

SALMON-TAGGING EXPERIMENTS IN ALASKA, 1930¹

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INTRODUCTION

Two distinct series of tagging experiments were carried out by the Bureau of Fisheries during the summer of 1930. The first involved the tagging of 1,994 salmon liberated from the traps located in the region of Cape Fox and Sitklan and Kanaganut Islands. This was undertaken at the request of the Department of Fisheries of the Dominion of Canada and was designed to test the extent to which these traps drew upon the salmon runs native to streams in British Columbia. The second series of experiments was conducted near the entrance to Kasaan Bay on the eastern coast of Prince of Wales Island, southeastern Alaska. One thousand four hundred and ninety-five fish were tagged and liberated from traps situated both north and south of the entrance to the bay. These experiments were carried out to test the extent to which these traps drew on the Kasaan Bay runs and to what extent on runs native to streams located elsewhere, the resident purse seiners claiming that the traps caught almost exclusively Kasaan Bay fish while the trap operators claimed that the traps caught chiefly migratory fish that were passing through Clarence Strait on their way to more distant spawning grounds.

The reader is again referred to the preceeding reports of this series,² especially that for 1923, for a description of the tags and methods used.

The actual tagging and the collection of most of the data was carried out in an efficient manner by F. W. Hynes, warden, Alaska Service, who tagged approximately 3,500 salmon between July 13 and August 14. The data were, in part, compiled and

¹ Bulletin No. 11. Approved for publication Mar. 26, 1932.

² Second Experiment in Tagging Salmon in the Alaska Peninsula Fisheries Reservation, Summer of 1923, by Charles H. Gilbert and Willis H. Rich. Bulletin, U. S. Bureau of Fisheries, Vol. XLII, 1926, Document No. 991, pp. 27-75. Washington.

Salmon Tagging Experiments in Alaska, 1924 and 1925, by Willis H. Rich. Bulletin, U. S. Bureau of Fisheries, Vol. XLII, 1926, Document No. 1005, pp. 109-146. Washington.

Salmon Tagging Experiments in Alaska, 1926, by Willis H. Rich and Arnie J. Suomela. Bulletin, U. S. Bureau of Fisheries Vol. XLIII, 1927, Part II, Document No. 1022, pp. 71-104. Washington.

Salmon Tagging Experiments in Alaska, 1927 and 1928, by Willis H. Rich and Frederick G. Morton. Bulletin, U. S. Bureau of Fisheries, Vol. XLV, 1929, Document No. 1057, pp. 1-23. Washington.

tabulated by Russell R. Vickers, of Stanford University. The list of tags attached follows:

TABLE 1.—Tags attached in southeastern Alaska during 1930

Experiment No.	Date	Serial Nos.	Species of fish tagged						Locality
			Red	Pink	Chum	Coho	King	Steel-head	
1	July 13	9001-9250	51	148	27	21			Stiklan Island.
2	do	9251-9500	35	166	6	40	2		Kanaganut Island.
3	July 25	9501-9750	5	240	2	1			Stiklan Island.
4	do	9751-10000	7	232	3	6			Kanaganut Island.
5	July 26	10001-10250		243	7				Cape Fox.
6	July 29	10251-10500	35	146	22	47			South side, entrance to Kasaan Bay.
7	Aug. 3	10501-10647		136	2	9			North side, entrance to Kasaan Bay. ¹
8	do	10648-10742	1	87	1	5		1	Do. ²
9	do	10743-10897	8	200	18	26		1	Do.
10	Aug. 7	10898-11250		246		6	1		Cape Fox.
11	Aug. 8	11251-11500	6	230	11	3			Kanaganut Island.
12	do	11501-11750	5	238	3	4			Stiklan Island.
13	do	11751-12000	10	135	95	10			South side, entrance to Kasaan Bay.
14	Aug. 14	12001-12250	6	191	45	8			North side, entrance to Kasaan Bay.
15	do	12251-12500	1	234	3	12			Do. ¹
Total		9001-12500	170	2,872	245	198	3	2	

¹ Near the south entrance to Windfall Harbor.

² Just north of the entrance to Windfall Harbor.

Tags were recovered from a few minor localities which have not been described in the previous papers dealing with salmon-tagging experiments in Alaska. These previously undescribed places are as follows:

Black Island. Southern entrance to Behm Canal.

Bulkley River. A tributary of the Skeena River, British Columbia.

Cape Fox Island. A small island just off Cape Fox.

Captain Cove. Near the northern end of Pitt Island, British Columbia.

Chasina Point. Eastern entrance to Cholmondeley Sound, east coast of Prince of Wales Island.

Cone Island. At the southern entrance to Thorne Arm, Revillagigedo Island.

Foggy Island. Probably an island in Foggy Bay, Revillagigedo Channel.

Hadley. A settlement on Lyman Anchorage, Kasaan Peninsula, Clarence Strait.

Harry Bay. In Nakat Inlet.

Hidden Inlet. Indenting the mainland north of Pearse Island, Portland Inlet.

Island Point. In Kasaan Bay, latitude 55° 22' 30''.

Kelp Island. Just south of Duke Island, latitude 55° 52', longitude 131° 16'.

Kitemaat River. Tributary to Douglas Channel, British Columbia.

Lull Point. Southern end of Thatcher Island, Chatham Strait.

Mill Bay. Near the mouth of Nass River, Portland Inlet, British Columbia.

Parkin Island. In Port Simpson just south of Portland Inlet, British Columbia.

Porcher Island. In British Columbia, latitude 54°, longitude 130° 30', off the mouth of the Skeena River.

Ray Anchorage. East coast of Duke Island.

Ratz Harbor. East coast of Prince of Wales Island, latitude 55° 53'.

Rip Point. Southern entrance to Moira Sound.

Tolstoi Point. Southern entrance to Tolstoi Bay, east coast of Prince of Wales Island, latitude 55° 40'

West Rock. Southwest of Duke Island, Clarence Strait.

Willard Inlet. Indenting mainland, Dixon Entrance, longitude 130° 40'.

Wedge Island. Off east coast Prince of Wales Island, Clarence Strait, latitude 55° 08'.

TABLE 2.—Returns from pink salmon tagged near Cape Fox

[In this and subsequent tables the figures in the columns headed "Time" indicate, in days, the least and the greatest time that elapsed between tagging and reported recapture.]

Locality of recapture	Locality and date of tagging																Total number returned
	Sitklan Island, July 13		Kanaganut Island, July 13		Sitklan Island, July 25		Kanaganut Island, July 25		Cape Fox, July 26		Cape Fox, Aug. 7		Kanaganut Island, Aug. 8		Sitklan Island, Aug. 8		
	Num-ber	Time	Num-ber	Time	Num-ber	Time	Num-ber	Time	Num-ber	Time	Num-ber	Time	Num-ber	Time	Num-ber	Time	
Dixon Entrance—east of Cape Fox:																	
Cape Fox	2	1-34	2	2-3	2	20-22	5	2-17	2	8-9	16	1-4	15	1-5	7	1-5	51
Cape Fox Island	3	3-5	1	5	1	24	1	10			3	2-4	22	1-7	17	1-7	42
Boat Rock															1	4	1
Harry Bay															1	1	1
Kanaganut Island			2	11-14	16	3-14	24	1-19	8	0-7	2	3-8	21	0-5	18	1-7	91
Sitklan Island			3	3-12	4	13-30	1	(?)	4	4-19	2	2	2	1	10	1-6	26
Willard Inlet															3	3	3
Fillmore Inlet	2	30-32	2	32			2	14-15	2	19-20	5	5-8	6	4-7	16	4-6	34
Hidden Inlet					3	23-26	3	11-12			1	2	2	1			9
Tombstone Bay	2	7-10	2	18-29	10	10-34	9	5-14	1	17							24
Revvilagedo Channel:																	
Tree Point					7	17-29	6	1-16	2	13-22	7	1-5	3	2-8	11	2-8	36
Foggy Point	3	2-5			1	1-2	10	1-9	5	0-4	22	1-3	7	1-4	4	1-10	57
Kirk Point			1	3													1
Kah Shakes	7	1-19	3	1-17	3	13-17	1	1	1	5	3	3					18
Boca de Quadra	5	9-18	4	9-39	7	15-26	4	3-6	8	2-5	1	1	2	0			31
Marten Arm							1	12	1	7	1	4			2	1-3	5
Point Sykes	1	3											1	6	1	8	3
Kalp Island	1	35															1
Duke Island											1	2					1
Ray Anchorage											1	5					1
Point Alava											1	9					1
Lucky Cove	6	3-4	9	2-7													14
Thorne Arm			1	4					2	2			1	4			4
Crab Bay	1	7															1
Carroll Point									1	17	2	5					3
Carroll Island											1	7			1	6	2
Behm Canal—South:																	
Smeaton Bay	6	4-10	5	2-6	3	4-7	5	7-8	24	2-16			1	(?)	1	3	45
Rudyard Bay									1	4							1
Clarence Strait—eastern shore:																	
Club Rocks	1	2															1
Hall Cove											1	4	1	1			2
Annotte Island, west shore							1	19					1	3			2
Bronaugh Islands									1	3			2	1-3			7
Gravina Island					1	26	1	5	3	5-21					2	8	4
Vallenar Bay			1	34					1	4	1	4					2
Vallenar Point									1	8							2
Niblack Point									1	4							1
Behm Canal—North:																	
Bond Bay													3	4-8	3	3-7	2
Black Island			3	2-3													9
Loring					1	8											1
Clarence Strait—western shore:																	
Rip Point					1	7					1	1	1	10	1	10	4
Wedge Island															1	10	1
Chasina Point									1	11							1
Grindall Point											1	1	1	9			1
Lyman Anchorage											1	(?)					1
Windfall Harbor											1	(?)					1
Doubtful					1	10											1
British Columbia:																	
Wales Island				(?)	3	(?)											3
Mill Bay			2	(?)	1	(?)											3
Arrandale					3	(?)	1	(?)									4
Steamer Pass															1	4	1
Wark Canal															1	5	1
Chatham Sound															1	3	1
Hyde Bay			1	23													1
Skeena River			1	(?)							1	1			1	(?)	3
Porcher Island							1	18									1
Captain Cove									1	6(?)							1
Doubtful					1	(?)	6	(?)	1	(?)	1	(?)			3	(?)	12
Total	39		43		74		82		72		80		94		105		589
Percentage	25.6		25.9		30.8		35.3		29.6		32.5		40.9		44.1		33.7

1 Reported as taken before date of tagging.
 2 Includes 2 reported as taken July 22, previous to date of tagging.
 3 Reported as taken during the last four days in July.
 4 Reported taken "about Aug. 1, 1931." Probably taken in 1930 but not reported until 1931.
 5 Reported as taken at Arrandale, Mill Bay, or Wales Island, British Columbia, during the first week in August.

EXPERIMENTS NEAR CAPE FOX

It has been mentioned above that these experiments were undertaken in order to test the extent to which the traps in the region of Cape Fox, and particularly those on Sitklan and Kanaganut Islands, drew upon the salmon runs native to the streams of British Columbia. There are no significant differences in the results of these experiments as compared with the previous experiments conducted in this region in 1924, 1925, and 1926 (*loc. cit.*). In general a small percentage of the fish were taken in British Columbia although in 1930 the tagging was done chiefly in those traps which were closest to the international boundary. The great majority of the fish tagged were pinks as was also the case in previous experiments. The returns of fish of this species are shown in Table 2.

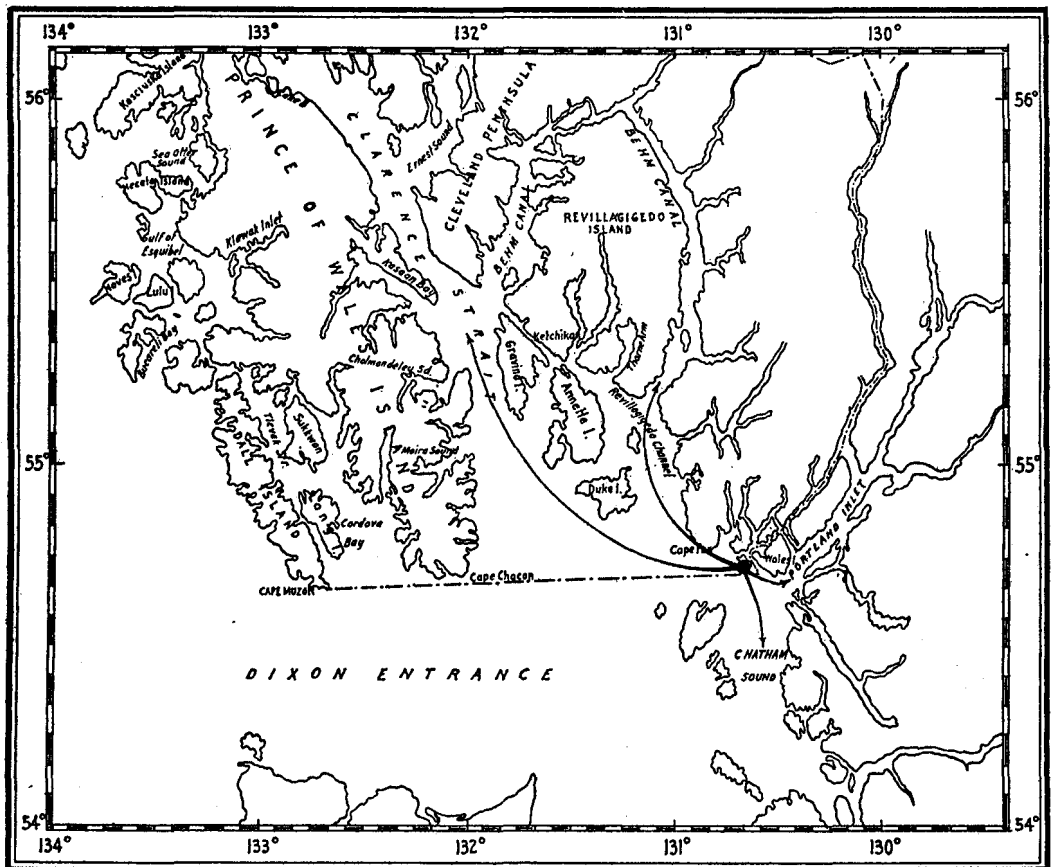


FIGURE 1.—Chief routes of distribution of pink salmon from the region of Cape Fox as shown by the experiments of 1930

The chief route of migration of pink salmon from the region of Cape Fox, Sitklan, and Kanaganut Islands is north in Clarence Strait along the eastern shore and into Revillagigedo Channel. A large number was taken close to the point of tagging as has been a common experience in previous experiments. A fairly large number was taken in Behm Canal, especially near the southern entrance. Comparatively few went across Clarence Strait to the western shore and only 31 out of 589 recaptures (5.3 per cent) were taken in the waters of British Columbia. This is a somewhat smaller percentage than was taken in British Columbia during the course of the ex-

periments in 1925 and 1926. In both of these years approximately 11 per cent of the pinks tagged near Cape Fox was taken below the international boundary. The results are shown graphically in Figure 1.

Comparatively few fish of the other species were tagged during 1930, and the returns were so few that detailed tabulation is unnecessary.

Of red salmon, 109 were tagged and 28 recovered. Of these 6, or 21.4 per cent, came from British Columbia, all being taken in the region of Portland Canal, either at Wales Island, Mill Bay, or Arrandale and were probably bound for the spawning grounds of the Nass River. Considerably larger numbers of red salmon were tagged in previous experiments (especially in 1926, when over 700 were tagged), but the results were much the same. In the experiments of 1924 and 1925 about one-third and in 1926 about 18 per cent of the recaptured reds came from British Columbia waters. In 1930, as in previous years, the reds taken in Alaskan waters were distributed chiefly along the eastern shore of Clarence Strait and in Revillagigedo Channel. Thirteen of the twenty-eight fish recaptured were taken in this region and nine were taken not far from the point of tagging—the others being taken in British Columbia.

Eighty coho salmon were tagged in 1930 near Cape Fox and 13 were recaptured. Six of these were taken in British Columbia waters, of which three came from the region of Portland Canal and one each from Wark Canal, Bulkley River, and Kitemaat River. In 1925 cohos were tagged at Foggy Point in Revillagigedo Channel north of Cape Fox and none was taken in British Columbia, but, in 1926, 238 were tagged near Cape Fox and 41 were returned, of which number about half came from south of the boundary. The results of the tagging in 1930 are much the same, therefore, as those of previous comparable experiments.

One tag attached at Cape Fox on August 7 was reported as placed on a coho, but the fish was recaptured at Metlakatla Bar, British Columbia, on April 20, 1931, and was reported as a king salmon weighing about 32 pounds. In the haste of tagging operations it is not surprising that an error was made in recording the species, but the interesting thing about the record is that, if the fish was small enough on August 7 to be mistaken for a coho, it must have made quite a remarkable growth between that date and the following April. Scales are preserved of all fish tagged and those of this fish have been examined. In certain minor characters they resemble those of the typical silver salmon, but the differences between the scales of silvers and kings are not so well marked that it is possible to distinguish all individual specimens with certainty. In so far as the age of the fish is concerned, however, there can be no doubt that it was a king salmon. It had evidently spent two full years in fresh water, migrating to the sea in the spring of its third year. At the time of tagging it was in its second year in the sea and must have completed this year and started a third year of ocean growth at the time of recapture. Although the silver salmon exhibit some variability as to the length of time spent in fresh water, especially in northern latitudes, they apparently never spend two full years in the sea. There can be little doubt, therefore, that this was a king salmon.

Only 59 chum salmon were tagged near Cape Fox in 1930. Of these, 12 were later recaptured, but only one was taken below the international boundary. This was taken at Wales Island, Portland Canal. The other returns came chiefly from Clarence Strait north of Cape Fox and from Revillagigedo Channel. One was taken in Behm Canal. These results, although meager, are again in substantial agreement with those previously secured. In 1924 and 1925, 67 chums were tagged and 12 recaptured

of which only 1 was taken in British Columbia. In 1926, 3 out of 82 recaptured were taken in British Columbia.

In connection with these experiments at Cape Fox it is interesting to note that the experiments conducted at approximately the same time near Kasaan Bay on the western side of Clarence Strait about 60 miles northwest of Cape Fox yielded only 2 returns from British Columbia—1 coho and 1 red salmon.

In general, the percentage of returns from these experiments was approximately the same as was secured in the experiments of previous years. The percentage of pinks recovered was 33.7 in 1930 and 36.6 in 1924 and 1925. Only a few pinks were tagged in this region in 1926, and the returns were relatively fewer—19 per cent. These last experiments have brought out no important new facts regarding the distribution of fish taken in the traps in the region of Cape Fox but corroborate the conclusion reached in earlier years that by far the larger proportion of the fish taken in Alaskan traps, even those closest to the international boundary, had their origin in Alaskan streams.

EXPERIMENTS NEAR KASAAN BAY

These experiments show quite clearly that the spawning streams of Kasaan Bay contribute an important element to the catches of traps located immediately above and below the entrance to the bay. The evidence on this point seems conclusive in the case of both pinks and chums. In the case of red salmon and cohos the number of returns was too few to warrant definite conclusions, but the indications are that, during the time covered by the experiments, the traps in question did not catch in appreciable quantities fish of these species that were bound for Kasaan Bay.

The returns for pink salmon are given in Table 3.

TABLE 3.—Returns from pink salmon tagged near Kasaan Bay

Locality of recapture	Locality and date of tagging														Total number returned	
	South side of entrance to Kasaan Bay, July 29		North of entrance to Kasaan Bay near Windfall Harbor, Aug. 3		North side of entrance to Windfall Harbor, Aug. 3		North side of entrance to Kasaan Bay, Aug. 3		South side of entrance to Kasaan Bay, Aug. 14		North side of entrance to Kasaan Bay, Aug. 14		South side of entrance to Windfall Harbor, Aug. 14			
	Number	Time	Number	Time	Number	Time	Number	Time	Number	Time	Number	Time	Number	Time		
Clarence Strait—north of Kasaan Bay:																
Streets Island.....	4	2-8	1	4			4	3-17	3	2-6	5	2-7	2	4		19
Lyman Anchorage.....							3	3-4			2	3-5	2	3		7
Windfall Harbor.....			1	4	1	4	1	1	3	1-2	4	2-5	10	2-3		20
Tolstoi Point.....			1	4	2	4							3	4		6
Narrow Point.....			1	5	2	5	5	5					1	6		9
Ratz Harbor.....			1	(?)												1
Lake Bay.....							1	11								1
Lemesurier Point.....			1	4							1	4				2
Myers Chuck.....											1	3	6	3-6		7
Ship Island.....													1	5		1
NiBlack Point.....	2	1							2	2	2	3-6				6
Kasaan Bay:																
Grindall Point.....			2	5-8			2	2	1	4	16	1-8	15	2-6		36
Grindall Island.....	2	3-6	1	12							18	1-6	4	4-6		25
Kasaan Bay.....			1	3					3	2						4
Twelve-mile Arm.....			1	3												1
Skowl Point.....	8	1-3							10	2-3	7	2-4	1	2		26
Island Point.....	2	2-3							13	1-6	12	2-5	6	2-5		33
Chasina Point.....									1	3						1

¹ Reported as taken in the latter part of July.

TABLE 3.—Returns from pink salmon tagged near Kasaan Bay—Continued

Locality of recapture	Locality and date of tagging														Total number returned	
	South side of entrance to Kasaan Bay, July 29		North of entrance to Kasaan Bay near Windfall Harbor, Aug. 3		North side of entrance to Windfall Harbor, Aug. 3		North side of entrance to Kasaan Bay, Aug. 3		South side of entrance to Kasaan Bay, Aug. 14		North side of entrance to Kasaan Bay, Aug. 14		South side of entrance to Windfall Harbor, Aug. 14			
	Number	Time	Number	Time	Number	Time	Number	Time	Number	Time	Number	Time	Number	Time		
Clarence Strait—south of Kasaan Bay:																
Hallbut Creek.....	2	6-9					2	4-13	4	2-4	2	2	1	2	11	
Wedge Island.....	1	4					1		2	2-4	2	2-4	2	2	7	
Rip Point.....	1	6									1	4			2	
Cape Chacon.....	1	4							15	1-2	2	6	1	6	19	
Prince of Wales Island.....	2	2-19					1	13	2	1	1	2			6	
Vallenor Point.....	1	4	1	6			4	2-5			3	3	3	2	12	
Gravina Island.....	2	1-2	1	1	1	6	3	1-5							7	
Bronaugh Island.....	1	2													1	
Annette Island.....	1	13					1	6							2	
Hall Cove.....	1	13													1	
Kah Shakes.....	1	8													1	
Tree Point.....	1	2													1	
Cape Fox.....							3	4-10	4	2			6	2	13	
Cape Fox Island.....	1	18													1	
Doubtful.....							1	13					3	(?)	4	
Cordova Bay, Shipwreck Point.....	1	22					1	3							2	
Behm Canal:																
Camaano Point.....	1	2									1	5			2	
Bond Bay.....			1	19	1	19									2	
Loring.....			1	18					1	7			1	6	3	
Smugglers Cove.....							3	1							3	
Betton Island.....							1	7							1	
Lake McDonald.....							1	41							1	
Point Alava.....					1	13									1	
Point Sykes.....			2	2-5			2	2-5			2	2			6	
Smeaton Bay.....	1	4													1	
Chatham Strait, Point Lull.....							1	4							1	
Total.....	36		17		8		40		63		84		68		316	
Percentage.....	24.6		12.5		9.2		20.0		46.6		44.0		29.1		27.8	

Out of the total of 316 recaptured, 293, or approximately 93 per cent, were taken either in Kasaan Bay or in Clarence Strait. Twenty were taken in Behm Canal and 1 each in Cordova Bay, on the west shore of Prince of Wales Island, and at Point Lull, Chatham Strait. One hundred and twenty-six, or 40 per cent came from Kasaan Bay proper or from fishing operations conducted at the entrance to the bay, and 167 from localities in Clarence Strait both north and south of Kasaan Bay. There appears to be a fairly well-marked difference in the distribution, depending on whether the fish were tagged north or south of the entrance to the bay. Those tagged south of the entrance were taken in greater numbers in the southern part of Clarence Strait, chiefly at localities south of the point of tagging, while those tagged north of the entrance were taken in greater numbers north of the point of tagging. The exact significance of this is not clear, but it seems probable that the difference is due mainly to a general dispersion from the locality where the fish were liberated. It is possible, however, that these results indicate that there is less certainty to the movements of the fish taken south of Kasaan Bay than to those taken north of the bay which are, presumably, nearer the streams to which they are bound. It is also possible, although rather improbable, that the fish taken south of the bay have entered the strait from the north, through Sumner Strait, and are traveling generally toward the south while those taken north of the bay have entered Clarence Strait from the south and are generally traveling northward. Approximately equal proportions crossed Clarence

Strait and were taken on the eastern shore. The fact of chief interest, however, is that from both north and south of the entrance to Kasaan Bay a large percentage of the recaptured fish were taken either in the bay or at its entrance, and it would appear from this that the runs to streams in Kasaan Bay provide an important element in the runs intercepted by traps both north and south of the entrance to the bay.

It is equally certain that the traps in question catch pink salmon that are bound for other localities, but it seems impossible to make any more exact statements than these or to evaluate the extent to which Kasaan Bay fish enter into the catches of the traps just north and south of the entrance of the bay. In order to do this many more fish would have to be tagged, and it would be necessary to have much more detailed information than is available as to the relative fishing effort in the respective localities.

One hundred and eighty-six chum salmon were tagged during the course of the Kasaan Bay experiments. Thirty-six were later recaptured, of which 24 came from the bay, 9 from scattered points in Clarence Strait both north and south of the entrance to the bay, and 1 each from Behm Canal and Sitklan Island. Although the number of returns is small, they indicate clearly the importance of Kasaan Bay as a source of the chums taken in Clarence Strait near the entrance to the bay.

Out of 61 red salmon tagged in this locality 15 were returned. Two of these were taken at Island Point and 1 at Skowl Point in Kasaan Bay. The others were taken at scattered places in Clarence Strait both north and south of the point of tagging and on both sides of the strait and 1 was reported from the Mezidan River in British Columbia. It is apparent that some of the reds caught in this region are native to the streams of Kasaan Bay, but the data are too few to warrant any conclusions as to the extent to which this is true.

One hundred and seventeen cohos were tagged here and 15 were recovered. Of these only 2 were taken in Kasaan Bay, 1 came from Wark Canal in British Columbia, 1 from Behm Canal, 1 from Revillagigedo Channel and the others from various points in Clarence Strait. As in the case of the reds, no definite conclusions can be reached as to the importance of Kasaan Bay cohos in the catch of this species in the traps of Clarence Strait.

CONCLUSIONS

1. The fish taken in the traps in the region of Cape Fox are predominantly native to Alaskan waters and include comparatively small percentages of fish derived from the streams of British Columbia.

2. The catch of the traps in Clarence Strait near the entrance to Kasaan Bay contains fish native to the streams of Kasaan Bay in rather large numbers, but also includes fish bound to other localities in what may be equal or even greater numbers. No reliable evaluation of the proportion of Kasaan Bay fish in these catches can be made with the data at hand.