Special Publication No. 20-10

Chum Salmon Stock Status and Escapement Goals in Southeast Alaska through 2019

by

Andrew W. Piston

and

Steven C. Heinl

December 2020

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

however, in many cases these fish also migrate through mixed stock fisheries where the stock composition may not be known.

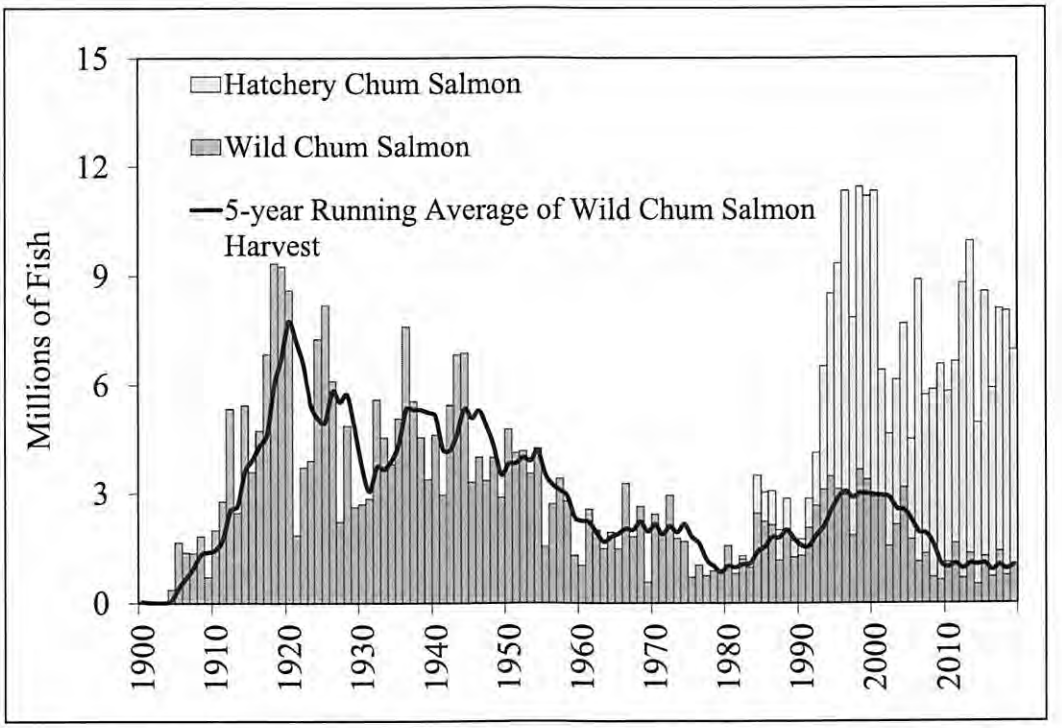

Figure 1.–Annual common property harvest of chum salmon in Southeast Alaska from 1900 to 2019 showing estimated harvests of both hatchery-produced and wild chum salmon. (Data prior to 1960 are from Byerly et al. 1999).

The Alaska Department of Fish and Game (ADF&G) developed a standardized program to estimate an annual index of spawning chum salmon abundance based primarily on aerial surveys (Heinl et al. 2004; Heinl 2005; Eggers and Heinl 2008). The trends in these indices provide a meaningful indicator of trends in the relative abundance of spawning chum salmon in Southeast Alaska. These indices also formed the basis of the first escapement goals for chum salmon in Southeast Alaska, which were established in 2009 (Eggers and Heinl 2008) and subsequently modified in 2012, 2015, and 2017 (Piston and Heinl 2011, 2014, 2017). Lower-bound sustainable escapement goals were developed for three broad regional aggregates of streams for summer-run chum salmon stocks, and sustainable escapement goal ranges were established for five additional fall-run chum salmon stocks.

In 2000 and 2001, the Alaska Board of Fisheries adopted the *Policy for the Management of Sustainable Salmon Fisheries* (5AAC 39.222) and the *Policy for Statewide Salmon Escapement Goals* (5 AAC 39.223) into state regulation to ensure that the state's salmon stocks would be conserved, managed, and developed using the sustained yield principle. These policies require ADF&G to report on salmon stock status and escapement goals to the board on a regular basis, document and review existing salmon escapement goals, establish goals for stocks for which escapement can be reliably measured, and prepare scientific analyses with supporting data when goals are created or modified. In order to meet requirements of these policies, Heinl et al. (2004) and Heinl (2005) produced ADF&G's first reports on stock status of chum salmon in Southeast

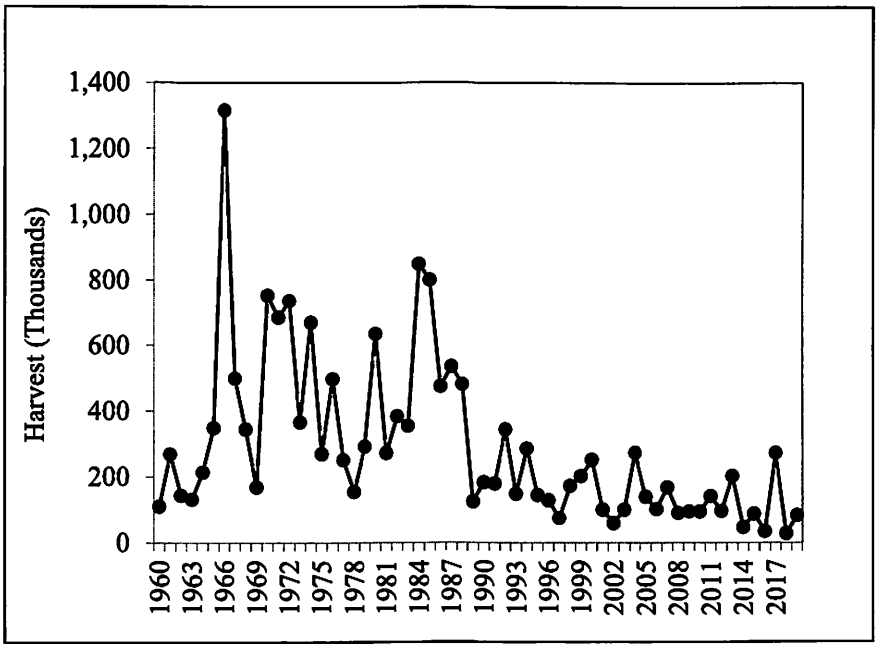

Figure 10.–Harvest of fall-run chum salmon in the Northern Southeast Inside Subregion, 1960–2019. Chum salmon harvested in statistical week 34 (average midweek date 19 August) and later are considered fall-run fish.

NORTHERN SOUTHEAST OUTSIDE SUMMER-RUN CHUM SALMON

The Northern Southeast Outside Subregion includes primarily summer-run chum salmon index streams on the outside waters of Chichagof and Baranof islands in northern Southeast Alaska. Peak escapement survey data were available for nine index streams since 1982 (Appendix A3). The current lower-bound sustainable escapement goal is 25,000 chum salmon counted on peak surveys to nine index streams combined (Piston and Heinl 2014). Escapement indices were above goal in three of the past five years (Figure 11). Total chum salmon harvests were relatively low until the onset of hatchery runs in the early 1980s and greatly increased since the 1990s due to increased hatchery production (Figure 11; Appendix B3 and B4).

In 2018 and 2019, the commercial chum salmon harvest in the Northern Southeast Outside Subregion increased substantially due to very large returns of hatchery chum salmon to the new Crawfish Inlet release site (Figure 6). Total runs were estimated to be 3.5 million fish in 2018 (Stopha 2019) and 2.1 million in 2019 (Wilson 2020). The total subregion harvest of 5.1 million chum salmon in 2018 was the largest since statehood (Figure 11; Appendix B3), and hatchery fish from the Crawfish Inlet release accounted for approximately 66% of that harvest. The chum salmon harvest in Crawfish Inlet and adjacent West Crawfish Inlet in 2018 and 2019 accounted for approximately 29% and 21% of the total Southeast Alaska chum salmon harvest, respectively.

Large numbers of Crawfish Inlet hatchery chum salmon entered West Crawfish Inlet in 2018 and 2019 rather than returning directly to the release site in Crawfish Inlet, which raised concerns about straying of hatchery fish into nearby wild stock streams. Otolith sampling conducted at the West Crawfish NE Arm Head index stream prior to 2018 showed relatively low proportions of stray hatchery fish (maximum 4.2% in 2008; Piston and Heinl 2012), as did the Northern Southeast Outside Subregion index as a whole (<2%; Piston and Heinl 2012). In 2018, otolith samples

collected from carcasses at West Crawfish NE Arm Head (Figure 6) on 27 August, which would represent the timing of spawning for the wild stock, were 62% hatchery origin (Table 4). Additional samples were collected on 28 September after it was noticed that large numbers of chum salmon were still present in the stream and these were found to be 99% hatchery origin. In 2019, otolith sampling was expanded to include West Crawfish NE Arm Head, West Crawfish North Arm NE (non-index stream), and Whale Bay Great Arm Head, which is an index stream located approximately 60 km southeast of the Crawfish Inlet release site (Table 4). Otolith samples collected from carcasses at West Crawfish NE Arm Head on 27 August and 4 September 2019, which would represent the timing of spawning for the wild stock, were 8% and 94% hatchery origin, respectively. Samples collected at West Crawfish North Arm NE on 29 August and 5 September 2019 were 83% and 93% hatchery origin, respectively. Finally, samples collected at Whale Bay Great Arm Head on 19 August and 28 August 2019 were 0% and 62% hatchery origin, respectively.

Table 4.–Proportions of stray hatchery chum salmon from samples collected in select streams in the Northern Southeast Outside Subregion of Southeast Alaska in 2018 and 2019.

Year	ADF&G Stream Number	Stream Name	Sample Date	Otoliths Analyzed	Not Marked	Marked	% Marked
2018	113-32-005	West Crawfish NE Arm Head	8/27/2018	92	35	57	62%
2018	113-32-005	West Crawfish NE Arm Head	9/28/2018	87	1	86	99%
2019	113-32-005	West Crawfish NE Arm Head	8/27/2019	63	58	5	8%
2019	113-32-005	West Crawfish NE Arm Head	9/4/2019	95	6	89	94%
2019	113-32-004	West Crawfish North Arm NE	8/29/2019	95	16	79	83%
2019	113-32-004	West Crawfish North Arm NE	9/5/2019	96	7	89	93%
2019	113-22-015	Whale Bay Great Arm Head	8/19/2019	29	29	0	0%
2019	113-22-015	Whale Bay Great Arm Head	8/28/2019	69	26	43	62%

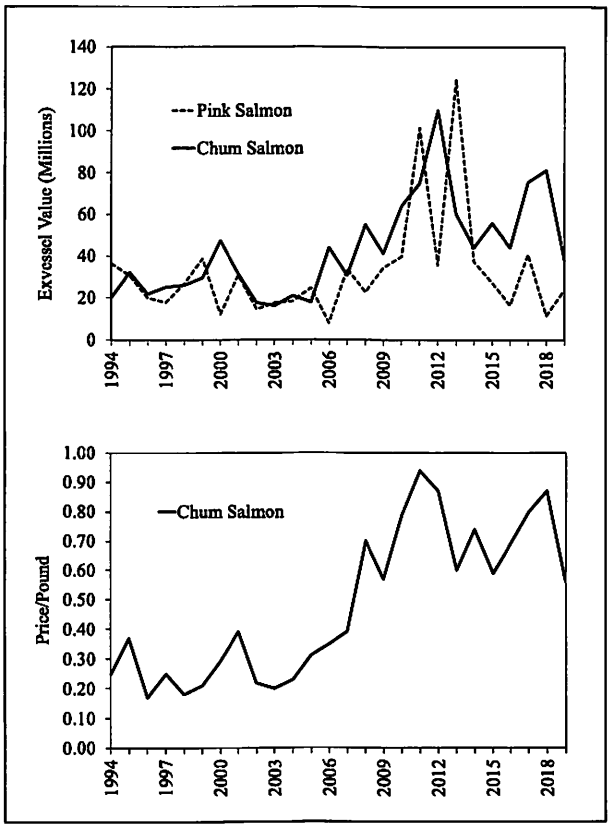

Figure 21.–Exvessel values (in dollars) of the pink and chum salmon harvest in Southeast Alaska (top), and average price per pound of chum salmon in Southeast Alaska (bottom), 1994–2019.

HATCHERY CHUM SALMON STRAYING

In 2018 and 2019, large numbers of hatchery chum salmon from the first returns to the new Crawfish Inlet release site entered adjacent West Crawfish Inlet, where they overlap in run timing with and vastly outnumber wild fish. Major increases of stray Crawfish Inlet hatchery fish in two of the nine Northern Southeast Outside Subregion index streams (West Crawfish NE Arm Head, Whale Bay Great Arm Head; Table 4; Figure 22) present challenges for monitoring wild stock escapements and assessing escapement goal performance as required by the sustainable salmon fisheries policy. Historically, peak survey counts in those two index streams accounted for an average 36% of the total subregion escapement index; thus, the overall proportion of stray hatchery fish in the subregion index has likely increased significantly. The high proportion of stray hatchery fish in Whale Bay Great Arm Head (Table 4), approximately 60 km from the Crawfish Inlet release site, indicates that additional sampling is required to determine the full extent of straying. This is particularly true for chum salmon index streams immediately north of Sitka Sound (e.g., Kalinin Cove Head; Figure 22) that have not been sampled previously for the presence of hatchery origin chum salmon. Given these changes, the department will need to consider how to best assess escapements in the Northern Southeast Outside Subregion. This could include removing chum salmon index streams from index, which would greatly reduce the geographic coverage, or reevaluate how wild chum salmon escapements in the subregion are monitored.

Although the hatchery chum salmon released at Crawfish Inlet (from Nakwasina River broodstock; Figure 22) have later run timing than wild stock chum salmon in West Crawfish Inlet and Whale

Bay, run timing overlaps, making it difficult to easily determine when a survey count could be used to represent wild fish. The high proportions of hatchery fish in otolith samples collected in late August and early September (Table 4) indicates that sometime in the first half of August the chum salmon composition transitions from primarily wild fish to a mix of hatchery and wild fish, and by late August or early September the composition appears to be primarily hatchery fish. Peak chum salmon surveys typically occur from late July to early September at the West Crawfish index stream (average 7 August) and from late July to mid-August at the Whale Bay index stream (average 5 August). Based on an assumed chum salmon stream life of approximately 8 to 11 days (Heinl et al. 2000; Piston and Heinl 2010a, 2010b; Piston and Brunette 2011), hatchery fish sampled as carcasses in late August and early September likely entered streams sometime in the second half of August and would have been present off the mouth of the creek or in the intertidal zone for at least a week prior to that, where they would potentially be counted during a normal peak survey. An estimated 20,000 chum salmon at the mouth of the West Crawfish index stream on 20 August 2019, probably composed almost entirely of hatchery fish, would have nearly met the lower bound escapement goal for the entire Northern Southeast Outside Subregion if it had been included in an index count.

No changes to releases at Crawfish Inlet have been recommended by the Southeast Regional Planning Team (AS 16.10.375) in response to high proportions of strays from the new release site in nearby wild stock index streams. Proposed actions to try to address the issue have primarily focused on increasing harvest opportunity in Crawfish and West Crawfish Inlets. In 2019, common property purse seine fisheries were conducted in West Crawfish Inlet beginning 25 August to harvest a significant number of chum salmon holding at the head of the inlet. The purse seine openings were intended to minimize potential straying and reduce loss in quality of harvested fish, and it was thought that the area of the openings would have minimal impact on wild stock salmon in the inlet. Approximately 707,000 chum salmon were harvested. An additional 243,000 chum salmon were harvested in hatchery cost recovery openings and in the common property troll fishery in West Crawfish Inlet.

Although the additional purse seine openings were conducted specifically to harvest hatchery chum salmon, otolith sampling and survey results indicate large numbers of hatchery chum salmon likely spawned or attempted to spawn during and after the spawning period of wild pink and chum salmon in the West Crawfish NE Arm Head wild stock index stream. The proportion of stray hatchery fish in West Crawfish NE Arm Head index stream was 94% in the 4 September 2019 sample and a total of 9,910 chum salmon were counted during the foot survey, including 410 fish in the intertidal section, 7,500 live chum salmon in the stream, and 2,000 carcasses (fish were also present off the mouth of the stream but numbers were not estimated). Taking into account the relatively short stream life of chum salmon (Heinl et al. 2000; Piston and Heinl 2010a, 2010b; Piston and Brunette 2011), the tendency of observers to undercount numbers of fish (Bevan 1961; Cousens et al. 1982; Symons and Waldichuk 1984; Dangel and Jones 1988; Bue et al. 1998; Jones et al. 1998), and the presence of uncounted fish off the mouth of the creek on 4 September, it is clear that in excess of 10,000 hatchery fish spawned or attempted to spawn in the wild stock index stream. Due to the overlap in run timing between wild and hatchery stocks, it would be difficult to harvest the majority of hatchery chum salmon before they enter the wild stock index stream in West Crawfish Inlet without earlier fishery openings that would potentially drastically increase harvest rates on wild chum salmon in West Crawfish Inlet.