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Oshoro-Marui, 1982-1985**

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北海道大学水産学部研究彙報 第38巻 第3号 203-208 頁別刷
昭和62年8月

Reprinted from Bulletin of the Faculty of Fisheries,
Hokkaido University, Vol. 38, No. 3, pp. 203-208

August 1987

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Abstract

Twenty-two steelhead trout (*Salmo gairdneri*) containing coded wire tags (CWT's) were captured in gillnets fished by the Oshoro-Maru in the Gulf of Alaska and along 180° during 1982-85. These fish originated from North American streams and hatcheries in British Columbia, Idaho, and Washington. One fish was age 0.1, 16 were age 1.1 and 5 were age 1.2. In 1985, 17% of the steelhead caught had missing adipose fins but did not contain tags. This high proportion of marked hatchery fish and the known fresh water ages of marked fish indicated that many of the steelhead caught by the Oshoro-Maru and other vessels in the Northeast Pacific originated from North American hatcheries.

Introduction

During cruises of the training ship Oshoro-Maru into waters of the subarctic Pacific in 1980 and 1981, thirteen steelhead trout with CWT's were caught in gillnets fished in the North Pacific and the Gulf of Alaska¹⁾. These fish, some of the first CWT steelhead recovered in the open ocean, originated from hatcheries in North America (Washington, British Columbia, Oregon, and Idaho). This paper presents new information on steelhead trout captured in gillnets during 1982-1985, and provides additional data on the distribution, migration and origin of this salmonid in the North Pacific.

Methods

Gillnets were fished in the central North Pacific along 180°, and in the Gulf of Alaska either along 55°N (1982 and 1983) or 155°W (1984 and 1985). Locations of the sets in each year are shown in Figure 1. A total of 12 to 19 sets were made in each year during the months of June and July (Table 1).

Gillnets were usually 6.3 to 6.6 km in length, consisting of 25, 29, 33, 37, 42, 48, 55, 63, 72, 82, 93, 106, 115, 121, 130, 138, 157, 179 and 204 mm (stretch) mesh. Gillnets were fished overnight at each station.

All salmonids were inspected for missing adipose fins during sorting, measuring and analysis of internal organs. Heads were removed from fish with missing adipose fins and were preserved for retrieval of tags. CWT's were recovered and decoded by

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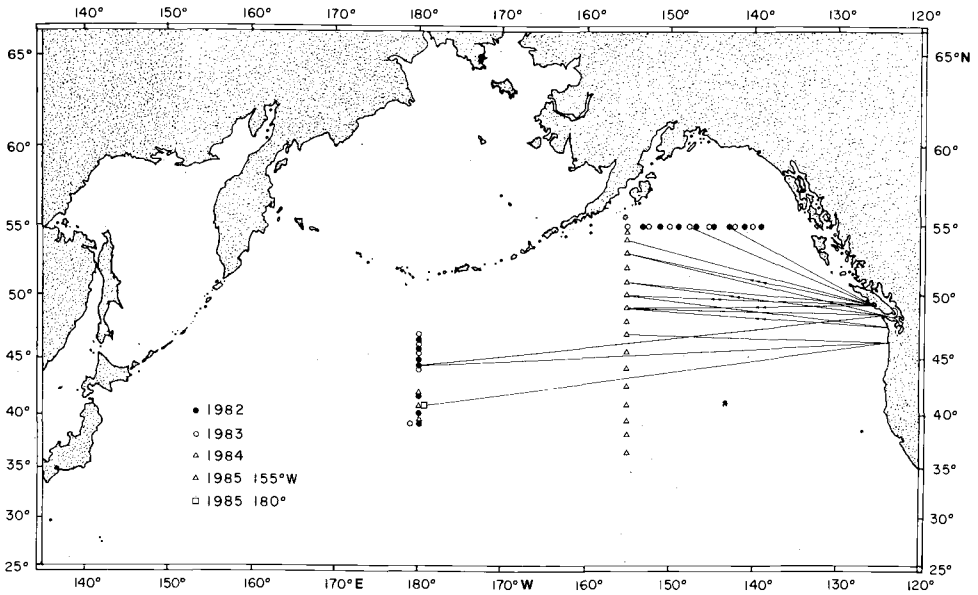


Fig. 1. Recovery of marked steelhead trout by the Oshoro-Maru in gillnet during 1982-1985 in the North Pacific Ocean. Lines connect location of fresh water release and capture. Lines without arrows represent single fish. When more than one fish was captured at a station, the number of arrowheads along the line shows the total number of fish caught at that station.

Table 1. The dates and numbers of gillnet sets along 180° and in the Gulf of Alaska, 1982-1985.

	1982	1983	1984	1985
Dates Hauled				
180°	12-20 June	12-20 June	12-14 June	15 June
Gulf of Alaska	17-24 July	1- 7 July	16-31 July	4-19 July
No. Sets				
180°	7	5	3	1
Gulf of Alaska	8	7	16	16
Cruise Track in Gulf	55°N	55°N	155°W	155°W

the Oregon Department of Fish and Wildlife or the National Marine Fisheries Service.

Results

The numbers of steelhead trout caught, numbers with missing adipose fins and the numbers with CWT's are shown in Table 2. A total of 81 steelhead without adipose fins and 22 with CWT's were found. Steelhead trout were the most common fish with missing adipose fins and CWT's, even though they were not nearly as numerous in the gillnet catches as sockeye, pink, chum or coho salmon. Only one

Table 2. Numbers of steelhead caught with missing adipose fins and with CWT's, 1982-1985.

	1982	1983	1984	1985
No. caught	123	128	160	345
No. with missing adipose fins	3	3	16	59
No. with CWT's	3	1	8	10

coho salmon was found during these four years with a missing adipose fin and CWT, and one sockeye salmon with a missing adipose fin.

The incidence of CWT's in steelhead varied from 0.7 to 0.5% of the total number of steelhead caught in different years. The percent of fish with missing adipose fins increased from 2.3-2.4% in 1982 and 1983 to 10% in 1984 and to 17% in 1985 (Table 2).

Information on the release and capture of the 22 steelhead with CWT's (Table 3) shows that fish were released from British Columbia (14, with 13 from Vancouver Island), Washington (5) and Idaho (3).

Sixteen of the 22 steelhead were caught in the ocean 11-15 months after release, 5 after 26-27 months after release, and one 3 months after release. All these fish presumably spent one year in fresh water and were therefore age 1.1, 1.2, and 0.1, respectively (where the numeral that precedes and follows the decimal point indicates the years in fresh water and the ocean respectively; age is usually determined from the number of fresh water and ocean annuli observed on the scales).

Both summer and winter run steelhead were recovered. Seven of the steelhead from Vancouver Island were wild fish released in the Somass River. Lengths of the fish ranged from 270 mm fork length for the age 1.0 fish to 778 mm for the age 1.2 fish.

Straight lines connect locations of release and ocean capture in Figure 1 of tagged steelhead. Captures ranged from as far south as 41°N near 180° but were no farther south than 47°N along 155°W. Most recoveries of CWT steelhead were between 49°N and 53°N. All three fish found between 41°N and 44°N along 180° were from Idaho or Washington. The fish found the farthest south along 155°W was from Idaho and entered the ocean via the Columbia River. The fish originating from British Columbia tended to be caught farthest to the north, between 49°N and 55°N in the Gulf of Alaska.

Discussion

The fresh water and ocean ages of steelhead caught by the Oshoro-Maru were estimated from scales by the Fishery Agency of Japan and are published in the Data Record of Oceanographic Observations and Exploratory Fishing, Faculty of Fisheries, Hokkaido University⁸⁻¹¹). This allows comparison of ages estimated from scales with those of marked steelhead. Seven of the coded wire tagged steelhead were classified as age 2.1 from scales (two fresh water annuli). All of these fish were actually age 1.1, having spent one rather than two years in fresh water. Five fish were classified as age - .2 (two years in the ocean) from scales and all of these were caught after residing two years in the ocean. One fish was classified as - .0, and it

Table 3. Summary of release and recapture data for steelhead trout containing CWT's

Tag/Release data						
	Tag code	Brood Year		Release site	Release Mo & Yr	Agency
1982	05-07-37	80 W		Elwha Rive	04-81	WDF
	10-21-61	79 S		No. Fk. Clearwater R.	04-80	IDFC
	12-18-24	79 D		Robertson Creek	05-80	BCFW
1983	12-17-53	82 D		Somass River	04-83	BCFW
1984	12-17-53	82 D		Somass River	04-83	BCFW
	12-17-53	82 D		Somass River	04-83	BCFW
	12-17-53	82 D		Somass River	04-83	BCFW
	12-19-26	82		Nicomekl River	04-83	BCFW
	12-19-41	82		Nanaimo River	06-83	BCFW
	12-20-17	82		Cowichan River	06-83	BCFW
	12-20-27	82		Somass River	04-83	BCFW
	62-16-39	82 W		Stillaguamish R.	05-83	WDF
1985	05-13-35	83 S		Clearwater R.	05-84	IDFG
	05-14-61	83 W		Hoh River	05-84	FWS
	05-14-61	83 W		Hoh River	05-84	FWS
	10-27-46	83 S		Pahsimeroi R.	04-84	IDFG
	12-17-53	82 D		Somass River	04-83	BCFW
	12-17-53	82 D		Somass River	04-83	BCFW
	12-19-45	82 D		Somass River	04-83	BCFW
	12-21-14	83 F		Somass River	04-84	BCFW
	12-21-17	83 S		Somass River	04-84	BCFW
	21-16-15	83 W		Hoh River	05-84	HOH

* All dates are ships local mean time when gillnets were hauled
 S : summer run IDFG : Idaho Department of Fish and Game
 W : winter run FWS : U.S. Fish and Wildlife Service

These data are summarized by the Pacific Marine Fisheries Commission²⁾ and reported by Thrower and Fowler⁷⁾.

was caught three months after release. Therefore the scales appeared to provide overestimates of the fresh water age but correct ocean ages of these steelhead.

This problem of determining fresh water ages from scales was also apparent from other adipose clipped fish. Of the total of 35 fish with missing adipose fins whose fresh water age was determined from scales, 23 (66%) were classified as age 2.-, 6 as age 3.- and only 6 as age 1.-. The fact that nearly all steelhead with missing adipose fins are released after only one year in fresh water (age 1.-), suggests that a problem may exist in estimation of fresh water ages of ocean caught steelhead from scales.

In our previous paper¹⁾, we concluded that the majority of steelhead caught in 1980 and 1981 by the Oshoro-Maruru spent more than one year in fresh water based on the published age estimates and were therefore mostly wild fish which reside longer in fresh water than hatchery fish¹²⁾. We acknowledge that this previous conclusion is wrong. We now believe that a large proportion of the steelhead caught by the

PEARCY & MASUDA: Tagged steelhead trout collected by the Oshoro-Maru

collected on cruises of the Oshoro-Maru in the North Pacific Ocean, 1982-1985.

Capture data					
Date*	Location		FL(mm)	Wt(g)	Sex
	Lat. (N)	Long. (W)			
June 17	43-54	179-56	572	2280	M
June 17	43-54	179-56	778	5200	F
July 22	55-00	143-00	740	4550	M
July 04	55-00	147-30	270	180	F
July 17	54-00	155-00	602	2030	F
July 18	52-59	155-00	586	2240	F
July 18	52-59	155-00	549	1550	M
July 22	49-00	154-59	625	2860	F
July 20	51-00	154-59	586	1950	M
July 18	52-59	155-00	532	1510	M
July 18	52-59	155-00	574	1940	F
July 20	51-00	154-59	503	1540	M
June 15	41-00	180-00	632	2540	M
July 10	49-00	155-00	598	2150	M
July 10	49-00	155-00	599	1970	M
July 12	47-00	155-00	598	2880	M
July 09	50-00	155-00	690	3900	F
July 09	50-00	155-00	685	3000	M
July 10	49-00	155-00	652	3000	F
July 08	51-00	155-00	562	1760	F
July 10	49-00	155-00	594	1940	F
July 09	50-00	155-00	540	1900	F

F : fall run BCFW : British Columbia Fish and Wildlife
D : wild HOH : Hoh Indian Tribe
 WDF : Washington Department of Fisheries

Dahlberg³⁾, Wertheimer and Dahlberg^{4,5)}, Dahlberg and Fowler⁶⁾, and Dahlberg,

Oshoro-Maru in 1980-1985 originated from hatcheries in North America.

This conclusion is reinforced by the large number (59) and high proportion of adipose clipped fish recovered in 1985. Many hatchery-reared steelhead from North America are marked as juveniles by removal of one or more fins. The increased occurrence of steelhead with missing adipose fins but without CWT's in 1985 compared to 1982, 1983 and 1984 is undoubtedly related to the removal of adipose fins from large numbers of steelhead smolts to distinguish hatchery from wild steelhead starting in 1984. For California, Oregon, Washington, British Columbia and Alaska the total numbers of adipose clipped fish without CWT's increased markedly after 1983, whereas the number with adipose clips and CWT's remained fairly constant²⁾. The large numbers of steelhead smolts released with adipose clips but no CWT's in 1984 explain the high incidence of mainly age 1.1 hatchery steelhead with missing adipose fins caught by the Oshoro-Maru in 1985.

Acknowledgements

We are grateful to the crew of the Oshoro-Maru for their dedicated efforts to recognize and collect data on marked fish. We also thank James Norton, Oregon Department of Fish and Wildlife, for reading CWT's Dr. Kenneth Johnson, Pacific Marine Fisheries Commission, for summarizing data on the numbers of adipose clipped and coded wire tagged steelhead, and Colin Harris, University of Washington, for his helpful interest in this research. This research was supported by the Northwest and Alaska Fisheries Center of the National Marine Fisheries Service and the Oregon State University Sea Grant College Program.

References

- 1) Pearcy, W.G. and Masuda, K. (1982). Tagged steelhead trout (*Salmo gairdneri*) collected in the North Pacific by the Oshoro-Maru, 1980-1981. *Bull. Fac. Fish. Hokkaido Univ.* 33(4): 249-254.
- 2) Pacific Marine Fisheries Commission. (1986). Pacific salmonid coded wire tag releases through 1985. Regional Mark Processing Center, 176 p.
- 3) Dahlberg, M.L. (1982). Report of incidence of coded-wire-tagged salmonids in catches of foreign commercial and research vessels operating in the North Pacific Ocean and Bering Sea 1980-1982. Document submitted to annual meeting of the International North Pacific Fisheries Commission, Tokyo, Japan, November 1982. 11 p. Auke Bay Laboratory.
- 4) Wertheimer, A.C. and Dahlberg, M.L. (1983). Report of incidence of coded-wire-tagged salmonids in catches of foreign commercial and research vessels operating in the North Pacific Ocean and Bering Sea during 1982-1983. Document submitted to annual meeting of the International North Pacific Fisheries Commission, Anchorage, Alaska, November 1983. 14 p. Auke Bay Laboratory.
- 5) Wertheimer, A.C. and Dahlberg, M.L. (1984). Report of the incidence of coded-wire-tagged salmonids in catches of foreign commercial and research vessels operating in the North Pacific Ocean and Bering Sea during 1983-1984. Document submitted to annual meeting of the International North Pacific Fisheries Commission, Vancouver, B.C., November 1984. 14 p. Auke Bay Laboratory.
- 6) Dahlberg, M.L. and Fowler, S. (1985). Report of the incidence of coded-wire-tagged salmonids in catches of foreign commercial and research vessels operating in the North Pacific Ocean and Bering Sea during 1984-1985. Document submitted to annual meeting of the International North Pacific Fisheries Commission, Tokyo, Japan, November 1985. 16 p. Auke Bay Laboratory.
- 7) Dahlberg, M.L., Thrower, F.P. and Fowler, S. (1986). Incidence of coded-wire-tagged salmonids in catches of foreign commercial and research vessels operating in the North Pacific Ocean and Bering Sea in 1985-1986. Document submitted to annual meeting of the International North Pacific Fisheries Commission, Anchorage, Alaska, November 1986. 26 p. Auke Bay Laboratory.
- 8) Faculty of Fisheries, Hokkaido University. (1983). *Data Rec. Oceanogr. Obs. Expl. Fish.* No. 26, 78-118.
- 9) Faculty of Fisheries, Hokkaido University. (1984). *Data Rec. Oceanogr. Obs. Expl. Fish.* No. 27, 65-104.
- 10) Faculty of Fisheries, Hokkaido University. (1985). *Data Rec. Oceanogr. Obs. Expl. Fish.* No. 28, 66-106.
- 11) Faculty of Fisheries, Hokkaido University. (1986). *Data Rec. Oceanogr. Obs. Expl. Fish.* No. 29, 72-116.
- 12) Withler, I.L. (1986). Variability in life history of characteristics of steelhead trout (*Salmo gairdneri*) along the Pacific coast of North America. *J. Fish. Res. Bd. Canada* 23: 365-392.