

The Population of Chum Salmon (*Oncorhynchus keta*) in the Anadyr River Basin, Chukotka AO, Russia

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The Anadyr basin of Chukotka is the largest producer of chum salmon in the Russian Northeast Pacific coast (Korotaev et al. 2002). On average, the proportion of chum salmon catches in the Anadyr basin is 75.3% of the catches of all other Pacific salmon in Chukotka. This represents up to 12% of the biomass for the total annual catch of chum salmon in the Russian Far East (Fig. 1). In addition, the chum salmon fishery plays an important role in the traditional life of the native population in Chukotka.

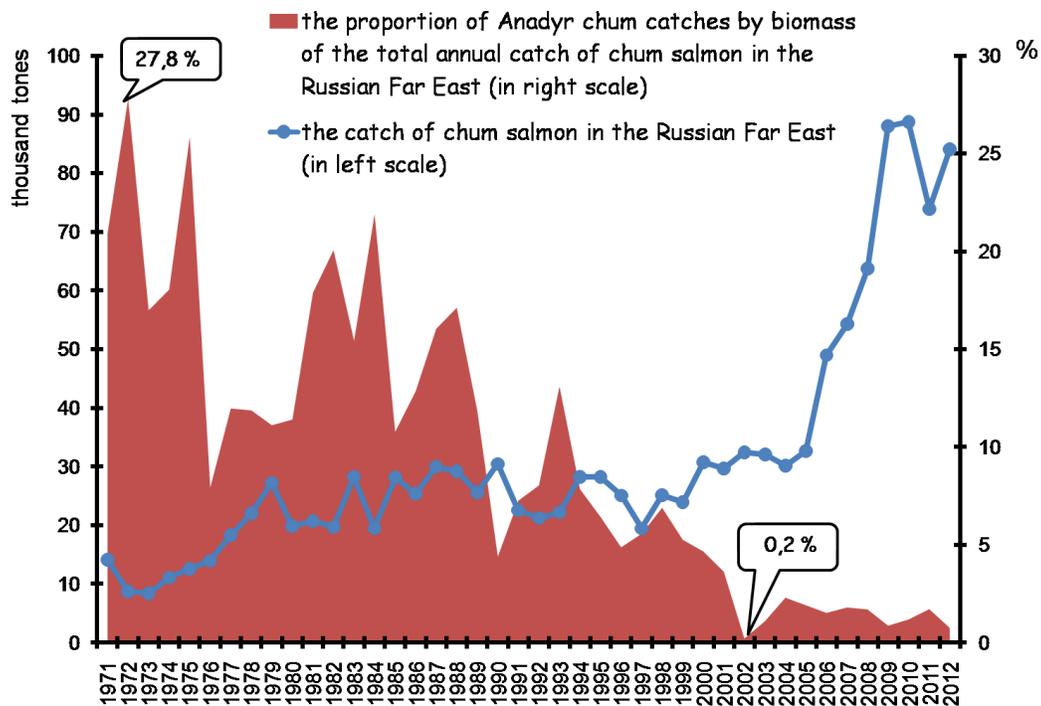


Fig. 1. Proportion of Anadyr basin chum salmon catches by biomass of the total annual catch of chum salmon in the Russian Far East (right y-axis) and the catch (thousand tones) of chum salmon in the Russian Far East (left y-axis), 1971-2012.

The annual monitoring of the Anadyr chum salmon stock includes recording of commercial and non-commercial catches and biological data sampling from adult migrants. The harvest of Anadyr chum salmon began about 100 years ago and has been ongoing since 1910 (Fig. 2). The data collected from monitoring programs are essential for accurate estimations of population size and quota limits for chum salmon. In the recent period, the low numbers of adult migrants was observed in 1968 (0.7 million), 1991 (0.7 million), and 2002 (0.8 million; Fig. 3). The maximum number chum salmon migrants to the Anadyr basin was observed in 1983 (7.3 million), and the annual average is 2.8 million fish (Chereshnev 2008).

The main chum salmon spawning grounds are concentrated in the middle and upper rivers of the Anadyr basin, principally the Anadyr, Velikaya, and Kanchalan rivers (Putivkin 1994). The quantity of chum salmon on spawning grounds fluctuates over a wide range from 0.234 to 2.81 million fish with an annual average (optimum) of 1.5-2.0 million fish. The number of smolts varies from 34 million in 1992 up to 495 million in 1990, and the average annual catch is 265 million fish (Putivkin 1999; Korotaev et al. 2002; Chereshnev 2008).

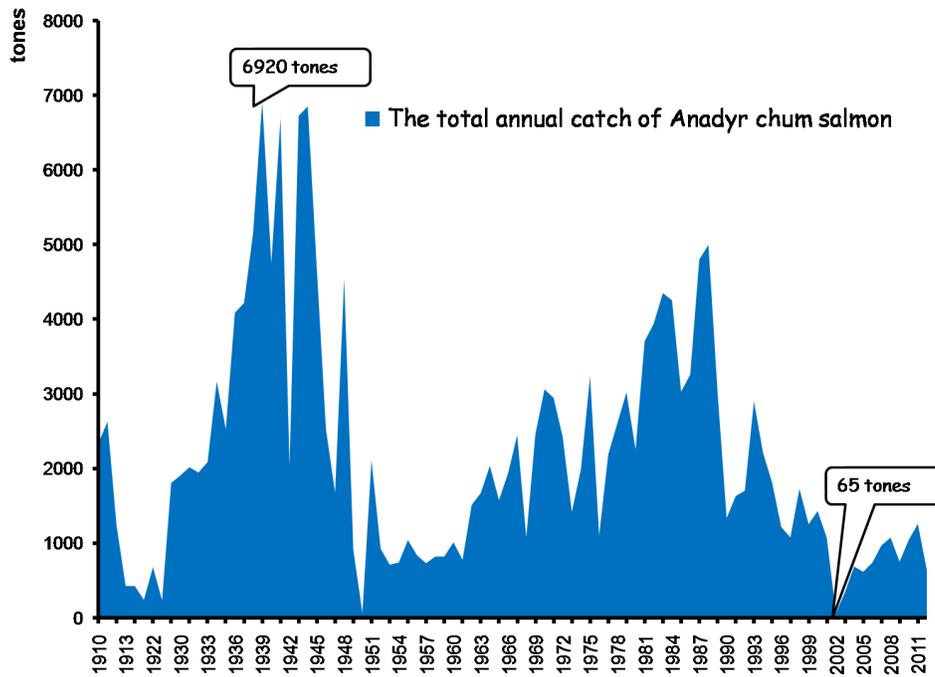


Fig. 2. The total annual catch (tonnes) of Anadyr basin chum salmon, 1910-2011.

Anadyr chum salmon reproduction occurs under extreme conditions for this species. The water level on the spawning grounds decreases to a minimum, causing the destruction of eggs by frost penetration. Juveniles develop in freshwater habitats at low temperatures for about 7-9 months and then migrate to the sea under ice during the April-June period. Inconsistencies in the time periods when fry leave the redds, the various periods of downstream migrations, variable length of the migration routes, and differences in the hydrological conditions among the rivers are the major causes of growth fluctuations of Anadyr chum juveniles both in freshwater and marine life stages (Shtundyk 1982; Korotaev 1997; Putivkin 1999; Korotaev et al. 2002; Chereshevnev 2008). Although smolts differ in length and weight during their migration down to the sea, their sizes become equalized after entering the marine environment for a period (Shuntov and Temnykh 2008).

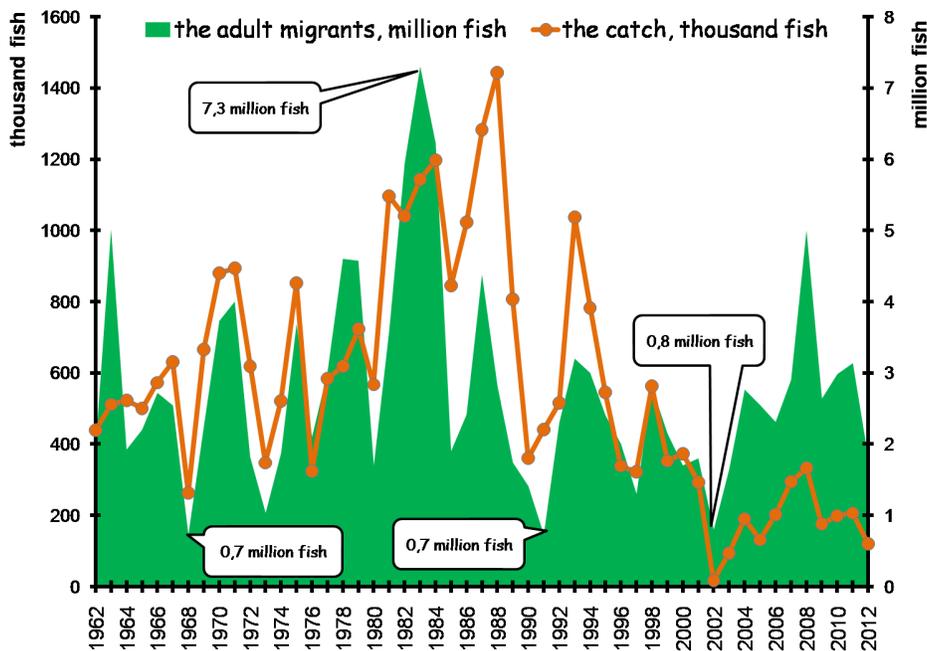


Fig. 3. Number of adult chum salmon migrants to the Anadyr basin (millions of fish; right y-axis) and the catch (thousands of fish; left y-axis), 1962-2012.

The oceanic feeding grounds are located south and southeast of the central part of Aleutian Island chain (Ostroumov 1967; Gritsenko 2002; Chereshnev 2008; Fig. 4). Implicitly, it is assumed there is a high level of food availability for chum salmon during the marine feeding period.

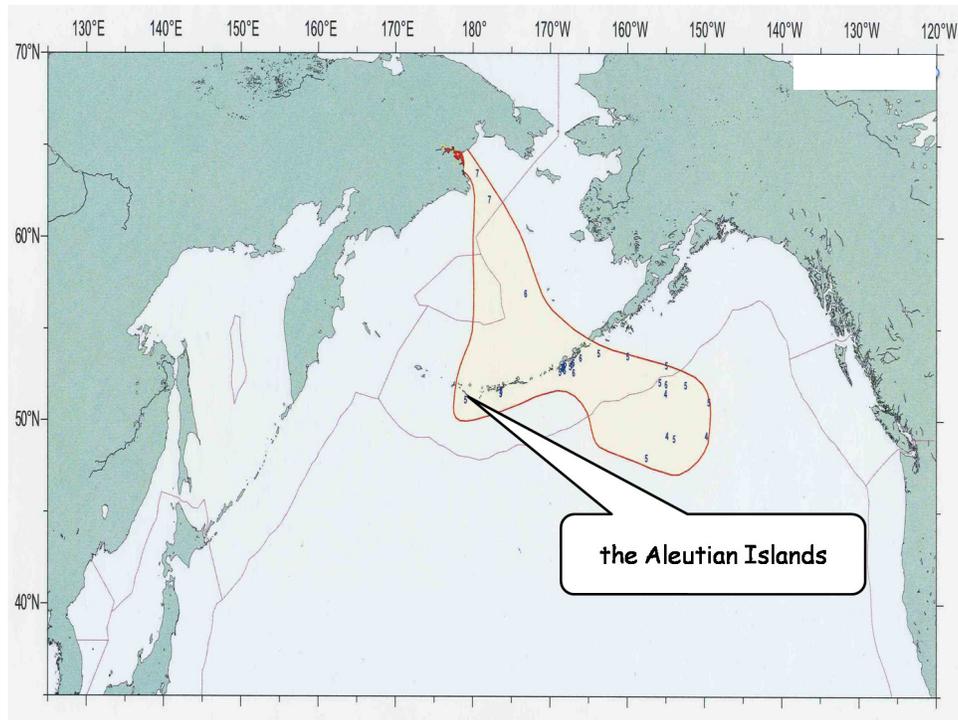


Fig. 4. Spring-summer ocean distribution of Anadyr chum salmon (Gritsenko 2002).

Extreme conditions of egg incubation and larval growth during the first months of the life cycle, including the considerable length of downstream migration, together with some other factors may contribute to larger body length and mass of adult chum salmon migrants in comparison with populations from other regions. In particular, Anadyr chum salmon compete more actively for food with other stocks in the sea and; although low in number, this stock is more viable.

Anadyr chum salmon is affected by predation from other fishes and animals at different stages of its life cycle. Grayling and char consumption of Anadyr chum salmon eggs is significant on the spawning grounds. In the river, jack pike prey on chum salmon juveniles. Anadromous fish species (chars, toothed smelt) eat chum salmon juveniles in the coastal zone. On average, it is estimated that during the adult spawning migration Largha (spotted) seals feed on 260.5 thousand Anadyr chum salmon, and beluga whales consume 77.5 thousand fish. At sea, some fish species have been observed to prey on chum salmon (e.g., daggertooth and longnose lancetfish), and the injury rate of occurrence caused from predation is less than 1%.

An expert estimate of the chum salmon illegal catch is equal to the official statistics in Chukotka. According to fishing data, the portion of chum salmon caught with coastal driftnets is about 1.5%.

In conclusion, the Anadyr basin chum salmon population plays an important role in gene pool preservation as a source stock of wild chum salmon in the North Pacific.

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REFERENCES

- Chereshnev, I.A. 2008. Freshwater fish by Chukotka. North Eastern Center of the Far Eastern Branch of Russian Academy of Sciences, Magadan. 324 pp. (In Russian)
- Gritsenko, O.F. 2002. Atlas of marine distribution of Pacific salmon during the spring-summer feeding and pre-spawning migrations. VNIRO, Moscow. 190 pp. (In Russian)
- Korotaev, Yu.A. 1997. The influence of hydrological conditions for the reproduction of the Anadyr chum. The First Congress of Ichthyologists of Russia. VNIRO. p. 157 (In Russian)

- Korotaev, Yu.A. A.N. Makoedov, O.B. Korotaeva. 2002. The population biology of fishery importance of the Anadyr chum. *Voprosy Rybolovstva*. 147 pp. (In Russian)
- Ostroumov, A.G. 1967. Some materials for biology of chum salmon in Anadyr River. TINRO-Center, Vladivostok. pp. 67-87. (In Russian)
- Putivkin, S.V. 1994. The topography of spawning grounds and distribution of Pacific salmon in the waters of the Bering Sea coast of Chukotka. In the complex research of marine hydrobionts and conditions of their habitat. TINRO-Center, Vladivostok. pp. 130-138. (In Russian)
- Putivkin, S.V. 1999. Biology and population dynamics of the Anadyr chum. Dissertation candidate of biological sciences. Vladivostok. 24 pp. (In Russian)
- Shtundyk, Y.V. 1982. Materials for biology of juvenile chum salmon *Oncorhynchus keta* (Walbaum) in the basin of Anadyr River. Biology of freshwater organisms of the Far East. Far East Branch of the Academy of Sciences of USSR. Vladivostok. pp. 41-53. (In Russian)
- Shuntov, V.P. and O.S. Temnykh. 2008. Pacific salmon in marine and ocean ecosystems Vol. 1. Monograph. TINRO-Center, Vladivostok. 481 pp. (In Russian)