31.6% of optimum) to only 13,200 in 1984 (5.8% of optimum). These low escapements are similar to the pre-1970 levels (Fig. 5) and represent 3.4 - 12.6% of the annual Study Area escapement.

The Embly, Kingcome and Wakeman Rivers have been the major pink spawning streams in this sub-area. The dramatic decline in escapements observed since 1976 was largely due to a major decrease in the Kingcome River stock from 280,000 in 1976 to only 2,200 in 1984.

Johnstone Strait sub-area

The Johnstone Strait sub-area was assessed for an optimum pink escapement of 213,000. Escapements to this sub-area for the 1978 - 1984 cycle years averaged only 32,600 and declined steadily from 79,000 in 1978 (37.1% of optimum) to only 6,500 in 1984 (3.1% of optimum). The 1982 and 1984 escapements were the lowest on record. The 1978 - 1984 sub-area escapements represent 1.2 - 7.5% of the annual Study Area escapement.

Much of the recent decrease in this sub-area is attributed to the dramatic decline of the dominant Adam and Bear River stocks, from a combined total of 190,000 pink salmon in 1974 to a critically low value of 6,000 fish in 1984. Returning this stock and other Johnstone Strait stocks to their former levels will require reduction in the Johnstone Strait fishing intensity combined with enhancement efforts.

Mid-Vancouver Island sub-area

The Mid-Vancouver Island sub-area was assessed for an optimum pink escapement of 38,900, the lowest among the Study Area regions. Escapements to this sub-area for the 1978 - 1984 cycle years averaged 18,300 and ranged from a high of 36,400 in 1980 (93.6% of optimum) to a low of 3,700 in 1982 (9.4% of optimum). The 1980 escapement was one of the highest since 1960 while the 1982 escapement was the lowest on record. The 1978 - 1984 sub-area escapements represent 0.6 - 3.5% of the annual Study Area escapement. The Quinsam River has been the major pink producer in this sub-area in recent years.

SOCKEYE SALMON

Annual sockeye escapements to the five major sockeye systems (Nimpkish, Fulmore, Haydon, Phillips, and Sakinaw) in the Study Area are shown for the period 1950 - 1984 in Table 11. The Nimpkish River system is by far the major sockeye producer. Total sockeye escapements to the Study Area have declined from about 100,000 in the 1950s and 1960s, to 72,800 in the 1970s and 63,600 in the early 1980s. A record low of 17,100 was reported in 1978. Since that time, sockeye escapements have been increasing, reaching 83,100 in 1983. This improvement is due mainly to a steady increase in the Nimpkish escapements, from a low of 8,500 in 1978 to 70,000 in 1983, and is attributed to protective measures introduced in the fishery since 1980.

Fraser River sockeye escapements in 1978, 1980, 1982 and 1984 were 2.5 million, 0.8 million, 4.0 million and 0.9 million respectively (IPSFC 1979, 1981, 1983, 1985).

TOTAL STOCK

PINK SALMON

Catch, escapement, total stock estimates and ratio of return for the Johnstone Strait Study Area pink salmon are shown for the 1952 - 1984 cycle period in Table 12. These data are illlustrated in Figure 6. The total pink stock was estimated at 2.4 million in 1978, 2.6 million in 1980, 0.8 million in 1982, and 0.6 million in 1984, averaging 1.6 million for that period. The return to escapement ratio averaged 1.4:1 for the same period. The above means are below the 1952 - 1984 average stock size of 2.4 million and average return ratio of 3.0:1 (Table 12). Figure 6 shows the recent downward trend in stock size from a record high of 5.5 million in 1976 to a record low of 0.6 million in 1984. This declining trend was observed primarily in the annual

Table 11. Sockeye salmon escapements (in thousands) to streams in the Johnstone Strait Study Area, 1950-1984.[a]

YEAR	NIMPKISH	FULMORE	HEYDON	PHILLIPS	SAKINAW	TOTAL
1950	100.0	3.5	3.5	3.5	3.5	114.0
1951	100.0	1.5	7.5	15.0	3.5	127.5
1952	100.0	0.7	1.5	3.5	7.5	113.2
1953	100.0	3.5	0.2	0.4	1.1	105.2
1954	75.0	1.5	0.2	3.5	4.1	84.3
1955	75.0	1.5	1.5	1.5	5.0	84.5
1956	75.0	0.7	0.7	1.5	2.1	80.0
1957	130.0	7.5	7.5	7.5	4.3	156.8
1958	75.0	1.5	0.1	3.5	4.3	84.4
1959	75.0	0.2	0.2	3.5	13.0	91.9
1960	75.0	1.5	N/O[b]	0.7	4.5	81.7
1961	75.0	3.5	0.4	1.5	0.7	81.1
1962	100.0	1.5	0.4	1.5	3.5	106.9
1963	150.0	1.5	0.4	3.5	7.5	162.9
1964	100.0	3.5	0.2	3.5	3.5	110.7
1965	30.0	3.5	0.2	3.5	0.7	37.9
1966	120.0	1.5	7.5	3.5	3.5	136.0
1967	100.0	0.7	3.5	1.5	6.0	111.7
1968	35.0	0.4	3.5	3.5	14.0	56.4
1969	100.0	1.5	3.5	1.5	1.2	107.7
1970	50.0	3.5	7.5	0.7	5.0	66.7
1971	75.0	7.5	4.5	3.5	8.0	98.5
1972	60.0	7.5	3.5	4.5	4.5	80.0
1973	100.0	10.0	3.5	3.5	1.5	118.5
1974	150.0	7.0	3.5	2.5	6.0	169.0
1975	40.0	6.0	3.5	1.5	16.0	67.0
1976	35.0	5.0	3.5	3.5	6.0	53.0
1977	15.0	1.5	3.5	1.5	1.2	22.7
1978	8.5	0.1	3.0	1.5	4.0	17.1
1979	20.0	0.5	2.0	1.5	11.0	35.0
1980	24.0	0.1	2.0	2.5	2.8	31.4
1981	60.0	0.8	4.5	5.0	3.0	73.3
1982	60.0	1.5	1.0	10.0	3.4	75.9
1983	70.0	1.5	N/O	10.0	1.6	83.1
1984	50.5	N/O	1.0	1.5	1.1	54.1
AVERAGE						
50-59	90.5	2.2	2.3	4.3	4.8	104.2
60-69	88.5	1.9	2.0	2.4	4.5	99.3
70-79	55.4	4.9	3.8	2.4	6.3	72.8
80-84	52.9	0.8	1.7	5.8	2.4	63.6
50-84	74.5	2.7	2.5	3.5	4.8	88.0

[a] Source: DFO Sprawning Files.
[b] N/O - none observed.

Table 12. Catch, escapement and ratio of return of Johnstone Strait Study Area pink salmon, 1952-1984 (even years).

YEAR	CATCH[a]	ESCAPEMENT[b]	TOTAL STOCK	PERCENT EXPLOITATION	BROOD ESCAPEMENT	RETURN TO ESCAPEMENT RATIO
1952	2,706,500	1,036,900	3,743,400	72.3%	662,320	5.7 : 1
1954	399,200	574,600	973,800	41.0%	1,036,900	0.9 : 1
1956	920,200	589,500	1,509,700	61.0%	574,600	2.6 : 1
1958	1,365,800	769,800	2,135,600	64.0%	589,500	3.6 : 1
1960	344,100	233,500	577,600	59.6%	769,800	0.8 : 1
1962	750,700	692,800	1,443,500	52.0%	233,500	6.2 : 1
1964	853,900	625,300	1,479,200	57.7%	692,800	2.1 : 1
1966	3,438,500	1,337,100	4,775,600	72.0%	625,300	7.6 : 1
1968	3,695,700	1,476,900	5,172,600	71.4%	1,337,100	3.9 : 1
1970	2,341,100	1,153,800	3,494,900	67.0%	1,476,900	2.4 : 1
1972	729,600	714,600	1,444,200	50.5%	1,153,800	1.3 : 1
1974	1,548,600	1,124,200	2,672,800	57.9%	714,600	3.7 : 1
1976	3,777,600	1,688,500	5,466,100	69.1%	1,124,200	4.9 : 1
1978	1,347,400	1,048,400	2,395,800	56.2%	1,688,500	1.4 : 1
1980	1,192,800	1,383,400	2,576,200	46.3%	1,048,400	2.5 : 1
1982	194,500	573,700	768,200	25.3%	1,383,400	0.6 : 1
1984	232,000	387,500	619,500	37.4%	573,700	1.1 : 1
AVERAGE						
52-84	1,519,900	906,500	2,426,400	56.5%[c]	922,700	3.0[d]
78-84	741,700	848,300	1,589,900	41.3%[c]	1,173,500	1.4[d]

[a] Source: British Columbia Catch Statistics, DFO.
[b] Source: DFO Spawning Files.
[c] Mean of annual percent exploitation values.
[d] Mean of annual ratios.

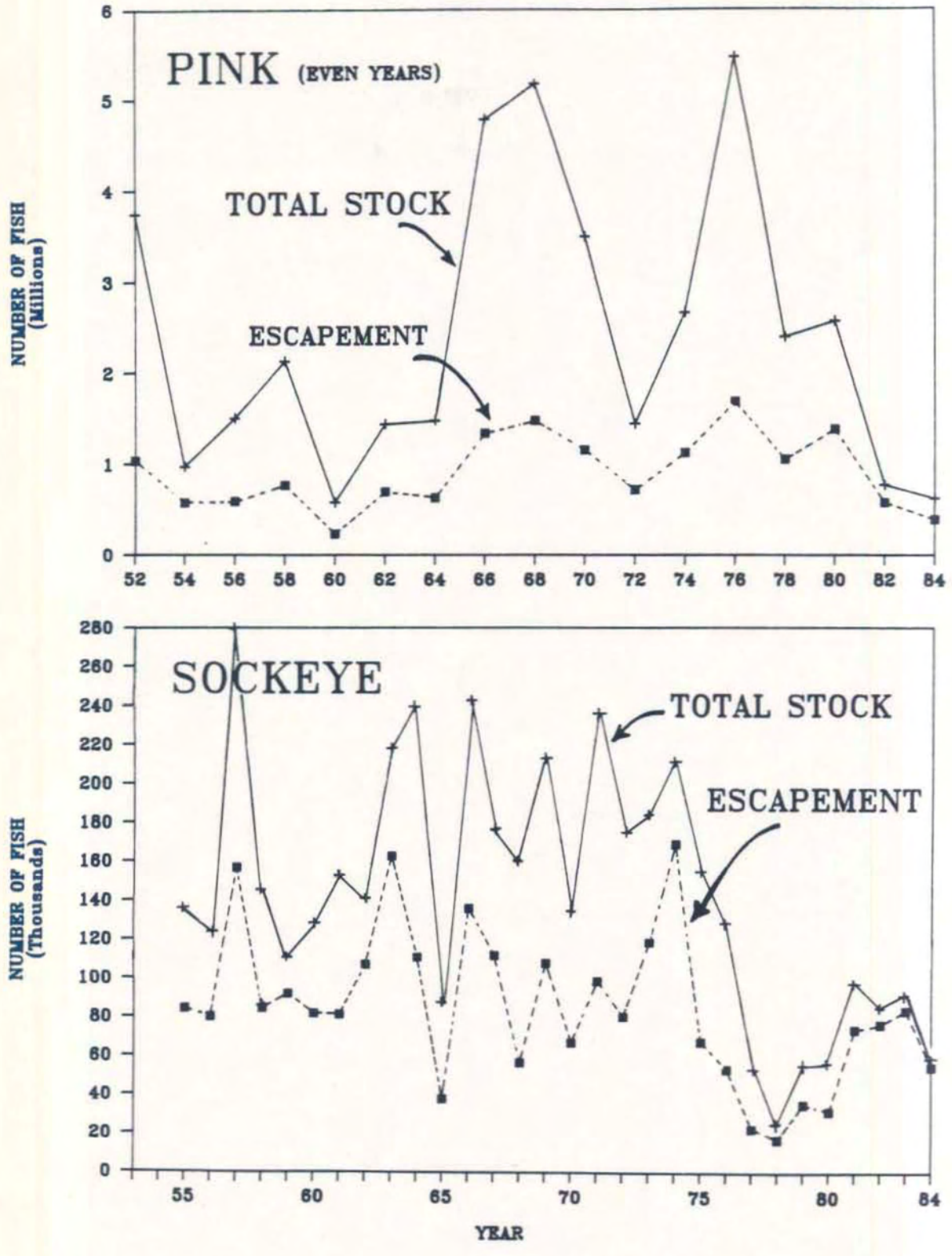


Fig. 6. Escapements and total stock estimates for pink salmon (1952-1984 cycle period, top) and sockeye salmon (1955-1984, bottom) in the Johnstone Strait Study Area.

catches and in the 1982 and 1984 escapements, and is likely a result of relatively high exploitation rates in the Johnstone Strait net fishery coupled with poor brood survival.

The exploitation rate of the even year pink stocks has declined in recent years from 69.1% in 1976 to 37.4% in 1984 (Table 12). This is likely a result of reduced fishing time in Johnstone Strait and terminal areas, as well as reduced stock abundance.

Historically, the great variability in total stock size has been related to both escapement levels and the ratio of return which has varied from 0.6:1 in 1982 to 7.6:1 in 1966 (Table 12). Flooding in the fall of 1980 was responsible for the poor return and low stock size in 1982. The catch of 194,500 pinks that year was the lowest since 1952.

In recent years and particularly in 1982 and 1984, each sub-area with the exception of Bond to Knight stocks, received well below the estimated optimum escapement (Fig. 5). This reflects the need for critical stock protection measures to secure the overall productivity of the Study Area pinks.

Efforts to protect these stocks in the fishery are confounded by extreme differences in relative stock size and productivity. Approximately 60 separate pink stocks which differ greatly in their relative abundance, are thought to be harvested in the Johnstone Strait Study Area (Appendix 13). Of these, the combined Ahnuhati, Glendale and Kakweiken stocks are responsible for over half of the Study Area escapement (58.9% in 1978, 64.3% in 1980, 53.2% in 1982, and 71.0% in 1984). These three stocks are all in the Bond to Knight sub-area and their successful production is a primary influence in the fishery. Another eight stocks each contain between 5,000 and 100,000 pink spawners. The above 11 dominant streams account for the majority of the Study Area escapement (80.9% in 1978, 88.2% in 1980, 90.4% in 1982, and 89.6% in 1984). The remaining 49 streams have each received less than 5,000 spawners in recent years, although their optimum escapements may be considerably greater (e.g. Upper Vancouver Island stocks). These smaller streams are collectively important in that they provide much of the genetic variability and productivity potential available to the overall Study Area population. The challenge for fishery managers is to maintain reasonable population levels in all these streams, although some stocks can and will be fished more intensively than others.

SOCKEYE SALMON

The catch of Study Area sockeye has been estimated using two indirect methods:

A. After the IPSFC has estimated the Fraser River catch contribution, the DFO assumed that the balance of the catch consisted of the Study Area stocks.

B. A fixed stock exploitation rate of 50% was assumed until 1981 for all Study Area sockeye stocks, except the Nimpkish, and a 30% stock exploitation rate was assumed for 1982-1984, as suggested by the late fishing patterns; the escapement estimates were then used to calculate catch estimates. The Nimpkish catch contribution until 1982 was taken from Gould and Stefanson (1985) and for 1983-1984 it was calculated using the stock migration route and timing, and general area harvest rates.

Method B provided catch estimates of the Study Area stocks independent of the Fraser River sockeye harvest (Table 13). Catch estimates using Method B, escapements and total stock estimates for the Johnstone Strait Study Area sockeye are presented for the period 1955 - 1984 in Table 14. These data are illustrated in Figure 6. The Study Area sockeye experienced a major decline in their escapements and total stock estimates during the late 1970s, followed by a slight recovery in the early 1980s. The total stock averaged 67,100 during 1978 - 1984 or less than half of the 1955 - 1984 average total stock of 144,200 (Table 14).

Five major sockeye stocks enter the Johnstone Strait enroute to spawning grounds in Areas 12 to 16 (Table 11), but only the Nimpkish stock has been an important contributor to the Johnstone Strait fishery. In 1978 the Nimpkish stock reached its lowest recorded escapement (8,500 fish, Table 11). Field studies, conducted in 1981 and 1982, provided the identification of Nimpkish sockeye using scale patterns. This lead to analysis of migration route, population age structure, and run timing of this stock during the Area 12 sockeye fishery (Gould and Stefanson 1985). Using this information, special area closures have been implemented since 1980 to protect the Nimpkish stocks early in the season, and from 1979 to the present, escapements have been rebuilding (Table 11).

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Table 13. Total annual Study Area catch and estimated contribution of Fraser River and Study Area sockeye stocks, 1955 - 1984.

YEAR	TOTAL CATCH FOR AREAS 12-16[a]	ESTIMATED CONTRIBUTION OF FRASER RIVER STOCKS[b]	ESTIMATED CONTRIBUTION OF STUDY AREA STOCKS[c,d]
1955	184,800	132,050	52,750
1956	159,600	117,100	42,500
1957	645,100	521,700	123,400
1958	4,313,300	4,253,600	59,700
1959	364,700	345,250	19,450
1960	247,800	199,450	48,350
1961	652,600	579,550	73,050
1962	171,500	137,050	34,450
1963	241,000	182,550	58,450
1964	168,300	37,950	130,350
1965	169,600	120,650	48,950
1966	746,400	638,400	108,000
1967	1,356,400	1,290,550	65,850
1968	465,400	358,700	106,700
1969	547,600	440,750	106,850
1970	1,060,300	991,950	68,350
1971	670,400	531,650	138,750
1972	589,300	491,300	98,000
1973	390,800	326,550	64,250[e]
1974	1,244,900	1,198,400	46,500
1975	189,400	98,900	90,500
1976	557,600	482,500	75,100
1977	754,300	724,150	30,150
1978	3,494,100[f]	3,486,600	7,500
1979	1,017,900[f]	997,400	20,500
1980	1,091,300[f]	1,066,050	25,250
1981	3,290,700[f]	3,262,750	27,950
1982	1,820,300[f]	1,812,060	8,240
1983	2,591,100[f]	2,584,170	6,930
1984	1,248,500[f]	1,245,414	3,086
AVERAGE			
55-84	1,014,800	955,200	59,700
78-84	2,079,100	2,064,900	14,200

[a]Source: British Columbia Catch Statistics, DFO; rounded to nearest 100.

[b]Fraser stock for each year was calculated by subtraction of Study Area stock catches from the total Statistical Area catches.

[c]Nimpkish catch contribution for 1955 to 1982 from Gould and Stefanson (1985); Nimpkish catch contribution for 1983-1984 calculated using stock migration route and timing, and general area harvest rates.

[d]The 1955 to 1981 catch contribution by Study Area sockeye (except Nimpkish) based on a fixed harvest rate of 50% (ie. catch=escapement); the 1982-1984 catch contribution based on a 30% harvest rate, as suggested by the late fishing patterns.

[e]Estimated contribution of Study Area stocks from 1973 includes an estimated 50% of escapement lost due to Dermocystidium in Nimpkish system (protozoan found in gill tissues of adult salmon, thought to be transmisible to emerging fry).

[f]Total catch for 1978 to 1984 includes Areas 11-16.

Table 14. Catch, escapement and total stock of Johnstone Strait Study Area sockeye salmon, 1955-1984.

YEAR	CATCH[a]	ESCAPEMENT[b]	TOTAL STOCK	PERCENT EXPLOITATION
1955	52,750	84,500	137,250	38.4%
1956	42,500	80,000	122,500	34.7%
1957	123,400	156,800	280,200	44.0%
1958	59,700	84,400	144,100	41.4%
1959	19,450	91,900	111,350	17.5%
1960	48,350	81,700	130,050	37.2%
1961	73,050	81,100	154,150	47.4%
1962	34,450	106,900	141,350	24.4%
1963	58,450	162,900	221,350	26.4%
1964	130,350	110,700	241,050	54.1%
1965	48,950	37,900	86,850	56.4%
1966	108,000	136,000	244,000	44.3%
1967	65,850	111,700	177,550	37.1%
1968	106,700	56,400	163,100	65.4%
1969	106,850	107,700	214,550	49.8%
1970	68,350	66,700	135,050	50.6%
1971	138,750	98,500	237,250	58.5%
1972	98,000	80,000	178,000	55.1%
1973	64,250	118,500	182,750	35.2%
1974	46,500	169,000	215,500	21.6%
1975	90,500	67,000	157,500	57.5%
1976	75,100	53,000	128,100	58.6%
1977	30,150	22,700	52,850	57.0%
1978	7,500	17,100	24,600	30.5%
1979	20,500	35,000	55,500	36.9%
1980	25,250	31,400	56,650	44.6%
1981	27,950	73,300	101,250	27.6%
1982	8,240	75,900	84,140	9.8%
1983	6,930	83,100	90,030	7.7%
1984	3,086	54,100	57,186	5.4%
AVERAGE				
55-84	59,700	84,600	144,200	39.2[c]
78-84	14,200	52,800	67,100	23.2[c]

[a]From Table 13.
[b]From Table 11.
[c]Mean of annual percent exploitation values.

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Appendix 1. Major regulations and fishing effort by week for pink and sockeye salmon in Areas 12 and 13, 1978.

Week ending	Week	Days fishing GN	Days fishing SN	Number of vessels GN	Number of vessels SN	Major regulations and changes to proposed fishing times[a]
Area 12						
Jun 24	6/3	4	4	32	7	Parsons Bay closed until September 17. Normal Nimpkish boundary in effect for balance of the season. Mesh size restrictions lifted, Sunday, June 18. Three days fishing in waters south and east of Blinkhorn Light-Hanson Island.
Jul 1	6/4	4	4	63	19	As above.
Jul 8	7/1	4	4	25	33	As above.
Jul 15	7/2	4	4	26	59	Extended Ahnuhati River boundary in effect.
Jul 22	7/3	4	4	87	83	Two days Mainland Inlets.
Jul 29	7/4	4	4	207	90	Goletas Channel closed for balance of sockeye season. Drury Inlet, Dunsany Pass, Grupplen Sound and Wells Passage closed to all commercial salmon fishing.
Aug 5	7/5	3	3	263	152	Knight Inlet closed from Steep Head-Protection point. Adam River boundary changed to box boundary. Kingcome Inlet and Wakeman Sound, north of a line from Bradley Point to Phillip Point, closed to net fishing.
Aug 12	8/1	2	2	273	148	Mainland Inlets one day, until further notice, trolling prohibited except during net fishing openings.
Aug 19	8/2	2	2	390	215	Until further notice, Goletas Channel and Queen Charlotte Strait, south of a line from Cape Sutil to Mexicana Point along the south and east shore of Hope Island to Cape James to Greeting Point to Crane Island Light to Pulteney Point to a boundary sign approximately one mile east of Cluxewe River, closed to all commercial salmon fishing.

Appendix 1 (cont'd)

Week ending	Week	Days fishing GN	Days fishing SN	Number of vessels GN	Number of vessels SN	Major regulations and changes to proposed fishing times[a]
Area 12 (cont'd)						
Aug 26	8/3	3	3	260	211	Mainland Inlets closed, Adam River box.
Sep 2	8/4	1	1	67	44	One day south and east of a line from Blinkhorn light to a boundary sign on Donegal head to a boundary sign on Bold Head to Bare Hill.
Sep 9	9/1					Closed to net fishing.
Sep 16	9/2	2	2	105	312	Two days south and west of a line from Boyles Point to Gawler Point to Success Point to Bare Hill to Dead Point to a boundary sign on west Cracroft Island then following the south shore of West Cracroft Island to the entrance to Port Harvey to Ransam Point.
Area 13						
Jul 8	7/1	3	3	6	21	Area 13 open. Bute Inlet closed.
Jul 15	7/2	4	4	13	4	As above.
Jul 22	7/3	4	3	12	18	As above.
Jul 29	7/4	4	4	16	19	As above. Bute Inlet open to gillnets only.
Aug 5	7/5	3	3	18	24	As above. Bute Inlet open.
Aug 12	8/1	2	2	15	34	Bute Inlet open. Fall boundaries for Mainland shore.
Aug 19	8/2	2	2	35	58	Bute Inlet closed.

Appendix 1 (cont'd)

Week ending	Week	Days fishing GN	Days fishing SN	Number of vessels GN	Number of vessels SN	Major regulations and changes to proposed fishing times[a]
Area 13 (cont'd)						
Aug 26	8/3	3	3	56	164	As above.
Sep 2	8/9	1	1	55	329	As above.
Sep 9	9/1					Closed.
Sep 16	9/2	2	2	60	199	Area 13 open. Mainland Inlets closed.

[a] Sub-units for each area are outlined in Figure 3 and specific legal descriptions are also available in the Pacific Fishery Management Area Regulations.

Appendix 2. Major regulations and fishing effort by week for pink and sockeye salmon in Areas 12 and 13, 1980.

Week ending	Week	Days fishing GN	Days fishing SN	Number of vessels GN	Number of vessels SN	Major regulations and changes to proposed fishing times[a]
Area 12						
Jul 5	7/1	2	2	54	23	Parsons Bay closed to all commercial salmon fishing until September 22. Waters of Broughton Strait, Cormorant Channel and Weyton Passage closed. Tsitika River boundary moved inward to Robson Bight. Mainland Inlets closed.
Jul 12	7/2	2	2	54	65	Same as above. Extended Ahnuhati River box boundary introduced.
Jul 19	7/3	2	2	31	30	Upper Vancouver Island (Malcolm Island North and West) closed. Other closures remain in effect.
Jul 26	7/4	3	3	80	100	As above.
Aug 2	7/5	1	1	134	134	As above. Area 12 closed to trolling except during net times.
Aug 9	8/1	1.5	1	239	159	As above. Knight Inlet open to seines, normal boundaries. Adam River box boundary no longer in effect.
Aug 16	8/2	3.5	3	307	327	As above. Trolling in northern portion of Area 12 only 7 days/week; non-retention of sockeye, pink and chum.
Aug 23	8/3	2.5	2	136	191	As above. Knight Inlet closed. Malcolm Point to Boyles Point boundary for trolling is removed.

Appendix 2 (cont'd)

Week ending	Week	Days fishing GN	Days fishing SN	Number of vessels GN	Number of vessels SN	Major regulations and changes to proposed fishing times[a]
Area 12 (cont'd)						
Aug 30	8/4	1.5	1	56	104	As above.
Sep 6	9/1	1.5	1	75	97	As above.
Sep 13	9/2	1.5	1	84	110	As above.
Sep 20	9/3	1.5	1	309	189	As above.
Area 13						
Jul 5	7/1	2	2	5	8	Area 13 open to gillnet and seine fishing. Bute Inlet closed to gillnet fishing.
Jul 12	7/2	2	2	9	8	As above.
Jul 19	7/3	2	2	8	8	As above.
Jul 26	7/4	3	3	40	25	As above.
Aug 2	7/5	1	1	11	19	As above.
Aug 9	8/1	1.5	1	28	53	As above.
Aug 16	8/2	3.5	3	13	75	Fall boundaries for Mainland Channels (Sunderland, Chancellor, Nodales and Okisallo).
Aug 23	8/3	2.5	2	43	156	As above. Bear River boundary enlarged.
Aug 30	8/4	2.5	2	26	100	As above.
Sep 6	9/1	1.5	1	32	73	As above.
Sep 13	9/2	1.5	1	33	46	As above.
Sep 20	9/3	1.5	1	93	136	As above.

[a] Sub-units for each area are outlined in Figure 3 and specific legal descriptions are also available in the Pacific Fishery Management Area Regulations.

Appendix 3. Major regulations and fishing effort by week for pink and sockeye salmon in Areas 12 and 13, 1982.

Week ending	Week	Days fishing GN	Days fishing SN	Number of vessels GN	Number of vessels SN	Major regulations and changes to proposed fishing times[a]
Area 12						
Jul 10	7/2	2.5	2	50	53	Areas 12-2, 6, 29, 30, open. Closed north of Lewis Pt. for Nimpkish sockeye conservation.
Jul 17	7/3	2.5	2	55	53	Areas 12-2, 6, 29, 30 as above, open.
Jul 24	7/4	2.5	2	71	74	Areas 12-2, 6, 29, 30 as above, open.
Jul 31	7/5	2.5	2	186	136	Areas 12-2, 6, 17, 22-24, 28-30, open. Gordon Channel area opened.
Aug 7	8/1	1.5	1	30	89	Areas 12-2, 6, 17, 29, 30, open. Ribbon boundary introduced (half mile from mainland shore).
Aug 14	8/2	2.5	2	300	251	Area 12-2, 6, 17, 14, 29, 30, open. Lower Gordon Channel open.
Aug 21	8/3	2.5	2	267	184	Area 12-2, 6, 7, 17, 22-25, 29, 30, Gordon Channel, Bates Passage, all open. Note gillnet and troll were opened again Friday, August 20, 1800 hrs to Tuesday, August 24, 0800 hrs to increase harvest of Adams River sockeye. Seine open Friday, August 20, 1800 hrs to Monday, August 23, 1800 hrs. These times have been applied to the August 28 week-ending period.
Aug 28	8/4	3.5	3	208	172	Areas 12-2, 3, 6-8, 17, 22-25, 28-30, open. Ribbon boundary removed.
Sep 4	9/1	1.5	1	111	90	Areas 12-2, 3, 6-8, 17, 22-25, 28-30, open.

Appendix 3 (cont'd)

Week ending	Week	Days fishing GN	Days fishing SN	Number of vessels GN	Number of vessels SN	Major regulations and changes to proposed fishing times[a]
Area 12 (cont'd)						
Sep 11	9/2	1.5	1	244	256	Areas 12-2, 3, 6-8, 17, 22-25, 28-30, open. Fife Sound Area 12-13 open.
Sep 18	9/3	1.5	1	207	183	Areas 12-2, 3, 6-8, 17, 22-25, 28-30, open. Fife Sound Area 12-13 open.
Area 13						
Jul 10	7/2	2.5	2	20	20	Areas 13-4, 5, 6, 12, 19, 20-25, 28, 30, open.
Jul 17	7/3	2.5	2	12	23	Areas 13-4, 5, 6, 12, 19, 22-25, 28, 30, open.
Jul 24	7/4	2.5	2	14	23	Areas 13-4, 5, 6, 12, 19, 22-25, 28, 30, open.
Jul 31	7/5	2.5	2	10	33	Areas 13-4, 5, 6, 12, 19, 22-25, 28, 30, open.
Aug 7	8/1	1.5	1	10	22	Areas 13-4, 5, 6, 12, 19, 22, 24, 25, 28, 30, open. Bear River closed. Ribbon (half mile) boundary in effect.
Aug 14	8/2	2.5	2	9	36	Areas 13-4, 5, 6, 12, 19, 22, 24, 25, 28, open. Bear River closed. Ribbon boundary Nodales Channel closed.
Aug 21	8/3	2.5	2	20	93	Area 13-4, 5, 6, 12, 19, 22, 24, 25, 28, open. As above. Note gillnet and troll were opened again that week, Friday, August 20, 1800 hrs to Tuesday, August 24, 0800 hrs to increase harvest of Adams River sockeye. Seine open Friday, August 20, 1800 hrs to Monday, August 23, 1800 hrs. These times have been applied to the August 28 week-ending period.

Appendix 3 (cont'd)

Week ending	Week	Days fishing GN	Days fishing SN	Number of vessels GN	Number of vessels SN	Major regulations and changes to proposed fishing times[a]
Area 13 (cont'd)						
Aug 28	8/4	3.5	3	34	69	Areas 13-4, 5, 6, 12, 19, 22, 24, 25, 28, 30, open. Areas closed as above. Note above overlap in fishing weeks. Nodales Channel re-opened.
Sep 4	9/1	1.5	1	35	67	Areas 12-2, 3, 6-8, 17, 22-25, 28-30, open. Note Bute Inlet opened Wednesday 1200 hrs to Thursday 1800 hrs, Area 13-8 (Lawrence Pt. to Clipper Pt.)
Sep 11	9/2	1.5	1	13	54	Areas 13-4, 5, 6, 12, 19, 22, 24, 25, 28, 30, open.
Sep 18	9/3	1.5	1	55	86	Areas 13-4, 5, 6, 12, 19, 22, 24, 25, 28, 30, open.

[a]Sub-units for each area are outlined in Figure 3 and specific legal descriptions are available in the Pacific Fishery Management Area Regulations.

Appendix 4. Major regulations and fishing effort by week for pink and sockeye salmon in Areas 12 and 13, 1984.

Week ending	Week	Days fishing GN	Days fishing SN	Number of vessels GN	Number of vessels SN	Major regulations and changes to proposed fishing times[a]
Area 12						
Jul 21	7/3	1.5	1	125	40	Mainland Inlets, Growler Cove and Parsons Bay closed to all gear. Closed north of Lewis Point for protection of early Nimpkish sockeye. Adam River box boundary in effect. Open for seines 1 day and for gillnets 1.5 days.
Jul 28	7/4	2.5	2	107	59	Fishing time extended for seine and gillnet by 1 day.
Aug 4	7/5	2.5	2	196	144	Fishing time extended for seine and gillnet by 1 day. Queen Charlotte Strait, Gordon Channel and Johnstone Strait open. Goletas Channel closed. Extended Keagh and Cluxewe boundaries in effect from Round Island to False Head to Pultney Point to Lady Ellen Point. Mainland Inlets remain closed.
Aug 11	8/1	3.5	3	240	168	Opening for seines 2 days and for gillnets 2.5 days. Fishing time extended to seine and gillnet by 1 day. Gordon Channel open south of Greetin Point on Nigel Island. Queen Charlotte Strait open inside Boulder Point to Staples Islets to Echo Island to Doyle Island to Round Island to False Head to Pultney Point to Lady Ellen Point. Johnstone Strait open south of Lewis Point to Donegal Head to the western most tip of Hanson Island and a line from Cracroft Point of Hanson Island opposite. Seines will be prohibited from fishing one-half mile of the mainland shore to provide a corridor for non-target species. Mainland Inlets remain closed.

Appendix 4 (cont'd)

Week ending	Week	Days fishing GN	Days fishing SN	Number of vessels GN	Number of vessels SN	Major regulations and changes to proposed fishing times[a]
Area 12 (cont'd)						
Aug 18	8/2	2.5	2	144	187	No change.
Aug 25	8/3	2.5	2	162	119	No. change.
Sep 1	8/4	2	1.4	103	142	Gordon Channel, Queen Charlotte Strait, and Johnstone Strait open. Goletas Channel closed. Extended Keoogh and Cluxewe boundaries in effect from Round Island to False Head to Pultney Point to Lady Ellen Point. Mainland Inlets remain closed.
Sep 8	9/1					Closed to protect early study area chums.
Sep 15	9/2					Closed to protect early study area chums.
Sep 22	9/3	1	1	140	142	A one-day net opening to assess chum stock strength. Gordon Channel, Queen Charlotte Strait, Brouhton Strait and Johnstone Strait open. Goletas Channel closed. Extended Keoogh and Cluxewe boundaries in effect from Round Island to False Head to Pultney Point to Lady Ellen Point. Mainland Inlets remain closed.
Area 13						
Jul 21	7/3	1.5	1	10	23	Johnstone Strait/Discovery Passage areas open. Open for seines 1 day and for gillnets 1.5 days.
Jul 28	7/4	2.5	2	19	33	Fishing time extended for seine and gillnet by 1 day.
Aug 4	7/5	2.5	2	14	26	Fishing time extended for seine and gillnet by 1 day.

Appendix 4 (cont'd)

Week ending	Week	Days fishing GN	Days fishing SN	Number of vessels GN	Number of vessels SN	Major regulations and changes to proposed fishing times[a]
Area 13 (cont'd)						
Aug 11	8/1	3.5	3	18	70	Opening for seines 2 days and for gillnet 2.5 days. Fishing time extended for seine and gillnet by 1 day. Seines prohibited from fishing within one-half mile of Vancouver Island in Discovery Passage. Okisollo Channel closed. Kanish Bay closed. Deepwater Bay closed. This provides a corridor for non-target species. Ribbon boundry in effect.
Aug 18	8/2	2.5	2	11	80	No change.
Aug 25	8/3	2.5	2	18	68	No change.
Sep 1	8/4	2	1.4	15	56	No change.
Sep 8	9/1					Closed to protect early study area chums.
Sep 15	9/2					Closed to protect early study area chums.
Sep 22	9/3	1	1	32	75	A one day net opening to assess chum stock strength.

[a] Sub-units for each area are outlined in Figure 3 and specific legal descriptions are available in the Pacific Fishery Management Area Regulations.

Appendix 5. Weekly catches of pink salmon by gear and area, Johnstone Strait Study Area, 1978.[a]

WEEK ENDING	AREA 11			AREA 12			AREA 13			AREA 14			AREA 15			AREA 16		
	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR
To 24-Jun	31	-	195	320	322	79	-	-	192	-	-	688	-	-	32	-	-	39
01-Jul 6/4	-	-	410	1,316	2,195	174	42	-	223	-	-	997	-	-	23	-	-	46
08-Jul 7/1	-	-	1,558	1,599	14,960	258	112	329	71	-	-	271	-	-	9	6	-	60
15-Jul 7/2	-	-	8,067	1,790	68,874	1,541	46	3,150	75	-	-	552	-	-	5	3	-	2
22-Jul 7/3	25	-	1,535	5,992	42,908	2,879	50	1,797	62	-	-	26	-	-	7	-	-	-
29-Jul 7/4	7,334	-	8,733	45,723	350,976	16,763	2,252	11,327	161	-	-	106	-	-	4	2	-	141
05-Aug 7/5	3,353	-	21,435	34,458	237,031	8,343	555	7,355	288	-	-	30	-	-	2	3	7	2
12-Aug 8/1	831	-	9,972	11,203	163,536	4,844	118	8,208	31	-	-	4	-	-	3	21	13	-
19-Aug 8/2	169	-	6,147	5,453	55,629	5,943	160	8,078	220	-	-	28	-	-	1	1	4	-
26-Aug 8/3	41	-	303	2,745	51,889	5,735	316	16,806	427	-	-	1	-	-	-	1	228	-
02-Sep 8/4	-	-	68	305	17,490	1,368	21	15,601	601	-	-	1	-	-	-	-	-	51
09-Sep 9/1	-	-	16	-	91	871	-	-	95	-	-	-	-	-	-	-	-	-
16-Sep 9/2	10	-	25	358	10,181	272	126	14,301	154	-	-	-	-	-	-	-	-	-
23-Sep 9/3	-	-	-	71	1,108	16	17	816	74	-	-	-	-	-	-	-	-	-
30-Sep 9/4	-	-	-	43	304	54	1	252	16	-	-	5	-	-	-	-	-	-
After 30-Sep	-	-	-	6	17	2	185	958	2	-	-	-	-	-	-	-	-	-
TOTAL	11,794	0	58,464	111,382	1,017,511	49,142	4,001	88,978	2,692	0	0	2,709	0	0	86	37	252	341

[a] Source: British Columbia Catch Statistics, DFO.

Appendix 6. Weekly catches of pink salmon by gear and area, Johnstone Strait Study Area, 1980.[a]

WEEK ENDING	AREA 11			AREA 12			AREA 13			AREA 14			AREA 15			AREA 16		
	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR
To 28-Jun	-	-	1,241	6	-	14	-	-	89	-	-	2	-	-	-	-	-	-
05-Jul 7/1	4	-	1,064	1,162	3,075	78	49	106	32	-	-	4	-	-	1	-	-	-
12-Jul 7/2	-	-	2,798	4,132	43,697	779	62	476	66	-	-	19	-	-	3	-	-	6
19-Jul 7/3	-	-	12,797	24,857	74,474	2,554	49	1,667	25	-	-	4	-	-	1	-	-	19
26-Jul 7/4	-	-	17,138	48,829	191,005	9,131	99	6,287	887	-	-	7	-	-	-	-	-	-
02-Aug 7/5	-	-	19,302	22,062	120,127	6,957	135	5,702	399	-	-	-	-	-	-	-	-	-
09-Aug 8/1	-	-	10,470	28,817	115,726	13,300	416	8,947	460	-	-	-	-	-	-	81	4	2
16-Aug 8/2	561	-	4,737	54,209	183,056	11,953	62	6,968	530	-	-	4	-	-	2	1	232	3
23-Aug 8/3	92	-	2,538	2,414	41,726	1,320	37	9,488	97	-	-	4	-	-	1	3	199	1
30-Aug 8/4	41	-	393	1,230	8,522	281	9	6,117	53	-	-	-	-	-	-	-	3,311	-
06-Sep 9/1	7	-	1,919	1,517	12,323	343	1	5,030	17	-	-	-	-	-	-	-	-	-
13-Sep 9/2	4	-	5	126	4,908	1,235	21	5,753	164	-	-	2	-	-	-	-	-	-
20-Sep 9/3	2	1	357	83	3,032	39	6	5,615	24	-	-	1	-	-	-	-	-	-
27-Sep 9/4	-	-	-	41	874	10	4	2,411	12	-	-	-	-	-	-	-	-	-
After 27-Sep	-	-	2	133	78	24	21	4,751	1	9	-	-	-	-	-	-	-	-
TOTAL	711	1	74,761	189,618	802,623	48,018	971	69,318	2,856	9	0	47	0	0	8	85	3,746	31

[a] Source: British Columbia Catch Statistics, DFO.

Appendix 7. Weekly catches of pink salmon by gear and area, Johnstone Strait Study Area 1982.[a]

WEEK ENDING	AREA 11			AREA 12			AREA 13			AREA 14			AREA 15			AREA 16		
	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR
To 26-Jun	-	-	6	1	-	11	-	-	19	-	-	-	-	-	-	-	-	-
03-Jul 7/1	-	-	485	1	-	255	-	-	2	-	-	3	-	-	-	-	-	26
10-Jul 7/2	-	-	925	80	274	156	17	77	76	-	-	20	-	-	-	-	-	-
17-Jul 7/3	-	-	1,269	411	3,206	95	12	446	52	-	-	7	-	-	-	-	-	-
24-Jul 7/4	-	-	915	680	8,887	102	132	696	47	-	-	9	-	-	-	-	-	-
31-Jul 7/5	1,988	-	662	3,409	68,146	3,346	15	6,299	671	-	-	28	-	-	6	8	590	-
07-Aug 8/1	79	-	162	483	10,844	493	42	709	287	-	-	-	-	-	-	-	319	-
14-Aug 8/2	136	-	1,496	2,743	23,335	256	119	2,373	191	-	-	12	-	-	-	-	358	-
21-Aug 8/3	135	-	415	1,123	20,827	317	21	1,553	59	-	-	-	-	-	-	11	327	1
28-Aug 8/4	-	-	214	673	7,424	711	14	389	79	-	-	-	-	-	-	296	307	27
04-Sep 9/1	12	-	53	143	2,703	211	6	1,129	157	-	-	-	-	-	-	-	139	1
11-Sep 9/2	5	-	23	172	625	31	2	886	12	-	-	1	-	-	37	-	-	-
18-Sep 9/3	13	-	2	70	663	17	3	1,094	9	-	-	-	-	-	-	-	-	-
25-Sep 9/4	-	-	2	-	-	1	327	-	3	-	-	-	-	-	-	-	-	-
After 25-Sep	-	-	2	18	295	7	803	641	-	92	189	-	-	-	-	-	-	-
TOTAL	2,368	0	6,631	10,007	147,229	6,009	1,513	16,292	1,664	92	189	80	0	0	43	315	2,040	55

[a] Source: British Columbia Catch Statistics, DFO.

Appendix 8. Weekly catches of pink salmon by gear and area, Johnstone Strait Study Area, 1984.[a]

WEEK ENDING	AREA 11			AREA 12			AREA 13			AREA 14			AREA 15			AREA 16		
	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR
To 30-Jun	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07-Jul 7/1	-	-	1,141	-	-	131	-	-	92	-	-	96	-	-	-	-	-	-
14-Jul 7/2	-	-	2,090	-	-	483	-	-	170	-	-	30	-	-	-	-	-	9
21-Jul 7/3	-	-	1,920	511	2,377	281	18	450	5	-	-	66	-	-	-	-	-	-
28-Jul 7/4	-	-	1,954	1,725	17,601	359	27	3,929	49	-	-	1	-	-	-	67	17	-
04-Aug 7/5	640	-	2,489	5,774	41,447	375	50	5,521	113	-	-	2	-	-	-	5	227	-
11-Aug 8/1	673	-	452	10,130	36,153	175	40	4,217	77	-	-	-	-	-	-	3	130	-
18-Aug 8/2	297	-	1,341	4,302	32,521	111	102	2,767	36	-	-	1,439	-	-	-	-	6	-
25-Aug 8/3	8	-	171	2,491	30,814	126	39	5,285	31	-	-	-	-	-	-	214	73	-
01-Sep 8/4	-	-	231	732	2,478	33	3	325	2	-	-	-	-	-	-	1	-	-
08-Sep 9/1	-	-	52	-	22	1	-	-	-	-	-	-	-	-	-	-	-	-
15-Sep 9/2	-	-	52	-	33	1	-	6	-	-	-	-	-	-	-	-	-	-
22-Sep 9/3	-	-	11	17	136	-	1	1,005	-	-	-	-	-	-	-	-	-	-
29-Sep 9/4	-	-	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
After 29-Sep	-	-	-	-	-	-	-	-	-	403	-	-	-	-	-	-	-	-
TOTAL	1,618	0	11,926	25,682	163,582	2,076	280	23,505	575	403	0	1,634	0	0	0	290	453	9

[a] Source: British Columbia Catch Statistics, DFO.

Apppendix 9. Weekly catches of sockeye salmon by gear and area, Johnstone Strait Study Area, 1978.[a]

WEEK ENDING	AREA 11			AREA 12			AREA 13			AREA 14			AREA 15			AREA 16		
	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR
To 24-Jun	518	-	202	4,176	831	15	-	-	1	-	-	1	-	-	20	-	-	1
01-Jul 6/4	-	-	46	10,229	3,955	162	9	-	17	-	-	33	-	-	-	-	-	2
08-Jul 7/1	-	-	136	9,427	8,307	93	110	2,639	37	-	-	104	-	-	-	180	-	-
15-Jul 7/2	6	-	690	7,525	13,203	260	439	1,257	102	-	-	16	-	-	-	72	-	13
22-Jul 7/3	16	-	75	4,982	6,546	703	1,170	3,448	83	-	-	7	-	-	-	6	-	1
29-Jul 7/4	8,685	-	1,941	45,661	105,725	1,060	1,145	16,813	19	-	-	38	-	-	-	264	-	96
05-Aug 7/5	7,221	-	22,456	34,340	85,279	1,637	2,696	27,393	205	-	-	66	-	-	1	271	893	6
12-Aug 8/1	3,025	-	48,097	34,430	219,813	8,446	1,095	35,013	27	-	-	224	-	-	-	773	1,554	153
19-Aug 8/2	1,427	-	44,036	45,921	748,988	43,887	4,440	58,345	1,674	-	-	455	-	-	1	141	1,179	22
26-Aug 8/3	424	-	758	48,271	812,680	19,774	8,557	507,936	10,190	-	-	1,250	-	-	7	3,076	27,252	566
02-Sep 8/4	-	-	214	980	48,270	5,061	929	130,178	12,129	-	-	460	-	-	1	-	-	806
09-Sep 9/1	-	-	57	-	786	4,443	-	-	8,048	-	-	177	-	-	333	-	-	639
16-Sep 9/2	85	-	43	3,065	23,109	573	1,828	50,995	2,525	-	-	92	-	-	38	-	-	-
23-Sep 9/3	9	-	-	652	869	16	834	1,726	436	-	-	27	-	-	-	-	-	9
30-Sep 9/4	-	-	-	423	536	102	279	2,133	97	-	-	35	-	-	-	-	-	8
After 30-Sep	-	-	-	22	55	2	195	35	5	27	-	-	-	-	-	-	-	-
TOTAL	21,416	0	118,751	250,104	2,078,952	86,234	23,726	837,911	35,595	27	0	2,985	0	0	401	4,783	30,878	2,322

[a] Source: British Columbia Catch Statistics, DFO.

Appendix 10. Weekly catches of sockeye salmon by gear and area, Johnstone Strait Study Area, 1980.[a]

WEEK ENDING	AREA 11			AREA 12			AREA 13			AREA 14			AREA 15			AREA 16		
	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR
To 28-Jun	-	-	24	29	-	1	-	14	-	-	-	-	-	-	-	-	-	-
05-Jul 7/1	17	-	211	5,134	3,989	45	141	429	7	-	-	86	-	-	-	-	-	-
12-Jul 7/2	-	-	234	6,393	10,464	277	265	1,131	9	-	-	23	-	-	-	-	-	-
19-Jul 7/3	-	-	577	2,989	7,240	18	96	1,727	5	-	-	67	-	-	-	-	-	91
26-Jul 7/4	-	-	465	5,134	17,897	544	1,183	8,770	34	-	-	-	-	-	-	-	-	11
02-Aug 7/5	-	-	962	7,498	29,298	331	1,178	18,995	157	-	-	-	-	-	-	-	-	1
09-Aug 8/1	-	-	1,534	10,051	139,131	1,671	3,486	64,566	687	-	-	-	-	-	1	1,048	6,491	1
16-Aug 8/2	1,275	-	1,399	11,168	357,239	3,520	3,367	122,716	1,609	-	-	89	-	-	156	1,406	43,757	484
23-Aug 8/3	1,366	1,255	887	6,676	46,814	700	1,637	49,471	787	-	-	117	-	-	74	1,994	29,386	255
30-Aug 8/4	38	-	146	1,622	8,172	59	1,128	11,772	592	-	-	30	-	-	6	424	5,282	35
06-Sep 9/1	1	-	25	96	3,855	46	276	2,732	106	-	-	-	-	-	6	-	-	3
13-Sep 9/2	-	-	2	38	390	59	59	656	20	-	-	25	-	-	-	-	-	-
20-Sep 9/3	15	-	-	22	69	3	8	77	4	-	-	-	-	-	-	-	-	-
27-Sep 9/4	-	-	-	146	15	-	25	8	64	-	-	-	-	-	-	-	-	8
After 27-Sep	-	-	1	2	2	3	620	22	2	-	-	1	-	-	-	-	-	-
TOTAL	2,712	1,255	6,467	56,998	624,575	7,277	13,469	283,086	4,083	0	0	438	0	0	243	4,872	84,916	889

[a] Source: British Columbia Catch Statistics, DFO.

Appendix 11. Weekly catches of sockeye salmon by gear and area, Johnstone Strait Study Area, 1982.[a]

WEEK ENDING	AREA 11			AREA 12			AREA 13			AREA 14			AREA 15			AREA 16		
	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR
To 26-Jun	-	-	-	177	-	-	-	-	-	-	-	-	-	-	-	-	-	-
03-Jul 7/1	-	-	8	727	-	5	-	-	2	-	-	-	-	-	-	-	-	-
10-Jul 7/2	-	-	57	3,468	8,886	22	230	8,126	71	-	-	71	-	-	-	-	-	-
17-Jul 7/3	-	-	476	5,994	15,069	129	444	2,707	129	-	-	-	-	-	-	-	-	-
24-Jul 7/4	-	-	331	10,952	19,593	30	2,056	7,782	337	-	-	11	-	-	-	-	1,137	-
31-Jul 7/5	12,358	-	439	21,618	71,617	1,192	1,158	29,218	1,431	-	-	442	-	-	2	182	171	122
07-Aug 8/1	559	-	1,121	2,445	25,543	700	568	2,888	2,164	-	-	88	-	-	-	80	1,008	14
14-Aug 8/2	2,231	-	7,610	48,215	357,403	1,755	5,443	129,797	8,892	-	-	1,331	-	-	1	3,100	4,910	2,324
21-Aug 8/3	2,818	-	8,234	71,747	366,249	10,865	6,782	177,146	11,309	-	-	324	-	-	6	800	44,970	9,130
28-Aug 8/4	-	-	2,093	36,741	80,878	6,276	4,045	26,110	10,034	-	-	157	-	-	-	1,088	45,044	6,801
04-Sep 9/1	113	-	24	3,596	8,023	229	2,458	13,832	2,874	-	-	13	-	-	13	476	4,880	427
11-Sep 9/2	45	-	18	1,464	1,885	50	367	3,142	199	-	-	106	-	-	-	-	-	118
18-Sep 9/3	834	-	39	483	1,615	21	158	2,073	353	-	-	-	-	-	-	-	-	-
25-Sep 9/4	-	-	-	-	-	2	231	18	12	-	-	4	-	-	-	-	-	142
After 25-Sep	-	-	1	236	77	3	33	744	2	1	-	15	-	-	-	-	-	-
TOTAL	18,958	0	20,451	207,863	956,838	21,279	23,973	403,583	37,809	1	0	2,562	0	0	22	5,726	102,120	19,078

[a] Source: British Columbia Catch Statistics, DFO.

Appendix 12. Weekly catches of sockeye salmon by gear and area, Johnstone Strait Study Area, 1984.[a]

WEEK ENDING	AREA 11			AREA 12			AREA 13			AREA 14			AREA 15			AREA 16		
	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR	GN	SN	TR
To 30-Jun	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07-Jul 7/1	-	-	45	-	-	4	-	-	49	-	-	2	-	-	-	-	-	-
14-Jul 7/2	-	-	271	30	-	88	-	-	1	-	-	29	-	-	-	-	-	-
21-Jul 7/3	-	-	234	11,717	3,683	146	912	6,226	44	-	-	2	-	-	-	-	-	-
28-Jul 7/4	-	-	344	29,116	35,345	101	2,238	11,890	259	-	-	282	-	-	1	3,091	3,213	231
04-Aug 7/5	3,533	-	829	46,858	95,233	826	2,623	39,995	716	-	-	110	-	-	3	1,997	14,652	147
11-Aug 8/1	4,676	-	204	62,039	181,755	364	3,497	100,867	1,166	-	-	173	-	-	13	2,102	19,838	301
18-Aug 8/2	6,953	-	932	49,325	181,804	490	4,097	47,447	832	-	-	75	-	-	-	417	3,674	380
25-Aug 8/3	187	-	293	33,794	130,272	584	2,352	40,735	715	-	-	13	-	-	6	4,171	10,004	251
01-Sep 8/4	306	-	155	10,900	9,809	118	966	6,960	177	-	-	247	-	-	-	476	-	36
08-Sep 9/1	-	-	44	-	219	61	-	-	-	-	-	-	-	-	-	-	-	-
15-Sep 9/2	-	-	33	-	541	-	-	6	-	-	-	-	-	-	-	-	-	-
22-Sep 9/3	-	-	19	662	1,032	13	83	1,638	-	-	-	-	-	-	-	-	-	-
29-Sep 9/4	-	-	1	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-
After 29-Sep	-	-	-	-	-	-	-	-	-	59	15	-	-	-	-	-	-	-
TOTAL	15,655	0	3,404	244,441	639,698	2,795	16,768	255,764	3,959	59	15	933	0	0	23	12,254	51,381	1,346

[a]Source: British Columbia Catch Statistics, DFO.

Appendix 13. Pink salmon escapements (in thousands) to streams and sub-areas in the Johnstone Strait Study Area, 1950-1984 (even years).[a,b]

SUB-AREA & RIVER	OPTIMUM	1984	1982	1980	1978	1976	1974	1972	1970	1968	1966	1964	1962	1960	50-58 AVERAGE
UPPER VANCOUVER IS.															
CLUXEWE R.	35.0	15.0	10.0	80.0	0.0	49.0	32.0	6.0	35.0	15.0	75.0	35.0	15.0	3.5	7.5
KEOGH R.	100.0	25.0	30.0	35.0	48.0	72.0	55.0	50.0	125.0	150.0	100.0	35.0	75.0	35.0	77.0
NAHWITTI R.	75.0	0.0	UN	UN	0.4	0.2	11.0	22.0	110.0	62.5	75.0	7.5	35.0	7.5	10.5
QUATSE R.	150.0	13.0	0.5	10.0	36.0	74.0	66.0	16.0	75.0	125.0	150.0	35.0	75.0	7.5	55.5
SHUSHARTIE R.	35.0	N/0	0.2	3.0	-	0.1	0.3	0.4	3.5	7.5	15.0	15.0	3.5	0.8	16.4
SONGHEES R.	3.5	N/0	0.3	-	2.3	3.5	3.0	1.8	0.2	3.5	1.5	3.5	3.5	0.4	1.0
STRANBY R.	75.0	UN	UN	3.5	-	1.5	3.0	24.0	75.0	75.0	75.0	-	-	1.5	7.6
TSULQUATE R.	15.0	1.0	0.2	4.5	28.0	37.0	11.0	4.5	35.0	15.0	15.0	3.5	0.4	0.4	3.4
MISC.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0
TOTAL	488.5	54.0	41.2	136.0	114.7	237.2	181.3	124.7	458.7	453.5	506.5	134.5	207.4	56.6	178.8
JOHNSTONE STRAIT															
ADAM R.	50.0	4.0	4.8	20.0	50.0	55.0	60.0	50.0	15.0	35.0	35.0	3.5	3.5	7.5	21.5
BEAR R.	100.0	2.0	0.5	5.7	18.0	52.5	130.0	100.0	100.0	75.0	75.0	75.0	75.0	35.0	64.0
HYDE CR.	3.5	N/0	UN	0.3	UN	0.1	0.1	0.1	0.4	0.8	3.5	3.5	3.5	0.8	3.2
KOKISH R.	7.5	N/0	UN	N/0	N/0	UN	0.3	0.4	1.5	7.5	7.5	3.5	0.8	0.4	4.5
MENZIES R.	3.5	N/0	UN	0.1	-	0.2	0.4	0.4	0.8	3.5	1.5	3.5	1.5	0.4	1.2
MILLS CR.	7.5	N/0	UN	-	0.4	1.8	UK	0.4	0.8	15.0	7.5	3.5	3.5	N/0	1.3
MOHUN CR.	3.5	N/0	N/0	-	-	-	0.0	0.4	3.5	7.5	3.5	7.5	3.5	0.4	2.1
NIMPKISH R.	15.0	UN	1.5	7.5	1.7	0.4	12.0	12.0	4.0	15.0	7.5	3.5	3.5	3.5	8.1
SALMON R.	7.5	0.5	0.1	2.0	8.0	15.0	3.5	7.5	3.5	15.0	3.5	7.5	15.0	3.5	6.6
TSITIKA R.	15.0	0.0	N/0	0.6	0.8	4.0	5.0	0.8	0.0	0.8	0.1	0.4	0.2	0.2	10.8
MISC.	-	-	0.1	2.0	0.1	0.3	0.3	0.2	0.4	0.4	0.5	0.5	0.6	0.1	0.9
TOTAL	213.0	6.5	6.9	38.1	79.0	129.3	211.6	172.1	129.8	175.5	145.0	111.9	110.6	51.7	124.2
MID-VANCOUVER IS.															
CAMPBELL R.	7.5	0.5	0.5	1.5	1.1	10.0	4.0	3.5	3.5	3.5	3.5	3.5	0.4	0.4	3.8
ENGLISHMAN R.	0.4	N/0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.2	-	NA	0.2	1.3
OYSTER R.	3.5	0.0	0.2	5.0	0.4	0.9	0.9	1.1	1.6	2.2	3.5	0.2	0.8	3.5	82.0
PUNTLEDGE R.	5.0	0.1	0.7	6.2	1.6	0.4	0.9	2.5	1.0	2.1	1.5	0.8	3.5	3.5	16.0
QUINSAM R.	7.5	12.9	2.1	18.2	14.8	24.0	7.5	3.5	1.5	1.5	1.5	1.5	0.8	0.8	7.5
TSOLUM R.	15.0	0.0	0.2	5.0	1.5	10.0	10.1	10.0	6.9	5.5	7.5	1.5	3.5	7.5	56.0
MISC.	-	-	0.0	0.4	0.0	0.1	0.1	0.1	2.6	0.3	10.2	-	-	0.2	1.2
TOTAL	38.9	13.5	3.7	36.4	19.4	45.3	23.5	20.7	17.2	15.2	27.9	7.5	8.9	16.1	167.8
KINGCOME INLET															
CARRIDEN CR.	3.5	N/0	N/0	1.0	1.5	0.6	0.6	0.8	3.5	3.5	0.8	-	UN	0.2	3.5
EMBLY R.	40.0	7.0	12.0	25.0	13.0	7.0	70.0	100.0	100.0	40.0	35.0	15.0	7.5	7.5	9.1
KINGCOME R.	150.0	2.2	24.0	20.0	20.0	280.0	190.0	75.0	25.0	7.5	7.5	7.5	35.0	15.0	25.7
WAKEMAN R.	35.0	4.0	35.0	25.0	25.0	55.0	81.0	75.0	75.0	3.5	1.5	3.5	15.0	3.5	12.1
MISC.	-	-	1.2	1.0	3.2	5.3	1.3	1.0	0.9	0.7	1.3	0.1	0.4	0.8	1.0
TOTAL	228.5	13.2	72.2	72.0	62.7	347.9	342.9	251.7	204.4	55.2	46.0	26.1	57.9	27.0	51.4

Appendix 13 (cont'd)

SUB AREA & RIVER	OPTIMUM	1984	1982	1980	1978	1976	1974	1972	1970	1968	1966	1964	1962	1960	50-58 AVERAGE
BOND TO KNIGHT															
AHNUHATI R.	35.0	50.0	85.0	340.0	120.0	100.0	15.0	3.0	35.0	55.0	75.0	35.0	35.0	7.5	6.2
AHTA VALLEY CR.	3.5	N/O	N/O	0.1	1.3	0.3	-	3.5	1.5	1.5	1.5	0.8	0.4	0.4	2.3
FRASER CR.	0.8	0.0	0.2	UN	UN	UN	0.0	0.0	-	0.0	0.0	0.8	0.8	0.2	0.3
GLENDALE R.	150.0	125.0	150.0	250.0	275.0	150.0	30.0	9.5	150.0	160.0	220.0	150.0	100.0	35.0	43.0
HOEYA CR.	7.5	0.4	3.5	0.8	2.0	6.0	2.0	0.8	0.4	3.5	7.5	7.5	7.5	1.5	6.2
KAKWEIKEN R.	100.0	100.0	70.0	300.0	222.0	500.0	100.0	15.0	35.0	62.5	7.5	3.5	35.0	7.5	43.0
KAMANO BAY CR.	3.5	0.0	0.0	0.1	0.1	0.1	0.5	1.0	3.5	15.0	0.8	7.5	15.0	3.5	1.9
KLINAKLINI R.	5.0	UN	UN	UN	N/O	0.3	0.1	0.8	0.8	3.5	3.5	7.5	1.5	7.5	3.5
KWALATTE R.	0.8	0.2	0.2	0.1	N/O	0.1	UN	UN	UN	UN	0.1	0.0	0.2	3.5	0.9
LULL CR.	1.5	0.5	0.7	0.6	0.2	1.5	1.5	0.4	0.4	0.2	3.5	0.8	0.2	1.5	1.9
VINER R.	15.0	UN	0.1	0.4	-	0.0	0.2	0.4	4.0	0.1	0.2	0.4	35.0	0.4	8.5
WATERFALL CR.	35.0	10.0	30.0	3.5	13.0	0.3	20.0	20.0	3.5	7.5	15.0	1.5	15.0	7.5	19.6
MISC.	-	-	0.1	1.0	0.6	0.1	0.1	0.2	0.3	0.0	1.7	0.8	0.2	1.0	1.4
TOTAL	357.5	286.0	339.7	896.4	634.1	758.6	169.4	54.6	234.3	308.8	336.2	216.0	245.8	77.0	138.7
LOUGHBOROUGH TO BUTE															
APPLE R.	0.2	N/O	N/O	2.0	3.5	4.0	-	1.5	5.0	15.0	0.1	0.8	0.2	0.0	0.7
CAMELEON HBR. CR	15.0	0.3	1.5	8.0	2.5	1.5	5.0	3.5	7.5	15.0	15.0	7.5	3.5	-	4.9
CUMSACK CR.	1.5	N/A	UN	N/O	-	-	-	-	-	UN	-	-	0.0	0.0	0.7
EVA CR.	0.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0
FANNY BAY CR.	1.5	N/O	N/O	-	-	-	-	0.0	1.5	3.5	1.5	0.4	-	-	0.1
FRASER CR .	3.5	N/O	UN	0.3	0.5	1.5	1.5	0.4	3.5	7.5	3.5	0.4	0.2	0.1	0.8
FULMORE R .	1.5	N/O	N/O	UN	UN	UN	UN	UN	UN	-	0.2	0.4	0.8	0.0	1.9
GRANITE CR.	7.5	0.0	N/O	UN	N/O	-	-	0.4	1.5	15.0	7.5	7.5	1.5	0.4	8.2
GRASSEY CR.	75.0	1.0	40.0	40.0	100.0	75.0	100.0	25.0	25.0	200.0	75.0	35.0	20.0	1.5	19.3
GRAYS CR.	7.5	0.3	1.0	0.6	1.8	0.8	7.5	0.8	3.5	7.5	7.5	3.5	1.5	0.8	4.0
HEYDON CR .	15.0	0.2	1.5	2.5	1.0	15.0	10.0	3.5	15.0	35.0	15.0	3.5	1.5	0.4	8.3
HOMATHKO R.	1.5	N/O	N/O	N/O	-	-	-	0.8	1.5	1.5	1.5	1.5	1.5	-	0.6
HYACINTHE CR.	0.8	N/O	UN	N/O	-	-	-	-	0.2	0.2	0.2	0.8	0.8	0.0	0.1
KANISH CR .	7.5	N/O	N/O	N/O	-	-	0.1	3.5	4.0	7.5	7.5	6.0	3.5	0.4	2.6
ORFORD R.	0.4	N/O	N/O	N/O	0.1	-	-	-	0.2	-	-	0.0	-	-	0.4
PHILLIPS R.	35.0	2.0	2.5	30.0	10.0	50.0	35.0	35.0	15.0	35.0	75.0	35.0	7.5	0.2	3.1
READ CR.	15.0	2.5	3.5	45.0	3.5	12.0	20.0	7.5	7.5	35.0	15.0	7.5	3.5	0.4	4.2
STAFFORD R.	1.5	UK	N/O	1.0	0.8	1.5	3.5	1.5	3.5	15.0	35.0	1.5	0.2	0.2	2.0
SOUTHGATE R.	0.8	N/O	N/O	N/O	-	-	-	-	-	-	-	-	3.5	-	0.6
WORTLEY CR.	15.0	8.0	60.0	75.0	15.0	9.0	13.0	7.5	15.0	75.0	15.0	17.5	12.5	0.8	1.2
MISC.	-	-	-	-	-	-	-	-	-	1.1	1.0	0.7	0.2	-	1.6
TOTAL	206.4	14.3	110.0	204.4	138.6	170.3	195.6	90.8	109.4	468.8	275.5	129.4	62.3	5.2	65.2
GRAND TOTAL	1532.8	387.5	573.7	1383.4	1048.4	1688.5	1124.2	714.6	1153.8	1476.9	1337.1	625.3	692.8	233.5	707.1

[a] Source: DFO Spawning Files.

[b] Abbreviations used: UN=unknown, N/O=none observed, N/A=not available.