

EXPERIMENT IN TAGGING ADULT RED SALMON, ALASKA PENINSULA FISHERIES RESERVATION, SUMMER OF 1922.

By CHARLES H. GILBERT,

Special assistant, U. S. Bureau of Fisheries.

Important fisheries conducted within the Alaska Peninsula Fisheries Reservation are dependent on runs of the red or sockeye salmon, the destination and spawning grounds of which have been undetermined. These runs are known to consist of mature fish that would spawn and die during the season in which they are captured, but the place of capture is not in close proximity to spawning grounds of sufficient importance, obviously, to account for the extensive runs in question, and no information has been hitherto available to connect them with more distant spawning grounds, toward which they are headed. It was for the purpose of throwing light on this important question that the tagging operations of the summer of 1922 were undertaken.

From the standpoint of conservation the final destination of a salmon run and the course it pursues in its final streamward migration are questions of prime importance. Not until the fish have approached the mouth of their spawning stream are they protected by law from capture. Along their migration routes in the sea they are subject to attack wherever they may mass themselves in sufficient numbers in close proximity to the coast. Should this repeatedly occur along a migration route that is annually traveled, a run of salmon may become decimated and eventually destroyed, even though the individual fisheries of which it repeatedly forms the subject are prosecuted in the usual manner and not with extraordinary severity.

To insure the adequate protection of a salmon run a spawning escapement that will bear a definite ratio to the total size of the run must be provided for. To make such provision we must first know the total number captured for commercial purposes and then the number that escape up the river to the spawning grounds. Obviously these facts can not be known unless the migration routes are established and the points at which salmon bound for the different streams are forced to contribute to the commercial fisheries. The more numerous the points of attack the greater the restrictions that will be necessary to save the runs from extinction.

The principal red salmon fisheries on the southern side of the Alaska Peninsula are those of Ikatan and Morzhovoi Bays, near the western extremity of the Peninsula, and those on Unga Island in the Shumagin Group, approximately 100 miles to the eastward. Problems of the kind above indicated have arisen regarding the

fish in each of these districts, for although local spawning grounds for red salmon occur in the vicinity of these fisheries, it has been generally believed that they are wholly inadequate to account for the very extensive runs that occur. As regards Ikatan Bay there can be no question that the salmon are on their passage, circling the shores of the bay on their journey elsewhere, because the red salmon runs are at times of great magnitude in this bay, although no spawning grounds of any size occur there. In the case of Morzhovoi Bay there has seemed to be more ground for divergence of opinion, for fresh-water lakes of large size, capable of producing very considerable runs of red salmon, are tributary to the head of the bay. On a preliminary examination of this district in 1918 it was considered not improbable that these lakes, together with the spawning grounds tributary to Thin Point, a short distance to the eastward, were the source of the Ikatan and the Morzhovoi runs. The investigations of 1922 failed to lend support to this hypothesis.

The Unga Island fishery is likewise concerned with a red salmon run which may at times reach large proportions. Local spawning grounds for red salmon exist, like those of Red Cove, Acheredin Bay, and a number of smaller streams, but these seem obviously inadequate to account for the run.

Another district in which the problem has arisen regarding the origin and destination of the run lies on the Bering Sea side of the Peninsula, immediately to the eastward of Port Moller. Here along a favorable stretch of coast, traps and purse seines have in certain years reaped an exceedingly rich harvest, whereas in other years the returns have been scanty. Two red salmon streams of importance—Bear River and Sandy River—have their mouths along this stretch of beach. Divergent views have been entertained concerning the destination of the Port Moller red salmon run, it being held by one faction that the run consists largely or wholly of local fish bound for Bear and Sandy Rivers, and by the other that, in the more prosperous years at least, the majority of the salmon are migrants, on their way to Bristol Bay. In our preliminary inspection of this field in 1918 all available evidence seemed to point to the local origin and destination of the run. The tagging experiments of 1922 gave no results in conflict with that theory. It must be recalled, however, that the runs in 1918 and 1922 were both small. Whether more prosperous years on the Port Moller grounds are in part or wholly due to Bristol Bay schools, which on those years more closely skirt the coast, is a problem still awaiting solution.

The tagging experiments of 1922 were planned to throw light on as many of these problems as possible. Consecutively numbered aluminum tags (fig. 1) were attached to the tails of 4,000 salmon, which were then released, and the time and place of recapture were recorded. Of these, 861 were attached at Unga Island, 200 in Morzhovoi Bay, 2,300 in Ikatan Bay, and 639 in the vicinity of Port Moller. Of the 4,000 salmon tagged, 709, or 18 per cent, were reported recaptured, either in the vicinity where tagged or at more distant points. A detailed record of all recaptures is presented in the tables given at the end of this paper. We here call attention to some of the more striking results.

1. *Shumagin Islands*.—The fish tagged at Unga Island, of the Shumagin Group, were obtained, through the highly appreciated cooperation of the Pacific American

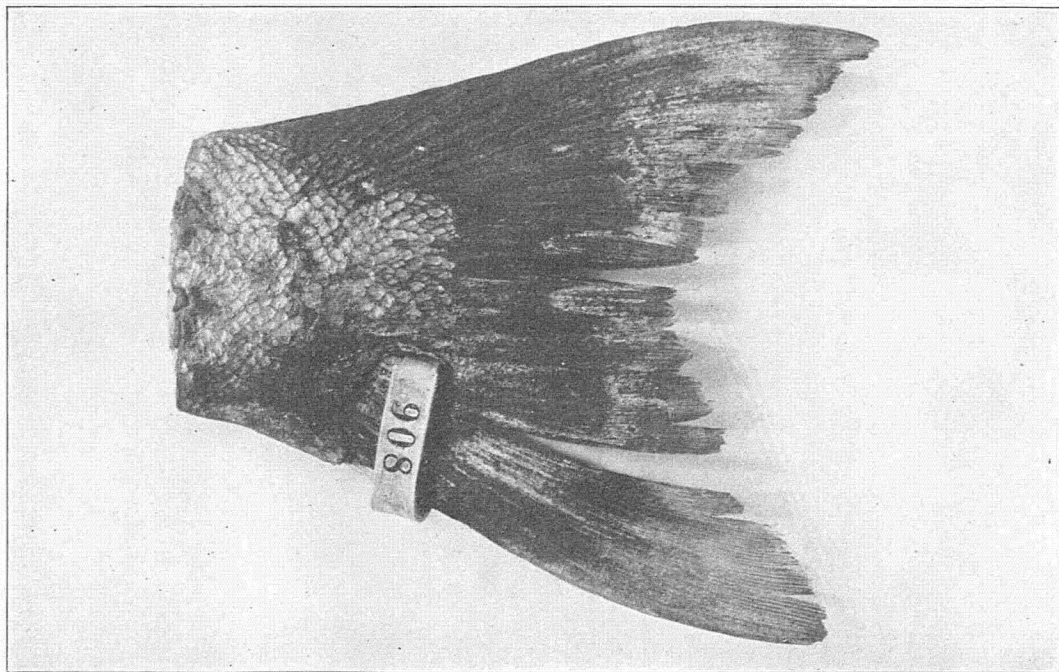


FIG. 1.—Tag No. 908, attached at East Anchor Cove, Ikatan Peninsula, June 15, 1922, and retaken July 4 at Squaw Creek, Kvichak River, Bristol Bay, distant by direct course about 350 miles from place of marking.

Fisheries, from two traps located off the southeastern shore of the island, in the vicinity of Kelly Rock. Of the 861 red salmon tagged only 1 was recaptured in either of these traps, being removed from the trap on the third day after tagging. From this it is clear that salmon released from the Kelly Rock traps do not linger in the vicinity, where they would be subject to recapture, but pass on immediately to other grounds. This is strikingly different, as we shall see, from the procedure of the salmon in Ikatan and Morzhovoi Bays, where many of them circled about the bays for a period of two weeks, during which time they were constantly in the danger zone.

None of the fish tagged and released at Unga Island was taken at Red Cove, Acheredin Bay, or other local fishing grounds among the Shumagin Islands. Five of them moved eastward along the south shore of the Peninsula, one being captured at the mouth of the Ozernoi River, the other four being taken on the eastern shore of Cook Inlet. It is worthy of note that the four salmon bound for Cook Inlet passed on their way such important red salmon streams as the Chignik and Karluk Rivers. Although very extensive fisheries were being prosecuted at both these points no tagged salmon were observed there.

The great majority of the captures from the Unga experiments were of salmon that had started westward on their migration instead of eastward. Furthermore, they proceeded directly to Morzhovoi and Ikatan Bays, without entering on their way the minor red salmon streams of Pavlof or Volcano Bays, Cold Bay, or Thin Point. Of the 601 red salmon tagged and released from Kelly Rock trap No. 6 on June 30, 6 were recovered in Morzhovoi Bay traps on July 6, 4 on July 7, and 5 on July 8, and on the last-mentioned date 1 specimen was recaptured in Ikatan Bay. Inspection of Table 9, in which are detailed the results of this marking, indicates that a stream of migrants from Unga Island was entering Morzhovoi and Ikatan Bays and that they first reached Morzhovoi Bay in numbers and a few days later were present in Ikatan Bay in full force. The last of those released from the New Kelly Rock trap on June 30 were taken in Morzhovoi Bay on July 20, three weeks later. How much of this interval was spent in Ikatan and Morzhovoi Bays can not be specified, but from information derived from tagging experiments conducted in these two bays it is evident that red salmon entering them may mill around in them and pass back and forth from one to the other for two or three weeks before proceeding on their journey. Twenty-four individuals recaptured in Morzhovoi Bay had spent on the average 10 days between tagging and recapture. Fifteen individuals recaptured at Ikatan averaged 13 days en route. The remaining recaptures of the June 30 experiment were made in Bristol Bay from July 14 to August 1 on the Naknek, Kvichak, and Nushagak fishing grounds. The salmon recaptured on July 14 was obtained by the Alaska Packers Association off Koggiung, in the estuary of the Kvichak River, distant by the shortest direct course approximately 465 miles from the point where tagged. If we assume that this fish began its migration immediately on being released after tagging, that it proceeded in a direct line to Isanotski Strait (False Pass), which it traversed without delay, that it pursued an undeviating course to the mouth of the Kvichak River and was there captured on the date of its arrival, it would have traveled at the average rate of 33 miles per day. All of

these assumptions are improbable, entailing the corresponding certainty that the rate of travel was frequently more than 33 miles per day and may even have doubled or trebled that speed. That the rate was not notably exceptional in this individual is shown in Tables 9 and 10 by records of other recaptures in the Bristol Bay district. Six individuals of the June 30 marking averaged 20 days in passing from Unga Island to the point of capture in Bristol Bay. Among our unverified assumptions is that predicating False Pass rather than Unimak Pass for entrance into Bering Sea. This assumption is a probable one in view of the number of captures in Morzhovoi and Ikatan Bays, near the entrance to False Pass. If Unimak Pass had been traversed, the distance would have been approximately 125 miles farther and the minimum rate increased to 40 miles per day.

A second marking experiment was conducted on Unga Island on July 1, when 260 fish were tagged and released from the Pacific American Fisheries trap No. 3 (the Old Kelly Rock trap). As shown in Table 10, the majority of the recaptures were made in Morzhovoi and Ikatan Bays, the remainder being reported from Ugashik, Egegik, Naknek, Kvichak, and Nushagak fishing grounds in Bristol Bay. The percentages of recapture from the two Unga experiments were almost identical—9 per cent in the first and 8 per cent in the second. In the first experiment 72 per cent of the total recaptures were made in Morzhovoi and Ikatan Bays, in the second experiment 65 per cent.

The rate of travel from the Old Kelly Rock trap of the salmon marked July 1 was consistently higher than in those tagged the previous day from the New Kelly Rock trap. In the second experiment the average time spent in reaching Morzhovoi and Ikatan Bays was 8 or 9 days and in reaching various points in Bristol Bay 15 days

2. *Morzhovoi Bay*.—Two hundred red salmon were tagged and released in Morzhovoi Bay on June 20 from Pacific American Fisheries trap No. 2, located near the middle of the southwest shore.

Heavy recaptures were at once effected in Morzhovoi Bay, beginning with June 22 and continuing until June 30, during which period 59 salmon, or 30 per cent of the tagged fish, were recaptured in the same bay in which they were liberated. During this same period scattering captures were made in the adjacent Ikatan Bay, the total equaling 14 salmon, or 7 per cent. Three individuals were captured on the Port Moller fishing grounds between June 27 and July 7. Thirty-nine per cent of the salmon tagged in Morzhovoi Bay were recaptured in these three localities. None was reported from Bristol Bay or from any district other than those mentioned.

It is worthy of note that of the salmon recaptured from this experiment more than four times as many (59 as against 14) were taken in Morzhovoi Bay as in Ikatan Bay, yet they would have to pass through Ikatan Bay on their way to Isanotski Strait if bound for Bering Sea and Bristol Bay.

This becomes all the more noteworthy when considered in connection with proportionate recaptures of salmon tagged and released in Ikatan Bay. As an extensive migration is known to exist into Bering Sea and as the fish are free to traverse Isanotski Strait directly from Ikatan Bay, it would seem highly probable that a much larger proportion of Ikatan fish would be recaptured in Ikatan Bay

than in Morzhovoi Bay, which they would enter only by way of a detour. But the reverse is the case. In the majority of the Ikatan tagging experiments (seven in all) more of the fish were recaptured in Morzhovoi than in Ikatan Bay, and if totals are considered, of all the recaptures from the Ikatan experiments 154 were made in Ikatan Bay and 173 in Morzhovoi Bay.

Two possible explanations occur to us. One is that a larger movement of fish takes place from Ikatan to Morzhovoi Bay than in the reverse direction. The other predicates a more efficient fishery in Morzhovoi Bay than in Ikatan Bay, although the number of traps is far less. The first of these explanations would seem valid if there were extensive spawning grounds tributary to Morzhovoi Bay, which would absorb a considerable percentage of the fish that enter the bay. Such grounds, in fact, do exist, but we have reasons, which we will not here discuss, to doubt their present efficiency. It is believed that in the season of 1922 comparatively few of the fish entering Morzhovoi Bay remained there to spawn, while practically none of them resorted to Thin Point, Cold Bay, Volcano Bay, or any of the minor spawning streams to the eastward.

There remains the hypothesis of more intense fishing and less chance of escape on the part of salmon entering Morzhovoi Bay than of those circling around Ikatan Bay or passing through it. This, we believe, is probably the case. As we have shown, 30 per cent of the fish tagged in Morzhovoi Bay were recaptured in this bay, and 38½ per cent in all were retaken. This is far beyond the average recaptures from the Ikatan Bay experiments, which equaled 19 per cent for the first 1,800 tagged. If the Morzhovoi traps catch a larger percentage of the fish that approach them than do the Ikatan traps, their effect on the run must be carefully considered.

3. *Ikatan Bay, Louisiana Cove, East Anchor Cove.*—The most extensive tagging program in 1922 was carried out in Ikatan Bay and on grounds along the shore of the Ikatan Peninsula, where 2,300 red salmon were marked and released on dates ranging from June 13 to July 10.

This is the seat of an extensive fishery for red salmon, which are evidently intercepted on their spawning migration, with their final destination not obvious. The red salmon spawning grounds tributary to Ikatan Bay are wholly inconsiderable and are not worthy of attention as possible source of the salmon run of the bay.

In order to secure as much information as possible concerning the movements of the salmon within the bay and along the Ikatan shore, the tagging experiments were conducted in six different traps, selected as embracing the entire fishing field. Two of these were at the head of the bay, on either side of the entrance to Isanotski Strait; one was in East Anchor Cove, near the outer extremity of the Ikatan Peninsula and the outermost trap of the group; another was in Louisiana Cove, the next trap site inside East Anchor Cove; and two others were intermediate in position between Louisiana Cove and the entrance to the pass. This distribution was expected to throw light on the theory widely held by the fishermen that salmon circled the shores of the bay once and then disappeared, being first seen on the eastward side of the entrance to Isanotski Strait and thence passing outward along the shores of the Ikatan Peninsula until they reached East Anchor Cove and vanished.

Such a movement of the salmon has been reported by numerous observers and undoubtedly occurs; but the tagging experiments have demonstrated that they do not make a single circuit of the grounds and then pass on. Recaptures from all the tagging experiments, without exception, indicate that the salmon tarry in this vicinity for a considerable period, often from two to three weeks, passing back and forth from Ikatan to Morzhovoi Bays and repeatedly running the gantlet of all the traps. Their behavior is very similar to that observed off river mouths, where salmon play back and forth on the tides in brackish water and are in repeated danger of capture. The efficiency of the Ikatan-Morzhovoi fishery is in no small measure dependent on the concentration of the salmon in this locality before proceeding on their farther migration.

As accurate a record as possible was kept of the traps in Ikatan and Morzhovoi Bays, in which recaptures from the various taggings were made, but no evidence of any definite movements or regularity of appearance was secured. A purely haphazard movement of salmon seemed indicated. Those marked and liberated from any trap, whether located near the head of the bay or toward the outer end of the Ikatan Peninsula, were equally liable to be recaptured in Morzhovoi Bay or in any of the traps of the Ikatan group, although their appearance in Morzhovoi Bay was usually two or three days later than the beginnings of their recapture in Ikatan Bay. From these tagging experiments it was made abundantly clear that Ikatan and Morzhovoi Bays form parts of the same fishing grounds and deal with the same schools of fish, which pass back and forth from one to the other. No conclusive evidence was obtained, however, that any considerable proportion of the commercial run frequents either the local spawning grounds tributary to these bays or other local spawning grounds on the south side of the Alaska Peninsula. A considerable fishery exists at Thin Point, a few miles east of Morzhovoi Bay, but of the 2,500 salmon tagged in Ikatan and Morzhovoi Bays during the season but one individual was captured at Thin Point, and this was from the last tagging experiment of the season, conducted at Louisiana Cove, Ikatan Peninsula, on July 10. It is an interesting coincidence that from this last tagging comes also the single recapture that was made in Cold Bay immediately to the eastward of Thin Point. Quite evidently, the Thin Point and the Cold Bay runs did not circle Ikatan and Morzhovoi Bays in 1922 but approached their spawning streams by an independent course.

A most important feature of the Ikatan tagging experiments consisted in the considerable number of marked salmon that passed into Bering Sea and were recaptured in the Port Moller district and on the various fishing grounds of Bristol Bay, including those off the mouths of the Ugashik, Egegik, Naknek, Kvichak, and Nushagak Rivers. One individual, tagged in Ikatan Bay on June 14, was captured on July 9 by a native fisherman at Quigiung, 25 miles above the mouth of the Kuskoquim River. Another from the same tagging was taken by a native at the Indian fishing village of Nondaulton on Lake Clark, above Iliamna Lake. Details of all recaptures from the Ikatan experiments are given in Tables 1 to 5, 11, and 12. These amply demonstrate a movement throughout the season from the North Pacific into Bering Sea and indicate that a considerable contingent of

the red salmon that form the great run on the northern shores of the Alaska Peninsula have their feeding grounds in the North Pacific and enter Bering Sea only when on their final spawning migration. The shortest time taken in passing from Ikatan to Bristol Bay (off the Naknek River) was 10 days. The average time during the height of the run was 20 days, but the rate was apparently accelerated toward the close, for six salmon tagged at Ikatan on July 10 were captured in Bristol Bay after an average interval of 12 days.

The number of tagged fish reported from Bristol Bay as a result of this experiment can not be accepted as furnishing reliable evidence concerning the magnitude of this movement. No rewards were offered for the return of tags from Bristol Bay, while to the westward such rewards were offered. As a result many of the recaptured tags in Bristol Bay were thrown away or were privately held and not reported. Current belief among fishermen and cannery employees was to the effect that the tags reported constituted a small fraction of those actually seen.

A similar series of tagging experiments on a larger scale is planned for the summer of 1923, when it will be hoped to throw additional light on the magnitude of the migration from the North Pacific into Bering Sea. This is a matter of the greatest importance in connection with conservation measures dealing with the most important red-salmon runs of Bristol Bay.

4. *Port Moller*.—Two tagging experiments were carried out in this district. On June 26, 200 red salmon were tagged from the Moller Bay trap in the immediate vicinity of the Port Moller cannery of the Pacific American Fisheries. This trap is not, primarily, a red-salmon trap, as the major part of its catch consists of cheaper grade fish; but it captures annually a considerable number of red salmon, the spawning destination of which has been unknown. As over 45 per cent of the tagged fish were recaptured, largely by purse seines, on the Bear River-Sandy River grounds between June 27 and July 7, it is safe to conclude that the red salmon taken in Moller Bay are bound for Bear and Sandy Rivers and enter Moller Bay in the course of their migration eastward along the coast of the peninsula. The very large percentage of these tagged fish that was recaptured, even during a year when the Bear River traps were not operating with their usual success, bears witness to the remarkable efficiency of this fishery. There are grounds for fearing that the escapement to the spawning grounds of Bear and Sandy Rivers has often been inadequate.

The second Port Moller experiment was conducted with red salmon that had been captured on June 27 by a purse-seine boat off the mouth of Sandy River. As this lies at the eastern end of the Port Moller grounds, hence nearest the Bristol Bay district, the fish captured at this point might well be expected to contain representatives of the Bristol Bay run, if any of these were to be found on the Port Moller grounds. Of 439 red salmon tagged and released at this point 19 per cent (83 fish) were recaptured between June 27 and July 7 on the Bear River-Sandy River fishing grounds. It was usually not possible to ascertain accurately on what part of the grounds the fish were taken, as the seine boats would make many hauls and the tagged fish were not recovered until the load was delivered at the cannery.

In several instances, however, the capture was known to be effected off the mouth of Bear River, and as this stream is far more important than the Sandy River it seems probable that the majority of the salmon that were schooling off the Bear River-Sandy River beaches in 1922 were bound for Bear River. It is strikingly corroborative of this view that not a single individual out of the 639 tagged in the Port Moller district was recaptured in Bristol Bay, whereas out of the nine tagging experiments conducted south of the Alaska Peninsula at Unga Island and in Ikatan Bay all but the first two experiments (June 13, 200 specimens; June 14, 100 specimens) contained salmon afterwards taken in Bristol Bay. The inference seems plain and unquestionable that in 1922 a stream of migrants was traversing Isanotski Strait (False Pass) from the Pacific into Bering Sea, from early June to the middle of July at least, and that these distributed themselves to the red-salmon rivers along the entire northern shore of the Alaska Peninsula and throughout Bering Sea, from Nelson Lagoon to the Nushagak, and even to the Kuskoquim. The red salmon bound in 1922 for Bristol Bay assuredly did not school close inshore until after they had passed the Sandy River and were perhaps approaching the mouth of the Ugashik.

TABLE 1.—*Ikatan experiment. Tags 1 to 200, attached June 13, 1922, at P. E. Harris trap No. 7, Ikatan Bay.*

[Total recaptures 27=14 per cent.]

Date.	Recaptures.			Date.	Recaptures.		
	Ikatan Bay.	Morz-hovoi Bay.	Port Moller.		Ikatan Bay.	Morz-hovoi Bay.	Port Moller.
June 14.....	4			June 24.....		1	
June 15.....	1			June 25.....	1		
June 16.....	1	2		June 26.....			1
June 18.....		12		No date.....			1
June 19.....	1			Total.....	9	16	2
June 20.....	1	1					

TABLE 2.—*Ikatan experiment. Tags 201 to 300, attached June 14, 1922, at P. E. Harris trap No. 3, Ikatan Bay.*

[Total recaptures 29=29 per cent.]

Date.	Recaptures.			Date.	Recaptures.		
	Ikatan Bay.	Morz-hovoi Bay.	Port Moller.		Ikatan Bay.	Morz-hovoi Bay.	Port Moller.
June 15.....	1			June 23.....		1	
June 16.....	3			June 25.....		1	
June 18.....		12		June 26.....			1
June 19.....	1			June 27.....		1	
June 20.....	4	1		No date.....			1
June 21.....	1			Total.....	10	17	2
June 22.....		1					

TABLE 3.—*Ikatan experiment. Tags 301 to 500, attached June 14, 1922, at Pacific American Fisheries trap No. 2, Ikatan Bay.*

[Total recaptures 51=26 per cent.]

Date.	Recaptures.						
	Ikatan Bay.	Morzhovoi Bay.	Port Moller.	Kvichak River.	Lake Clark, Kvichak River.	Nushagak River.	Kuskoquim River.
June 15.....	1						
June 16.....	2	1					
June 17.....	3						
June 18.....		16					
June 19.....	4	1					
June 20.....	2	3					
June 21.....	3	1					
June 22.....		1					
June 23.....	1						
June 24.....		2					
June 26.....	1						
June 27.....		1					
June 30.....			1				
July 1.....				1			
July 2.....			1				
July 6.....	1						
July 9.....							1
July 10.....				1			
July 13.....						1	
No date.....					1		
Total.....	18	26	2	2	1	1	1

TABLE 4.—*Ikatan experiment. Tags 501 to 1000, attached June 14, 1922, at P. E. Harris trap in East Anchor Cove, Ikatan Peninsula.*

[Total recaptures 67=13 per cent.]

Date.	Recaptures.							
	Ikatan Bay.	Morzhovoi Bay.	Port Moller.	Ugashik River.	Egegik River.	Naknek River.	Kvichak River.	Nushagak River.
June 15.....	13							
June 16.....	2							
June 17.....	1							
June 18.....	1	1						
June 19.....	3	2						
June 20.....	2	1						
June 21.....	7	1						
June 22.....	2	7						
June 23.....		22						
June 24.....	1	3						
June 25.....	1							
June 28.....	1	1					1	
July 3.....								1
July 4.....					1		2	1
July 5.....				1				
July 6.....	3							
July 7.....						1	1	
July 13.....					1			
No date.....			2					
Total.....	37	18	2	1	2	1	4	2

1 Captured at time of tagging by purse seines working immediately outside trap.

TABLE 5.—*Ikatan experiment. Tags 1001 to 1800, attached June 18, 1922, at Pacific American Fisheries trap No. 13, Ikatan Bay.*

[Total recaptures 160=20 per cent.]

Date.	Recaptures. ¹					
	Ikatan Bay.	Morzhovoi Bay.	Port Moller.	Egegik River.	Kvichak River.	Nushagak River.
June 19.....	2					
June 20.....	20	1				
June 21.....	19	7				
June 22.....	1	31				
June 23.....	3	8				
June 24.....	2	23				
June 25.....	1	5				
June 27.....	1	1				
June 28.....	1	5				
June 29.....	1	2				
June 30.....			1			
July 2.....						1
July 3.....		2	3			
July 4.....			1	1		1
July 6.....	2					
July 7.....	2	2				
July 8.....						1
July 10.....	1					
July 11.....				1		
July 12.....					1	
July 13.....					1	
July 20.....					1	
No date.....			3			
Total.....	56	87	8	2	3	3

¹ One tag recovered without data.TABLE 6.—*Morzhovoi Bay experiment. Tags 1801 to 2000, attached June 20, 1922, at Pacific American Fisheries trap No. 2, Morzhovoi Bay.*

[Total recaptures 76=39 per cent.]

Date.	Recaptures.			Date.	Recaptures.		
	Ikatan Bay.	Morzhovoi Bay.	Port Moller.		Ikatan Bay.	Morzhovoi Bay.	Port Moller.
June 22.....		26		June 29.....	1	1	
June 23.....	1	5		June 30.....		1	
June 24.....	2	17		July 6.....	1		
June 25.....		4		July 7.....	1		
June 26.....	3	1		No date.....	3		3
June 27.....	1	1		Total.....	14	59	3
June 28.....	1	3					

TABLE 7.—*Port Moller experiment. Tags 2001 to 2200, attached June 26, 1922, at Moller Bay trap of the Pacific American Fisheries.*

[Total recaptures 91=46 per cent.]

Date.	Recaptures: Bear River-Sandy River grounds.	Date.	Recaptures: Bear River-Sandy River grounds.
June 27.....	5	July 3.....	7
June 28.....	11	July 4.....	8
June 29.....	30	July 7.....	5
June 30.....	2	Total.....	91
July 2.....	23		

TABLE 8.—*Port Moller experiment. Tags 2201 to 2639, attached June 27, 1922, purse-seine boat off mouth Sandy River.*

[Total recaptures 83=19 per cent.]

Date.	Recaptures: Bear River- Sandy River grounds.	Date.	Recaptures: Bear River- Sandy River grounds.
June 27.....	3	July 3.....	4
June 28.....	20	July 4.....	4
June 29.....	17	July 7.....	2
June 30.....	18		
July 2.....	15	Total.....	83

TABLE 9.—*Shumagin experiment. Tags 2640 to 3240, attached June 30, 1922, at New Kelly Rock trap No. 6, near Squaw Harbor, Unga Island.*

[Total recaptures, 54=9 per cent.]

Date.	Recaptures.							No data.
	Unga Island.	Ozernoi River.	Cook Inlet.	Mor- zhovoi Bay.	Ikatan Bay.	Naknek River.	Kvichak River.	
July 3.....	1							
July 6.....				6				
July 7.....				4				
July 8.....				5	1			
July 10.....				1				
July 11.....					1			
July 12.....				3	4			
July 13.....					2			
July 14.....				3	2		1	
July 15.....					5			
July 18.....						1		
July 20.....						1		
July 21.....				2			1	
July 24.....							1	
July 26.....			1					1
July 27.....			1					
Aug. 1.....			2					
No date.....		1					2	1
Total.....	1	1	4	24	15	2	5	1

TABLE 10.—*Shumagin experiment. Tags 3241 to 3500, attached July 1, 1922, at Old Kelly Rock trap No. 3, near Squaw Harbor, Unga Island.*

[Total recaptures, 20=8 per cent.]

Date.	Recaptures.							No data.
	Morzho- vovoi Bay.	Ikatan Bay.	Ugashik River.	Egegik River.	Naknek River.	Kvichak River.	Nushagak River.	
July 5.....		1						
July 6.....	1	1						
July 7.....	1							
July 8.....		1						
July 10.....	1							
July 11.....		4						
July 12.....	1	1						
July 13.....	1							
July 14.....							1	
July 15.....				1				
July 16.....			1					
July 17.....					1			
July 19.....						1		
No date.....						1	1	
Total.....	5	8	1	1	1	2	1	

TABLE 11.—*Ikatan* experiment. Tags 3501 to 3600, attached July 6, 1922, at Pacific American Fisheries trap No. 13, *Ikatan* Bay.

[Total recaptures 13=13 per cent.]

Date.	Recaptures.				Date.	Recaptures.			
	<i>Ikatan</i> Bay.	Morzho- voi Bay.	Ugashik River.	Kvichak River.		<i>Ikatan</i> Bay.	Morzho- voi Bay.	Ugashik River.	Kvichak River.
July 6.....	1				July 16.....	1			
July 10.....	1	1			July 18.....		2		
July 11.....	1				July 25.....			1	
July 12.....	1				No date.....				1
July 13.....	2				Total.....	8	3	1	1
July 14.....	1								

TABLE 12.—*Ikatan* experiment. Tags 3601 to 4000, attached July 10, 1922, at Pacific American Fisheries trap No. 18, Louisiana Cove, *Ikatan* Peninsula.

[Total recaptures 35=9 per cent.]

Date.	Recaptures.								
	<i>Ikatan</i> Bay.	Morzho- voi Bay.	Thin Point.	Cold Bay.	Ugashik River.	Naknek River.	Kvichak River.	Nush- agak River.	No data.
July 10.....	7								
July 13.....	1	4							
July 14.....	4	2							
July 15.....	3								
July 16.....	1								
July 18.....				1					
July 20.....						1			
July 21.....			1			1	1		
July 24.....					1		1	1	
No date.....							2		3
Total.....	16	6	1	1	1	2	4	1	3