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Further Notes on Migration of the Masu Salmon, *Oncorhynchus masou* (BREVOORT), in the Japan Sea as Determined by Tagging

HIROSHI FUKATAKI

In 1967, the writer reported on the migration of the masu salmon, *Oncorhynchus masou* (BREVOORT), in the Japan Sea confirmed by the tagging experiments of 1965 and 1966. Thereafter, the tagging experiments for the pink and masu salmon have been carried out in various offshore areas of the Japan Sea during the spring season of each year (Appendix Table 1–A, –B), to clear the interrelationship between the oceanic distribution and migration manners of these species arriving at their natal streams. In this paper, the writer reports on the additional informations on migration of the masu salmon, using the results of the tagging experiments conducted in 1967 and 1968. The results for the pink salmon will be reported at another occasion.

The tagging method used in 1967 and 1968 was much the same as that in 1965–66, except for the use of new crimping pliers. The pliers (Fig. 1) was devised by remodeling a usual punch for tickets. Concerning this design, the writer received many useful hints from JONES (1966).

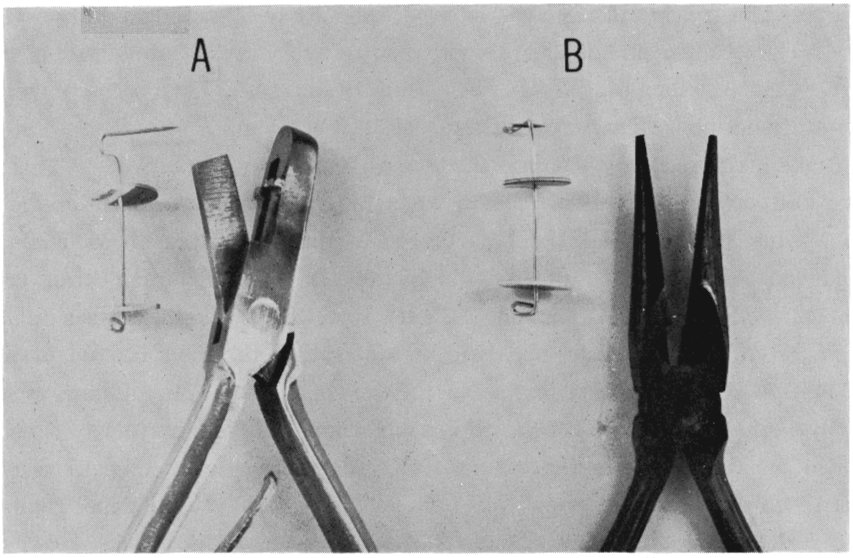

Fig. 1. The new crimping pliers (A) and the common pliers up to 1966 (B).

The fork length of the masu salmon tagged in 1967 and 1968 ranged from 36 cm to 64 cm and 32 cm to 65 cm, respectively. Thus, these fishes were composed only of the maturing salmon (TANAKA, 1965).

The writer is much indebted to Dr. SHIRO MURAKAMI, Director of the Japan Sea Regional Fisheries Research Laboratory, and Mr. TADAO KAMIMURA, Chief of the Department of Oceanography, the same Laboratory, for their critical reading of the manuscript. He also wishes to express his thanks to other members of his Laboratory: to Mr. MAMORU KATO for his good performance of the alloted task in the tagging experiment on the ship, and Mrs. NORIKO NAGANUMA for her assistance in preparing the text figures. The field works were assisted by the continued cooperation of Captain KŌJIRO TAKAHASHI and his crew of the Ariso-maru, a training ship of the Ariso High School, Himi City, Toyama Prefecture, chartered by the Fishery Agency. In collecting informations on recovery, many services were received from personnels of Prefectural Fisheries Experimental Stations, various Fishermen's Associations and Fishery Agency.

Results of Tagging Experiments in 1967

Releasing areas for the masu salmon in 1967 may be conveniently divided into the following two parts; one of them is the north area of Sado Island, and the other is the offshore area of the western Japan Sea. The former is a narrow area surounded with lines of 38°40′ N, 39°00′ N, 138°00′ E and 138°40′ E; while the latter extends broadly from east to west (135°45′ E–131°48′ E), but is rather narrow from south to north (39°42′ N–40°07′ N).

Fifty-three masu salmon were tagged and released in the former area in mid-April and late-April, and 31 in the latter area in early-May and mid-May, respectively. The localities and dates of tagging and recovery in 1967 are shown in Figure 2. Of 84 masu salmon tagged and released in both areas, 12 have been recovered by Japanese fishermen. The recovery rate was 14.3 per cent.

Another one recovery was informed from the fishery of U. S. S. R.. This specimen was recorded as the pink salmon when tagged, but reported to us as the masu salmon after recovery. The fish was tagged in the north area of Sado Island on April 30, and recaptured by a trap net in Silateva Bay, the Tatarskii Strait, Primorskaia (49°12′ N, 140°22′ E), on June 22, after traveling 635 nautical miles in 53 days (Fig. 2, No. 13?). Generally speaking, it seems that the identification of species recovered is more precise than that at the time of tagging. In addition, as will be described latter, two returns of the masu salmon obtained from northern Primorskaia yield in our tagging experiments in 1968, indicating lengthy migrations of this species. Thus, the return from U. S. S. R. in 1967 is treated as the masu salmon in this report.

The number of fish tagged, therefore, is corrected to 54 for the north area of

Sado Island, and to 85 for the total, respectively. The rate of recovery is also corrected to 15. 3 per cent.

All recoveries in 1967 were only from fishes released in the north area of Sado Island, but no return was reported from among those in the offshore area of the

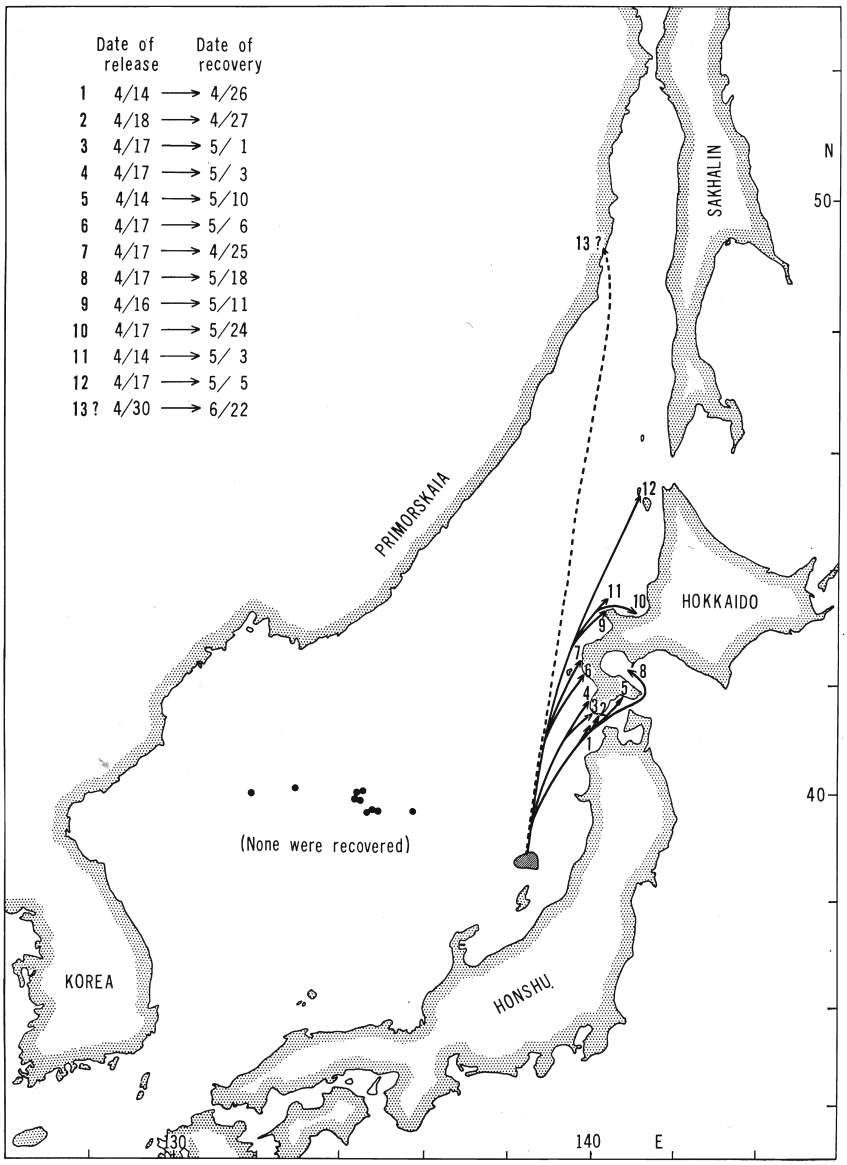

Fig. 2. Localities and dates of tagging and recovery in 1967

western Japan Sea. Thus, the rate of recovery for the north area of Sado Island alone attains 24. 1 per cent.

All recoveries by Japanese fishermen were obtained from the coastal waters of Hokkaido, showing that the pattern of movement was basically north-north-eastward.

One tagged north of Sado Island on April 17 was recaptured near Oniwaki Port, Rishiri Island, on May 5 (Fig. 2, No. 12). This fish had traveled 412 miles in 18 days. Another one tagged at the same releasing point had passed through the Tsugaru Strait and was recaptured at 8 miles southeast of Daikoku Island, off Muroran Port, Hokkaido, on May 18 (Fig. 2, No. 8). So far as the tagging experiments are concerned, this is the first evidence that the masu salmon passed entirely through the Tsugaru Strait from the Japan Sea to the Pacific. One tagged on April 18 was recaptured by a trap net set on the coast of Hakodate City, Hokkaido, facing the Tsugaru Strait, on May 10 (Fig. 2, No. 5). It is probable that this specimen also was on the way to pass through the Strait to the Pacific side of Hokkaido.

There were three recoveries in the coastal waters near Cape Kamui, Shakotan Peninsula and Ishikari Bay, Hokkaido; i. e., two from near the coast of Shakotan Town on May 3 and on May 11, one on each day (Fig. 2, Nos. 11 and 9), and one from a gill net for the plaice operating at 6 miles northeast of Hiyoriyama lighthouse, Otaru City, on May 24 (Fig. 2, No. 10). These fishes had traveled about 287 miles through 326 miles within the period of 19 to 37 days.

The remaining six recoveries were obtained from the coastal waters between Cape Shirakami, the southernmost point of Hokkaido, and Cape Motta; i. e., three from near Matsumae lighthouse (Fig. 2, Nos. 1, 2, and 3), one from near Shiofuki, Kaminokuni Town (Fig. 2, No. 4), one from near Taisei Town (Fig. 2, No. 6), and one from near Tanakado, Kitahiyama Town (Fig. 2, No. 7), respectively. These fishes were tagged for the period of April 14 to 17, and recaptured from April 25 through May 6, thus had traveled over the distance from 164 miles to 218 miles during 8–19 days.

Results of the Tagging Experiment in 1968

In 1968, 114 masu salmon were tagged and released by three research vessels; 101 by the Ariso-maru from March 11 through May 9, 12 by the Kinsei-maru, Hokkaido Prefectural Central Fisheries Experimental Station, in mid-April and late-April, and only one by the Tōou-maru, Aomori Prefectural Fisheries Experimental Station, on May 4, respectively. From these taggings, 18 recoveries were obtained, thus the rate of recovery was 15. 8 per cent. However, no recovery was obtained from the tagging of the Kinsei-maru and the Tōou-maru, and the rate for the Ariso-maru alone was 17. 8 per cent.

The localities and dates of release and recovery in 1968 are shown in Figure 3, divided into three maps by the releasing terms.

Of 31 masu salmon released in the north area of Sado Island in mid-March, seven were recaptured (Fig. 3–A). Four of them migrated north-north-eastward and were recaptured in the waters between near Cape Nyudō, Akita Prefecture, and near Setana Town, Hokkaido. These fishes had traveled 108–254 miles in 16–47

days. Another two were recaptured at 30 and 188 miles northwestward from the point of release 6 and 56 days after being released, respectively. The locality of recovery of the remaining one fish, released on March 18 and recaptured on March 26, was omitted from Figure 3–A, because it was reported only as "off Sado Island"

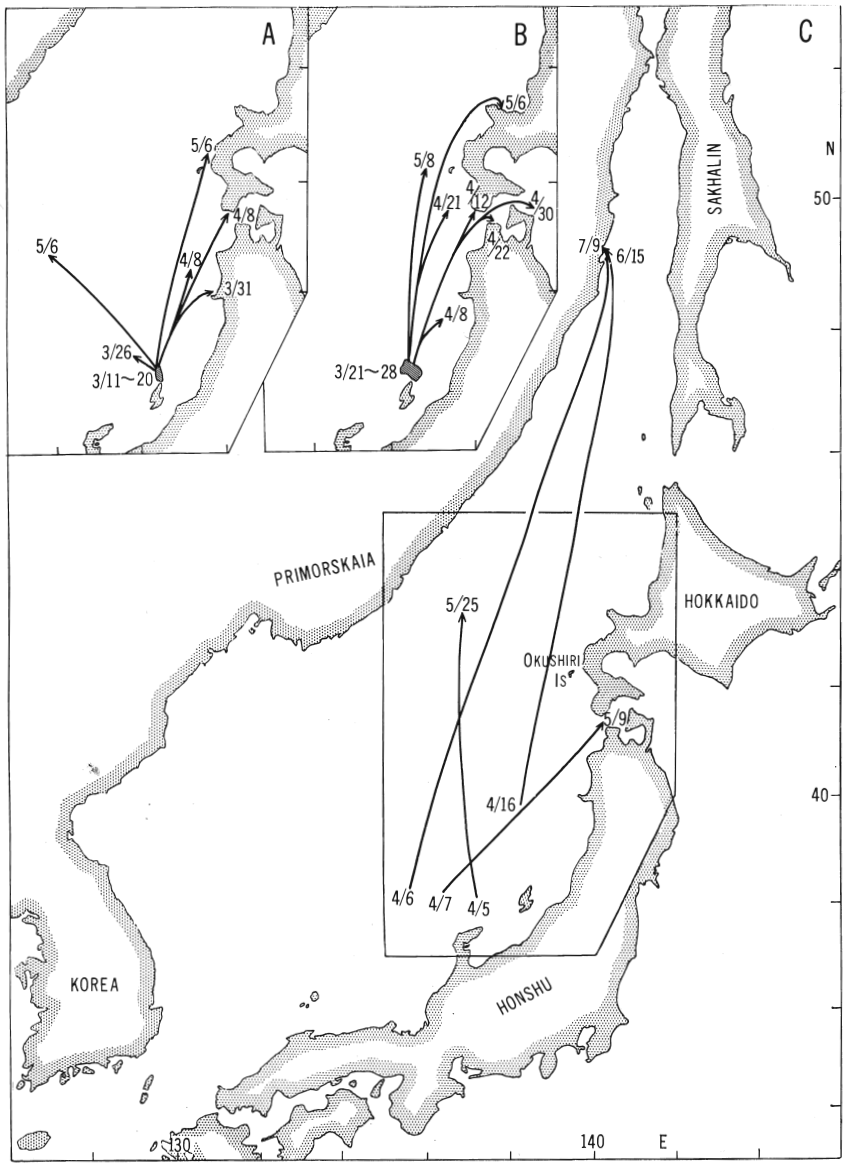

Fig. 3. Localities and dates of tagging and recovery in 1968

and the detailed examination was impossible.

In late-March, 37 masu salmon were tagged and released at the same area as in mid-March. Five returns of them were obtained from the Japan Sea between off Akita Prefecture and near Yoichi Town, Ishikari Bay, Hokkaido. These fishes had

migrated northward or north-north-eastward over the distance of 67 miles to 337 miles during 11–46 days (Fig. 3–B). Another two were recaptured in the Tsugaru Strait; one from near Miumaya Port, Aomori Prefecture, on April 22, and one from near Cape Shiriya, Aomori Pref., on April 30 (Fig. 3–B). It seems that these two fishes were just going to pass through the Tsugaru Strait to the Pacific side of Hokkaido or northern Honshu.

Of 13 masu salmon tagged and released in the offshore areas of Noto Peninsula in early-April, three were recovered; i. e., one released on April 7 was recaptured in the coastal waters near Cape Tappi, Aomori Pref., situated 258 miles northeast from the releasing point, on May 9; one released on April 5 was recovered in the offshore area of southern Primorskaia, located 318 miles north from the releasing point, on May 25; and one released on April 6 was found in a trap net in the Tumnin River, northern Primorskaia, U. S. S. R., situated about 700 miles north from the releasing point, on July 9 (Fig. 3–C).

In mid-April, 10 and 11 masu salmon were released by the Ariso-maru and Kinsei-maru, respectively. One of the former was taken by a trap net in Datta Bay, northern Primorskaia, U. S. S. R. (Fig. 3–C). The fish was tagged and released off Cape Nyudō on April 16, and recaptured on June 15, thus had traveled approximately 580 miles from the releasing location for 2 months.

In late-April and early-May, 12 masu salmon were tagged and released by the Ariso-maru, the Kinsei-maru, and the Tōou-maru, but none were recovered.

Swimming Speed of the Masu Salmon in the Sea

The rate of travel of the masu salmon in the sea was calculated based on the data of 1967 and 1968 applying the same method as used in the previous report (FUKATAKI, 1967). The rate of travel of the individual specimen was shown in Appendix Table 2. These values ranged from 7.5 miles to 27.3 miles per day for 13 masu salmon in 1967, and from 3.4 miles to 9.8 miles per day for 17 masu salmon in 1968, respectively. Generally speaking, the rate of travel of the masu salmon is relatively small as compared with those of other species of Pacific salmon (HARTT, 1962; 1966; KONDO et al, 1965; ROYCE et al, 1968).

The relationship between the distance traveled and number of days out is shown in Figure 4. Tagging and recovery data for the four-year period, 1965–68, were used in this figure. From these tables and figure,it is sh own that the rate of travel of the masu salmon in 1968 was less than that in the other years. In 1968, although, the starting date of the tagging experiments was earlier that in other years, the distance traveled was well proportioned to the number of days out. Thus, no remarkable seasonal change was found in the rate of travel.

Since it seems that the migration speed of the masu salmon is affected by their maturing conditions and environmental factors, the writer examined the data on the

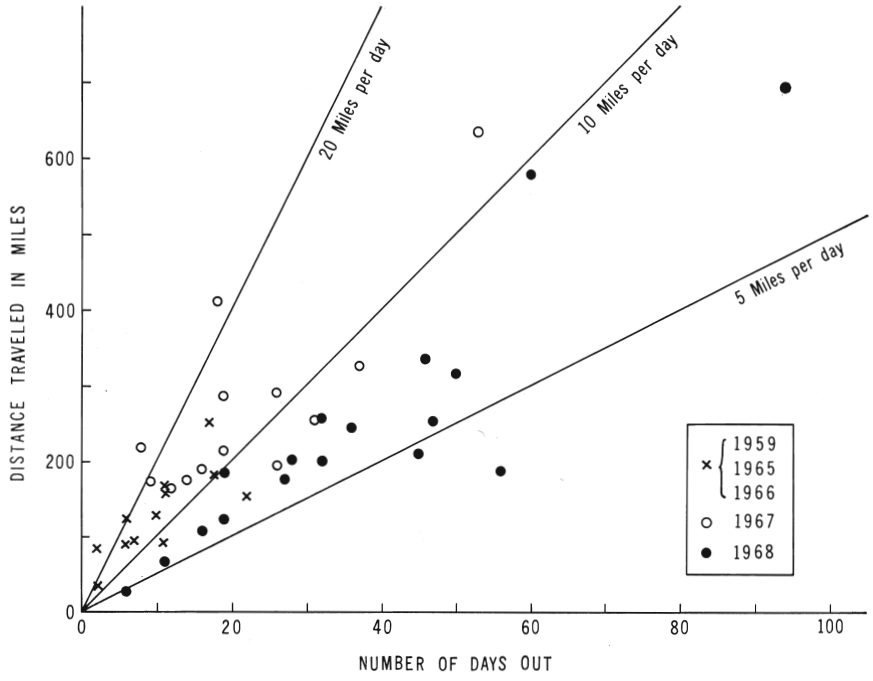

Fig. 4. Relationship between distance traveled and number of days out obtained from tagging experiments for masu salmon during the four-years period, 1965–68.

seasonal changes of their gonad weight and sea conditions during the spring season of the Japan Sea. So far as seasonal changes in the gonad weight of the masu salmon are concerned, there is no considerable difference between 1967 and 1968 (Table 1). On the other hand, it my be noticed, as is shown in Figure 5, that the water temperature in the Japan Sea during the spring season of 1968 was abnormally cold in comparison with the mean status for the past ten-year period, 1953–62

Table 1 Average gonad weight of masu salmon caught in the Japan Sea, by sex, month, and year

Sex	Month	No. of fish examined		Average gonad weight	
		1967	1968	1967	1968
Female				g	g
	March	86	363	11.8	9.5
	April	155	331	26.6	28.5
	May	84	46	54.5	52.6
	Total	325	740		
Male					
	March	45	221	2.6	2.4
	April	71	202	4.4	5.4
	May	35	50	23.1	13.1
	Total	151	473		

(NAGANUMA, 1964; JAP. SEA REG. FISH. RES. LAB., 1968). Accordingly, it is probable that this unusual phenomena caused the exceptionally slow migration of the masu salmon in 1968.

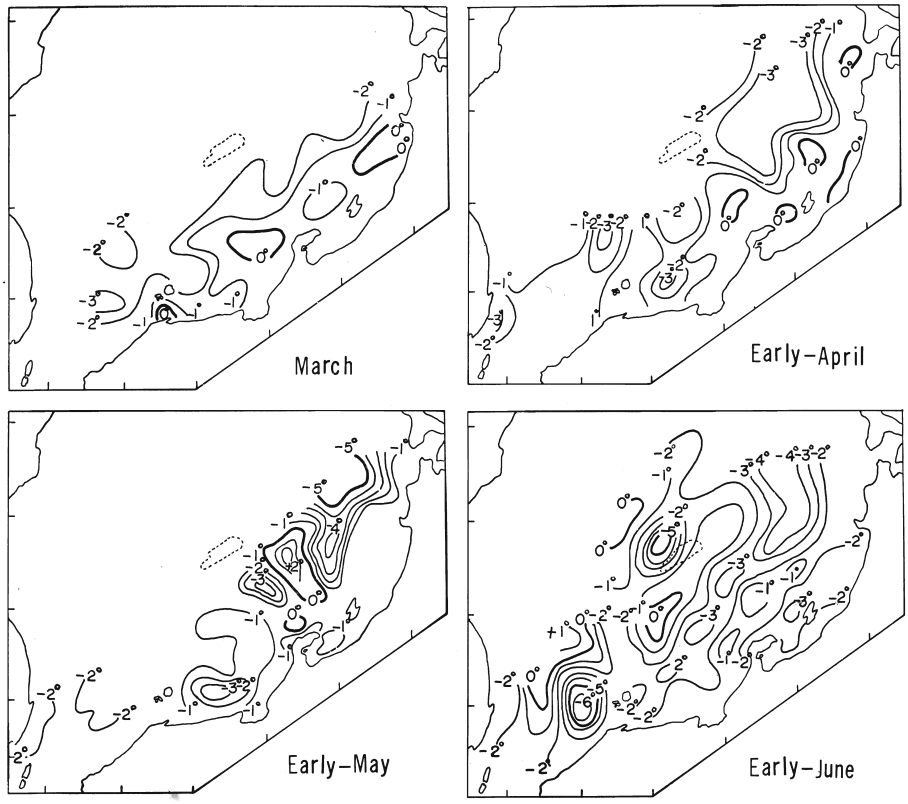

Fig. 5. Distribution of temperature deviation at a depth of 50m during the spring of 1968 from the monthly mean temperature for the period 1953 to 1962 (after JAP. SEA REG. FISH. RES. LAB., 1968)

Conclusions from Tagging Experiments for the Masu Salmon during the Four-Year Period, 1965–68

In the 1965–66 report (FUKATAKI, 1967), it was suggested that most of the masu salmon appearing in waters off the west coast of northern Honshu tend to migrate to the Japan Sea coast of southern Hokkaido, and at the same time it was also assumed that some of them move to the Pacific coast of southern Hokkaido through the Tsugaru Strait. These views are confirmed by the facts obtained from the tagging experiments for the masu salmon in 1967 and 1968.

On the other hand, one recovery was obtained near Rishiri Island in our tagging experiment of 1967 (Fig. 2, No. 12). In addition, another one masu salmon, with a hydrostatic tag (Fig. 6), attached by the Sakhalin Branch, Pacific Research Institute

of Fisheries and Oceanography (TINRO), U. S. S. R. was recaptured at 27 miles northwest from Kyuroku Island (40°48′ N, 139°02′ E) on April 8, 1968, by a Japanese longline fishery. According to a kind information from Mr. KANIDEV, a fishery biologist of the Sakhalin Branch of TINRO, this specimen was initially taken as a stray young individual during the tagging works for the plaice in the Terpeniya Bay (=Taraika Bay), the eastern coast of Sakhalin in July of 1967, and released there without expecting the recovery. These two recoveries support the writer's previous opinion that it will be improper to neglect the possibility that the masu salmon off northern Honshu is destined for the Japan Sea coast of northern Hokkaido and Sakhalin or for the Okhotsk Sea coast of these Islands.

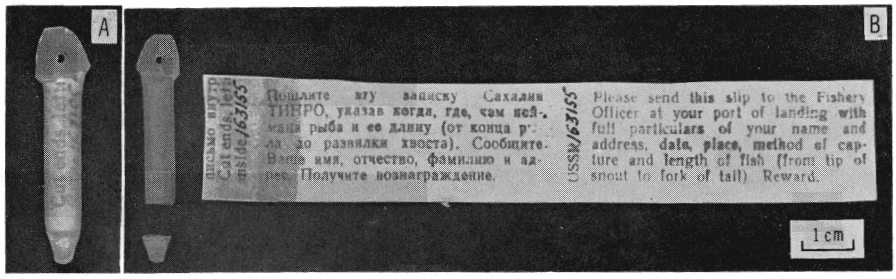

Fig. 6. The hydrostatic tag (A) for masu salmon released by Sakhalin Branch, TINRO, U. S. S. R., and recaptured near Kyuroku Island on April 8, 1968, by a Japanese longline fishery, and the slip letter enclosed in it (B)

As described earlier, although there is a little pending question on the identification of species, it was informed that one masu salmon from our tagging experiments in 1967 was recaptured on the coast of northern Primorskaia (Fig. 2, No. 13?). In 1968, two more also returned from near the recovery point in the last year (Fig. 3–C). These three (or two, at least) were the first northern Primorskaia returns to date from Japanese tagging experiments for this species. These recoveries have produced newly indubitable evidence that the masu salmon which appear off the west coast of northern Honshu are partially destined for northern Primorskaia. Moreover, another two high seas recoveries showed that they might have been moving to the coastal waters of Primorskaia (Fig. 3–A, and 3–C).

In our experiments of 1966, one masu salmon tagged in the offshore area of northern Korea was recaptured at Avakumevska, the Sadacha River, southern Primorskaia, U. S. S. R., situated at 43°45′ N, 135°18′ E (FUKATAKI, 1967).

From tagging experiments carried out during the four-year period, 1965–68, it may be concluded that the natal streams of the masu salmon wintering in the southern part of the Japan Sea extend over the Pacific side of southern Hokkaido, the Japan Sea side or the Okhotsk Sea side of northern Hokkaido, Sakhalin, northern Primorskaia and southern Primorskaia as well as the Japan Sea side of northern Honshu and southern Hokkaido. At the same time, it is also suggested that these

stocks, except the southern Primorskaia one, intermingle partially with each other off northern Honshu.

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再び標識放流試験結果からみた日本海におけるサクラマスの回遊について

深　滝　　弘

要　　約

この報告においては，1967～68年の標識放流試験結果にもとづいて，先回の報告（1965～66年の結果）以後に，あらたにえられた知見をのべた．

1967年には，水産庁用船有磯丸によつて，4月中・下旬に佐渡北方水域から54尾，5月上・中旬に西部日本海沖合水域から31尾，合計85尾のサクラマスを放流した．前者から13尾（24.1%）の再捕をえたが，後者からの再捕はまつたくなかつた．再捕位置別尾数は，北部沿海州1，利尻島付近1，積丹半島～石狩湾付近3，茂津田岬～白神岬付近間6，函館市沿岸1，および室蘭港外大黒島沖1であつた（Fig. 2）．北部沿海州に達したもの（魚種確認上多少問題が残つている），および津軽海峡を完全にとおりぬけたものは，どちらも最初の記録であつた．

1968年には，有磯丸によつて3月中旬～5月上旬に101尾，北海道中央水試の金星丸によつて4月中・下

旬に12尾，青森水試の東奥丸によつて5月上旬に1尾，合計114尾のサクラマスを放流した．そのうち，有磯丸放流分だけから18尾（17.8%）の再捕をえた．3月中旬の佐渡北方水域における放流31尾のうち7尾の再捕をえた．その再捕位置別尾数は，入道埼付近～北海道瀬棚町付近間の日本海4，放流地点から北西方向の沖合2，佐渡沖（詳細位置不明）1であつた（Fig. 3-A）．3月下旬の佐渡北方水域における放流37尾のうち7尾の再捕をえた．再捕位置別尾数は，秋田県沖～北海道余市町付近間の日本海5，津軽海峡内本州側沿岸2であつた（Fig. 3-B）．4月上旬に能登半島沖で放流した13尾のうち3尾が，北部沿海州ツムニン河，南部沿海州沖および竜飛岬付近で，また，4月中旬放流10尾のうち1尾が北部沿海州で，それぞれ再捕された（Fig. 3-C）．このほかに，1968年4月には，久六島沖で日本の漁業者が，ソ連の太平洋漁業海洋学研究所カラフト支所の標識（Fig. 6）をつけたサクラマス1尾を再捕した．この個体は1967年7月にタライカ湾で放流されたものであつた．

放流・再捕間の移動距離と経過日数から1日平均移動距離を求めたところ，1968年にはサクラマスが例年よりおそい速度で北上したという結果をえた（Fig. 4）．サクラマスの成熟速度がこの年に例年よりとくにおくれたという傾向は認められなかつた（Table 1）．しかし，この年の春の水温は，過去10年間の平均と比較するとかなり異常に低かつた（Fig. 5）．サクラマスの北上速度が例外的におそかつたことには，おそらくこうした異常な海洋条件が影響していたのであろう．

1965～68年間の標識放流試験結果から，日本海南部で越冬するサクラマスの産卵河川地方は，北部本州や道南の日本海側はもちろん，道南太平洋側，道北およびカラフトの日本海側やオホーツク海側，北部および南部沿海州にまでおよんでいることが明らかになつた．そして，南部沿海州群に若干の保留をおけば，これらの各地方群は，北部本州沖において，すくなくとも部分的に，たがいに混りあつていることを示唆する結果が得られた．

Appendix Table 1–A Number of salmon tagged in the Japan Sea, by date, location and species (1967)

Date	Location N	Location E	No. of skates used	No. of fishes tagged Pink	Masu	Total
(*Ariso-maru*)						
4/13	38°50′	138°14′	30	11	1	12
4/14	38°56′	138°39′	80	2	12	14
4/14	38°50′	138°16′	40	9	3	12
4/14	38°41′	138°40′	40	10	4	14
4/17	38°47′	138°29′	70	3	21	24
4/17	38°56′	138°23′	40	9	7	16
4/18	38°57′	138°06′	70	7	3	10
4/19	38°51′	138°23′	30	2	1	3
4/24	38°52′	138°22′	70	46	–	46
4/24	38°54′	138°23′	40	11	–	11
4/25	38°56′	138°04′	65	60	–	60
4/25	38°57′	138°03′	40	27	–	27
4/26	39°05′	137°49′	70	37	–	37
4/27	39°00′	138°00′	35	25	1	26
4/29	38°38′	137°58′	50	6	–	6
4/29	39°07′	138°17′	50	1	–	1
4/30	38°42′	138°12′	40	(17)	(1)	18
5/ 6	39°23′	136°20′	40	5	–	5
5/ 7	39°47′	136°35′	70	78	–	78
5/ 7	39°44′	136°36′	40	10	–	10
5/ 8	39°42′	135°45′	80	19	1	20
5/ 9	39°45′	134°50′	60	44	2	46
5/ 9	39°45′	134°47′	40	63	4	67
5/10	39°42′	134°42′	70	12	7	19
5/10	39°56′	134°23′	50	40	4	44
5/11	39°57′	134°21′	60	124	3	127
5/11	40°02′	134°26′	50	90	1	91
5/12	40°07′	134°40′	60	78	7	85
5/17	40°08′	133°32′	80	9	–	9
5/17	40°11′	132°55′	50	78	1	79
5/18	40°15′	132°50′	70	109	–	109
5/18	40°15′	132°51′	40	27	–	27
5/19	40°05′	131°48′	50	5	1	6
5/20	40°07′	132°31′	70	80	–	80
5/20	40°06′	132°32′	50	87	–	87
5/21	40°03′	132°37′	80	97	–	97
6/ 2	41°00′	136°55′	40	2	–	2
6/ 3	41°00′	137°00′	50	2	–	2
6/ 3	41°36′	136°47′	50	10	–	10
6/ 4	42°00′	136°43′	70	2	–	2
6/10	41°58′	137°06′	40	11	–	11
6/11	41°53′	137°05′	60	18	–	18
6/13	42°25′	136°56′	50	2	–	2
6/14	42°46′	137°02′	60	27	–	27
6/14	42°46′	137°05′	30	1	–	1
6/15	42°32′	136°57′	60	3	–	3
	subtotal			*1416*	*85*	*1501*
(*Kinsei-maru*)						
4/30	43°25′	140°27′		35	–	35
5/ 7	43°42′	140°41′		7	–	7
5/ 8	43°35′	140°30′		41	–	41
	Subtotal			*83*	–	*83*
	Total			*1499*	*85*	*1584*

Appendix Tadle 1–B Number of salmon tagged in the Japan Sea, by date, location and species (1968)

Date	Location N	Location E	No. of skates used	No. of fishes tagged Pink	Masu	Total
(*Ariso-maru*)						
3/11	38°18′	138°25′	30	–	3	3
3/15	38°33′	138°22′	50	–	5	5
3/18	38°15′	138°36′	40	–	3	3
3/19	38°35′	138°30′	40	6	1	7
3/19	38°35′	138°26′	40	–	6	6
3/20	38°29′	138°26′	45	–	6	6
3/20	38°30′	138°25′	40	3	7	10
3/21	38°18′	138°38′	30	–	4	4
3/22	38°31′	138°27′	40	–	3	3
3/23	38°37′	138°33′	40	3	2	5
3/23	38°55′	138°38′	40	–	4	4
3/24	38°31′	138°45′	40	–	3	3
3/24	38°45′	138°19′	40	4	5	9
3/25	38°36′	138°14′	40	1	5	6
3/25	38°41′	138°12′	40	1	6	7
3/26	38°30′	138°02′	20	1	4	5
3/28	38°38′	138°15′	50	1	1	2
4/ 5	38°07′	137°15	35	1	2	3
4/ 6	38°15′	135°38′	40	–	1	1
4/ 7	38°11′	136°26′	40	–	5	5
4/ 7	38°39′	135°24′	50	12	2	14
4/ 8	38°47′	135°10′	50	34	1	35
4/ 8	38°45′	135°14′	50	5	2	7
4/12	39°05′	136°14′	60	2	3	5
4/13	39°29′	137°46′	70	1	1	2
4/15	39°46′	138°00′	60	–	1	1
4/16	39°48′	138°12′	60	7	3	10
4/16	38°41′	138°21′	30	–	2	2
4/22	38°27′	133°43′	60	1	3	4
4/24	39°11′	132°50′	60	1	2	3
5/ 7	40°51′	138°40′	50	–	2	2
5/ 8	40°52′	138°29′	60	2	2	4
5/ 9	41°01′	138°21′	50	–	1	1
5/10	40°55′	137°34′	60	1	–	1
5/17	40°20′	135°09′	80	2	–	2
5/18	40°20′	135°11′	80	1	–	1
5/22	41°06′	138°27′	60	4	–	4
5/22	41°38′	138°25′	65	2	–	2
5/25	42°45′	137°47′	80	3	–	3
	subtotal			*99*	*101*	*200*
(*Kinsei-maru*)						
4/ 9	43°30′	140°39′	50	12	–	12
4/12	43°32′	140°48′	50	3	–	3
4/13	43°29′	140°35′	50	11	–	11
4/15	43°32′	140°38′	50	13	–	13
4/17	43°34′	140°48′	50	4	–	4
4/18	43°35′	140°43′	50	13	9	22
4/19	43°30′	140°35′	25	17	2	19
4/28	43°39′	140°34′	50	10	1	11
4/29	43°29′	140°43′	50	4	–	4
5/ 4	43°23′	140°45′	16	3	–	3
	subtotal			*90*	*12*	*102*
(*Tōou-maru*)						
5/ 4	40°49′	136°33′	100	2	1	3
	Total			*191*	*114*	*305*

Appendix Table 2 Detailed informations on release and recovery of masu salmon tagged in the Japan Sea during spring seasons of 1967 and 1968

Tag no.	Date of release	Date of recovery	Location				Fork length		Fishing gear at recovery	Distance traveled in miles	No. of days out	No. of miles per day
			At tagging		At recovery		At tagging	At recovery				
			N	E	N	E						
0611	4/14, '67	5/10, '67	38°56′	138°39′	41°46′	140°42′	45cm	—cm	Trapnet	195	26	7.5
0614	4/14	5/ 3	38°56′	138°39′	43°30′	140°21′	44	46	?	287	19	15.1
0625	4/14	4/26	38°50′	138°16′	41°13′	140°02′	47	—	Driftnet	164	12	13.7
0626	4/16	5/11	38°41′	138°40′	43°22′	140°19′	40	—	Trapnet	292	26	11.2
0636	4/17	5/ 6	38°47′	138°29′	42°11′	139°52′	43	44	?	214	19	11.3
0637	4/17	5/18	38°47′	138°29′	42°13′	140°50′	43	—	Driftnet	254	31	8.2
0638	4/17	5/ 3	38°47′	138°29′	41°44′	140°01′	43	42	Angling	190	16	11.9
0639	4/17	5/ 5	38°47′	138°29′	45°16′	141°22′	39	39	?	412	18	22.9
0650	4/17	5/ 1	83°47′	138°29′	41°25′	140°04′	43	—	Angling	174	14	9.7
0652	4/17	4/25	38°56′	138°23′	42°23′	139°48′	42	—	?	218	8	27.3
0656	4/17	5/24	38°56′	138°23′	43°20′	141°06′	42	41	Gillnet	326	37	8.8
0660	4/18	4/27	38°57′	138°06′	41°25′	140°06′	44	—	Trolling	174	9	19.3
†0982	4/30	6/22	38°42′	138°12′	49°12′	140°22′	46	—	Trapnet	635	53	12.0
0694	3/11, '68	4/ 8, '68	38°18′	138°25′	41°24′	140°09′	46	—	Driftnet	203	28	7.3
0698	3/11	5/ 6	38°18′	138°25′	40°43′	135°50′	41	—	Longline	188	56	3.4
0700	3/15	3/31	38°33′	138°22′	40°01′	139°43′	41	43	Trolling	108	16	6.8
2128	3/18	3/26	38°15′	138°36′	Off Sado Is.		42	—	Driftnet	?	8	?
2139	3/20	5/ 6	38°29′	138°26′	42°34′	139°50′	41	48	Trolling	254	47	5.4
2145	3/20	4/ 8	38°30′	138°25′	40°26′	139°18′	42	47	Driftnet	123	19	6.8
2148	3/20	3/26	38°30′	138°25′	38°47′	137°52′	39	—	Driftnet	30	6	5.0
2150	3/21	4/22	38°18′	138°38′	41°13′	140°28′	43	46	?	202	32	6.3
2151	3/21	5/ 6	38°18′	138°38′	43°19′	140°47′	40	—	Gillnet	337	46	7.3
2164	3/24	4/12	38°31′	138°45′	41°28′	140°00′	47	48	?	186	19	9.8
2167	3/24	5/ 8	38°45′	138°19′	42°15′	138°55′	42	47	Driftnet	211	45	4.7
2171	3/25	4/30	38°36′	138°14′	41°28′	141°26′	49	—	?	245	36	6.8
2175	3/25	4/21	38°41′	138°12′	41°29′	139°26′	38	—	Longline	177	27	6.6
2185	3/28	4/ 8	38°38′	138°15′	39°25′	139°15′	41	40	Driftnet	67	11	6.1
2186	4/ 5	5/25	38°07′	137°15′	43°15′	136°55′	45	49	Longline	318	50	6.4
2188	4/ 6	7/ 9	38°15′	135°38′	49°18′	140°28′	63	70	Trapnet	695	94	7.4
2192	4/ 7	5/ 9	38°11′	136°26′	41°16′	140°19′	54	—	Trolling	258	32	8.1
3403	4/16	6/15	39°48′	138°12′	49°18′	140°30′	63	66	Trapnet	578	60	9.6

† This specimen was recorded as the pink salmon at tagging, but reported as the masu salmon at recovery in U. S. S. R..