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**Recoveries of High Seas Tags and Tag Releases from
High Seas Research Vessel Surveys in 2020**

by

Working Group on Salmon Marking (WGSM),
Committee on Scientific Research and Statistics (CSRS)

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Abstract

In late July 2020, tagging operations were conducted in the central Bering Sea by the Japanese R/V *Hokko maru*, and 18 chum salmon were released with FAJ/NPAFC disk tags and archival tags (ARCGEO-9TS, LAT2910, or DST-magnetic tags). Furthermore, 25 sockeye, seven chum, and one coho salmon were tagged with FAJ/NPAFC disk tags and released into the central Bering Sea. Other tagging experiments were conducted by US scientists, in which 40 Chinook salmon were tagged with PSATs and released near Chignik Bay on the Alaska Peninsula ($n = 20$) in August 2020 and near Kodiak Island, Alaska in October 2020. Although no recovery of disk tag and archival tags released in the summer Bering Sea was reported in 2020, archived tag data were retrieved via the Argos satellite system from 35 PSATs during September 2020 to February 2021 that were attached to Chinook salmon.

Introduction

The Working Group on Salmon Tagging (WGST) was established by the Committee on Scientific Research and Statistics (CSRS) at the 15th Annual Meeting in 2007 to manage the INPFC-NPAFC tagging database and to coordinate high seas tagging activities of the Parties. The WGST was taken over by the Working Group on Salmon Marking (WGSM) in 2016. This document summarizes releases of tagged high-seas salmon in 2020 and reports recoveries of high-seas tags by the Parties, covering information updated since the previous report (WGSM 2020).

Releases of High Seas Tags in 2020

The Japanese R/V *Hokko maru* conducted trawl and hook-and-line operations at 17 stations in the Bering Sea in the summer of 2020 (Honda et al. 2021). During the research cruise, 18 chum salmon (*Oncorhynchus keta*) were tagged with two (Fisheries Agency of Japan, FAJ and NPAFC) disk tags and archival tags, and released into the central Bering Sea (Table 1). The archival tags attached to chum salmon were ARCGEO-9TS ($n=5$), LAT2910 ($n = 10$), and DST-magnetic ($n = 3$). The ARCGEO-9TS (manufactured by Lotek, Newmarket, Canada, size, 9×38 mm; weight in air, 5.1 g) and LAT2910 (manufactured by Lotek, size, 7.8×26 mm; weight in air, 2.3 g) tags record seawater temperature, depth, and ambient light intensity. The DST magnetic tag (manufactured by Star-Oddi, Gardabaer, Iceland, size, 15×46 mm; weight in air, 19 g; number of records, 4,000 per sensor) records seawater temperature, depth, earth's magnetic field strength (in three directions), and tilt (in three directions).

Relative magnetic field vectors are calculated from the magnetic field strength measurements, which can be put into models to find longitude and latitude of the fish. It is also a useful tool for recording compass directions. In addition, 25 sockeye salmon (*O. nerka*), seven chum salmon, and one coho salmon (*O. kisutch*) were tagged with FAJ and NPAFC disk tags and released into the central Bering Sea (Table 1).

In addition, US scientists (University of Alaska Fairbanks) conducted tagging experiments in Alaska, near Chignik Bay (56°11'35"N–56°17'33"N, 158°11'44"W–158°17'33"W) on the Alaska Peninsula and near Kodiak Island (57°50'04"N–57°57'01"N, 152°12'55"W–152°56'49"W). Twenty Chinook salmon (*O. tshawytscha*) near Chignik Bay caught by hook-and-line were tagged and released with pop-up satellite archival tags (PSATs) in August 2020, and an additional 20 Chinook salmon near Kodiak Island were tagged and released with PSATs in October 2020 (Table 1). The PSAT (model miniPAT, manufactured by Wildlife Computer, Redmond, Washington) weighed 60 g in air, had overall length of 30.5 cm (maximum diameter 3.8 cm, tag length 12 cm) and was slightly positively buoyant. The tags contained a lithium composite battery, temperature gauge, pressure sensor, light sensor, and a satellite transmitter. The PSATs recorded seawater temperature, depth, and ambient light level data every ten seconds. On a pre-programmed date, the PSATs automatically released from the fish and summaries of recorded data were transmitted through the Argos satellite system. In addition, the tags were programmed to release and transmit data if they were at a constant depth (± 5 m) for more than 3 days.

Recovery of High Seas Tags in 2020–2021

No recovery of disk tag and archival tags released in the summer Bering Sea was reported in 2020. On the other hand, archival tag data were retrieved via data communication through the Argos satellite system from 35 PSATs from September 2020 to February 2021 that were attached to Chinook salmon (Table 2).

References

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Table 1. Release of high-seas tagged salmon in 2020. DTM: DST-magnetic, depth, temperature, compass, and tilt (3D) record tag; DTL-ARC or DTL-LAT: ARCGEO-9TS or LAT2910, depth, temperature, and ambient light intensity record tag; PSAT, pop-up satellite archival tag; G, sampling gear; HL, hook and line; Sp., species; SS, sockeye salmon; CM, chum salmon; CO, coho salmon; CH, Chinook salmon; FL, fork length (mm). Age designation is the European method, where the first number is the number of freshwater annuli and the second number is the number of ocean annuli. x, unreadable.

No.	Japan tag #	NPAFC tag #	Archival tag		Date	Latitude	Longitude	G	Sp.	FL (mm)	Age
			#	Type							
1	E0604	NA6099			26 Jul.	58°30'N	180°00'	HL	SS	336	1.1
2	E0625	NA6078			26 Jul.	58°30'N	180°00'	HL	SS	372	2.1
3	E0645	NA6058			26 Jul.	58°30'N	180°00'	HL	SS	466	2.2
4	E0647	NA6056			26 Jul.	58°30'N	180°00'	HL	SS	408	1.2
5	E0643	NA6060			26 Jul.	58°30'N	180°00'	HL	SS	336	1.1
6	E0651	NA5991			26 Jul.	58°30'N	180°00'	HL	SS	418	1.1
7	E0657	NA5985			26 Jul.	58°30'N	180°00'	HL	SS	440	1.2
8	E0664	NA5978			26 Jul.	58°30'N	180°00'	HL	SS	450	2.1
9	E0669	NA5973			26 Jul.	58°30'N	180°00'	HL	CM	356	0.1
10	E0672	NA5970			26 Jul.	58°30'N	180°00'	HL	SS	352	1.1
11	E0655	NA5987			26 Jul.	58°30'N	180°00'	HL	CM	360	0.1
12	E0666	NA5976			26 Jul.	58°30'N	180°00'	HL	SS	456	1.2
13	E0660	NA5982			26 Jul.	58°30'N	180°00'	HL	CM	368	0.1
14	E0670	NA5972	L01738	DTL-ARC	26 Jul.	58°30'N	180°00'	HL	CM	422	0.2
15	E0656	NA5986			26 Jul.	58°30'N	180°00'	HL	SS	386	2.1
16	E0661	NA5981			26 Jul.	58°30'N	180°00'	HL	SS	454	0.2
17	E0668	NA5974	L01735	DTL-ARC	26 Jul.	58°30'N	180°00'	HL	CM	438	0.2
18	E0676	NA5966			26 Jul.	58°30'N	180°00'	HL	SS	436	1.2
19	E0667	NA5975	L02152	DTL-ARC	26 Jul.	58°30'N	180°00'	HL	CM	374	0.1
20	E0663	NA5979			26 Jul.	58°30'N	180°00'	HL	CM	368	0.1
21	E1575	NA6169			27 Jul.	58°00'N	175°00'W	HL	CM	350	0.1
22	E1573	NA6166			27 Jul.	58°00'N	175°00'W	HL	SS	304	1.1
23	E1577	NA6170	L02184	DTL-ARC	27 Jul.	58°00'N	175°00'W	HL	CM	448	0.2
24	E0646	NA6057	J1119	DTM	27 Jul.	57°00'N	175°00'W	HL	CM	504	0.2
25	E0648	NA6055			27 Jul.	57°00'N	175°00'W	HL	SS	438	0.2
26	E0639	NA6064	L02151	DTL-ARC	27 Jul.	57°00'N	175°00'W	HL	CM	406	0.2
27	E0612	NA6091			27 Jul.	57°00'N	175°00'W	HL	CM	415	0.2
28	E0638	NA6065	7206	DTL-LAT	27 Jul.	57°00'N	175°00'W	HL	CM	432	0.3
29	E0610	NA6093	7283	DTL-LAT	27 Jul.	57°00'N	175°00'W	HL	CM	406	0.2
30	E0627	NA6076			27 Jul.	57°00'N	175°00'W	HL	CM	480	0.2
31	E1563	NA6156	7186	DTL-LAT	28 Jul.	56°00'N	175°00'W	HL	CM	440	0.2
32	E1572	NA6165	7286	DTL-LAT	28 Jul.	56°00'N	175°00'W	HL	CM	423	0.2
33	E1564	NA6157	7171	DTL-LAT	28 Jul.	56°00'N	175°00'W	HL	CM	452	0.2
34	E1556	NA6190	7267	DTL-LAT	28 Jul.	56°00'N	175°00'W	HL	CM	500	0.3
35	E1590	NA6179	J1220	DTM	28 Jul.	55°00'N	175°00'W	HL	CM	522	0.3
36	E1599	NA6180	7208	DTL-LAT	28 Jul.	55°00'N	175°00'W	HL	CM	420	0.2
37	E1571	NA6164			29 Jul.	54°00'N	175°00'W	HL	SS	458	1.2
38	E1582	NA6192			29 Jul.	54°00'N	175°00'W	HL	SS	357	1.1
39	E1562	NA6155			29 Jul.	54°00'N	175°00'W	HL	SS	433	1.2
40	E1559	NA6152			29 Jul.	54°00'N	175°00'W	HL	SS	397	X.1
41	E1569	NA6162			29 Jul.	54°00'N	175°00'W	HL	SS	407	0.2
42	E0602	NA6200			29 Jul.	54°00'N	175°00'W	HL	SS	413	0.2
43	E0618	NA6085			29 Jul.	54°00'N	175°00'W	HL	CO	445	1.1
44	E1584	NA6193			29 Jul.	54°00'N	175°00'W	HL	SS	491	2.2

Table 2. Continued.

No.	Japan tag #	NPAFC tag #	Archival tag		Date	Latitude	Longitude	G	Sp.	FL (mm)	Age
			#	Type							
45	E1553	NA6189	J1221	DTM	29 Jul.	54°00'N	175°00'W	HL	CM	519	0.3
46	E0636	NA6067	7294	DTL-LAT	29 Jul.	54°00'N	175°00'W	HL	CM	477	0.2
47	E0637	NA6066	7280	DTL-LAT	29 Jul.	54°00'N	175°00'W	HL	CM	442	0.2
48	E1578	NA6185			31 Jul.	53°00'N	175°00'E	HL	SS	494	2.2
49	E1579	NA6184			31 Jul.	53°00'N	175°00'E	HL	SS	491	2.2
50	E1593	NA6175			31 Jul.	53°00'N	175°00'E	HL	SS	518	1.2
51	E1596	NA6172	7296	DTL-LAT	31 Jul.	53°00'N	175°00'E	HL	CM	458	0.2
52			202588	PSAT	01 Aug.	56°13'41"N	158°11'44"W	HL	CH	740	
53			202591	PSAT	01 Aug.	56°14'35"N	158°17'29"W	HL	CH	650	
54			202593	PSAT	02 Aug.	56°14'44"N	158°17'21"W	HL	CH	650	
55			202594	PSAT	02 Aug.	56°17'02"N	158°12'01"W	HL	CH	920	
56			202600	PSAT	02 Aug.	56°14'43"N	158°17'23"W	HL	CH	830	
57			202604	PSAT	02 Aug.	56°14'42"N	158°17'24"W	HL	CH	880	
58			202585	PSAT	03 Aug.	56°14'38"N	158°17'30"W	HL	CH	670	
59			202589	PSAT	03 Aug.	56°14'37"N	158°17'29"W	HL	CH	670	
60			202592	PSAT	03 Aug.	56°14'36"N	158°17'30"W	HL	CH	750	
61			202596	PSAT	03 Aug.	56°17'33"N	158°11'56"W	HL	CH	730	
62			202597	PSAT	03 Aug.	56°14'35"N	158°17'44"W	HL	CH	720	
63			202601	PSAT	03 Aug.	56°11'35"N	158°16'49"W	HL	CH	620	
64			202602	PSAT	03 Aug.	56°14'35"N	158°17'33"W	HL	CH	700	
65			202586	PSAT	04 Aug.	56°14'44"N	158°17'23"W	HL	CH	700	
66			202587	PSAT	04 Aug.	56°14'39"N	158°17'28"W	HL	CH	810	
67			202590	PSAT	04 Aug.	56°14'42"N	158°17'23"W	HL	CH	700	
68			202595	PSAT	04 Aug.	56°14'37"N	158°17'32"W	HL	CH	690	
69			202598	PSAT	04 Aug.	56°14'40"N	158°17'27"W	HL	CH	1010	
70			202599	PSAT	04 Aug.	56°14'42"N	158°17'25"W	HL	CH	690	
71			202603	PSAT	04 Aug.	56°14'37"N	158°17'28"W	HL	CH	710	
72			205399	PSAT	05 Oct.	57°50'16"N	152°19'14"W	HL	CH	680	
73			205415	PSAT	05 Oct.	57°50'09"N	152°19'28"W	HL	CH	810	
74			205398	PSAT	06 Oct.	57°51'15"N	152°15'59"W	HL	CH	670	
75			205401	PSAT	06 Oct.	57°50'53"N	152°16'21"W	HL	CH	680	
76			205408	PSAT	06 Oct.	57°51'09"N	152°16'17"W	HL	CH	770	
77			205412	PSAT	06 Oct.	57°51'10"N	152°16'16"W	HL	CH	690	
78			205413	PSAT	06 Oct.	57°51'10"N	152°16'22"W	HL	CH	750	
79			205417	PSAT	06 Oct.	57°51'09"N	152°16'10"W	HL	CH	640	
80			205409	PSAT	07 Oct.	57°50'04"N	152°15'17"W	HL	CH	770	
81			205416	PSAT	07 Oct.	57°51'04"N	152°16'10"W	HL	CH	710	
82			205400	PSAT	08 Oct.	57°51'28"N	152°16'20"W	HL	CH	740	
83			205403	PSAT	08 Oct.	57°51'36"N	152°16'23"W	HL	CH	660	
84			205402	PSAT	09 Oct.	57°50'08"N	152°15'13"W	HL	CH	760	
85			205410	PSAT	09 Oct.	57°50'25"N	152°12'55"W	HL	CH	690	
86			205404	PSAT	11 Oct.	57°56'53"N	152°55'46"W	HL	CH	690	
87			205406	PSAT	11 Oct.	57°56'58"N	152°55'50"W	HL	CH	660	
88			205407	PSAT	11 Oct.	57°56'58"N	152°56'49"W	HL	CH	710	
89			205405	PSAT	13 Oct.	57°57'01"N	152°56'30"W	HL	CH	740	
90			205414	PSAT	13 Oct.	57°56'38"N	152°55'27"W	HL	CH	660	
91			205411	PSAT	15 Oct.	57°51'10"N	152°16'18"W	HL	CH	850	

Table 2. Recoveries of high-seas tagged salmon during fall 2020 to winter 2021. DS tag, data storage tag; PSAT, pop-up satellite archival tag; FL, fork length (mm).

No.	Ds tag		Release				Recoveries			
	#	Type	Date	Latitude	Longitude	Species	FL (mm)	Date	Latitude	Longitude
1	202592	PSAT	03 Aug. 2020	56°14'36"N	158°17'30"W	Chinook	750	06 Sep. 2020	57°06'58"N	136°10'31"W
2	202603	PSAT	04 Aug. 2020	56°14'37"N	158°17'28"W	Chinook	710	07 Sep. 2020	54°40'46"N	163°22'31"W
3	202585	PSAT	03 Aug. 2020	56°14'38"N	158°17'30"W	Chinook	670	12 Sep. 2020	55°35'28"N	159°17'38"W
4	202593	PSAT	02 Aug. 2020	56°14'44"N	158°17'21"W	Chinook	650	13 Sep. 2020	56°34'00"N	157°38'54"W
5	202598	PSAT	04 Aug. 2020	56°14'40"N	158°17'27"W	Chinook	1010	23 Sep. 2020	53°50'26"N	130°40'46"W
6	202597	PSAT	03 Aug. 2020	56°14'35"N	158°17'44"W	Chinook	720	25 Sep. 2020	56°17'09"N	158°05'24"W
7	202602	PSAT	03 Aug. 2020	56°14'35"N	158°17'33"W	Chinook	700	04 Oct. 2020	55°42'27"N	158°28'28"W
8	202601	PSAT	03 Aug. 2020	56°11'35"N	158°16'49"W	Chinook	620	08 Oct. 2020	55°47'51"N	159°45'07"W
9	202599	PSAT	04 Aug. 2020	56°14'42"N	158°17'25"W	Chinook	690	11 Oct. 2020	55°50'15"N	158°13'51"W
10	202589	PSAT	03 Aug. 2020	56°14'37"N	158°17'29"W	Chinook	670	12 Oct. 2020	56°09'20"N	158°29'40"W
11	202600	PSAT	02 Aug. 2020	56°14'43"N	158°17'23"W	Chinook	830	17 Oct. 2020	51°34'35"N	132°45'26"W
12	205402	PSAT	09 Oct. 2020	57°50'08"N	152°15'13"W	Chinook	760	18 Oct. 2020	58°08'50"N	151°58'54"W
13	205412	PSAT	06 Oct. 2020	57°51'10"N	152°16'16"W	Chinook	690	24 Oct. 2020	58°09'10"N	151°08'30"W
14	205399	PSAT	05 Oct. 2020	57°50'16"N	152°19'14"W	Chinook	680	26 Oct. 2020	58°36'55"N	151°10'13"W
15	205416	PSAT	07 Oct. 2020	57°51'04"N	152°16'10"W	Chinook	710	27 Oct. 2020	59°29'04"N	151°39'03"W
16	202586	PSAT	04 Aug. 2020	56°14'44"N	158°17'23"W	Chinook	700	27 Oct. 2020	55°02'58"N	160°09'33"W
17	202591	PSAT	01 Aug. 2020	56°14'35"N	158°17'29"W	Chinook	650	27 Oct. 2020	56°54'04"N	154°39'22"W
18	205401	PSAT	06 Oct. 2020	57°50'53"N	152°16'21"W	Chinook	680	30 Oct. 2020	57°54'20"N	152°11'16"W
19	205409	PSAT	07 Oct. 2020	57°50'04"N	152°15'17"W	Chinook	770	31 Oct. 2020	59°02'26"N	153°39'21"W
20	205408	PSAT	06 Oct. 2020	57°51'09"N	152°16'17"W	Chinook	770	08 Nov. 2020	57°49'35"N	150°08'42"W
21	205417	PSAT	06 Oct. 2020	57°51'09"N	152°16'10"W	Chinook	640	12 Nov. 2020	58°43'58"N	149°48'57"W
22	205398	PSAT	06 Oct. 2020	57°51'15"N	152°15'59"W	Chinook	670	14 Nov. 2020	58°15'49"N	151°48'53"W
23	202596	PSAT	03 Aug. 2020	56°17'33"N	158°11'56"W	Chinook	730	22 Nov. 2020	57°41'53"N	154°03'49"W
24	205400	PSAT	08 Oct. 2020	57°51'28"N	152°16'20"W	Chinook	740	26 Nov. 2020	58°53'34"N	151°34'11"W
25	202588	PSAT	01 Aug. 2020	56°13'41"N	158°11'44"W	Chinook	740	27 Nov. 2020	54°34'43"N	161°16'44"W
26	202587	PSAT	04 Aug. 2020	56°14'39"N	158°17'28"W	Chinook	810	05 Dec. 2020	55°39'46"N	158°47'29"W
27	205403	PSAT	08 Oct. 2020	57°51'36"N	152°16'23"W	Chinook	660	08 Dec. 2020	57°50'25"N	154°37'04"W
28	205410	PSAT	09 Oct. 2020	57°50'25"N	152°12'55"W	Chinook	690	10 Dec. 2020	59°43'44"N	149°55'25"W
29	205411	PSAT	15 Oct. 2020	57°51'10"N	152°16'18"W	Chinook	850	12 Dec. 2020	58°22'10"N	148°55'44"W
30	205406	PSAT	11 Oct. 2020	57°56'58"N	152°55'50"W	Chinook	660	13 Dec. 2020	55°15'23"N	158°51'44"W
31	205407	PSAT	11 Oct. 2020	57°56'58"N	152°56'49"W	Chinook	710	25 Dec. 2020	59°43'29"N	147°34'54"W
32	205404	PSAT	11 Oct. 2020	57°56'53"N	152°55'46"W	Chinook	690	02 Jan. 2021	56°12'30"N	156°46'50"W
33	205413	PSAT	06 Oct. 2020	57°51'10"N	152°16'22"W	Chinook	750	09 Jan. 2021	59°27'58"N	149°35'06"W
34	202594	PSAT	02 Aug. 2020	56°17'02"N	158°12'01"W	Chinook	920	23 Jan. 2021	55°56'16"N	158°42'35"W
35	202590	PSAT	04 Aug. 2020	56°14'42"N	158°17'23"W	Chinook	700	08 Feb. 2021	53°21'27"N	167°44'07"W