Current Status of Chum Salmon Populations in the Rivers with and without Hatchery Stock Enhancement on the Sanriku Coast, Japan

Yuki Minegishi, Tatsuya Kawakami, and Jun Aoyama

International Coastal Research Center, Atmosphere and Ocean Research Institute, The University of Tokyo, Akahama 1-19-8, Otsuchi, Iwate 028-1102, Japan

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Chum salmon (Oncorhynchus keta) are one of the most important fish species in northern Japan. The hatchery-based stock enhancement program has been implemented since the 1800s and resulted in significant increases of returning adults with the increase of juvenile release. However, the adult return has been decreasing after the peak in 1996 despite the fact that almost constant number of juveniles have been annually released (Hokkaido National Fisheries Research Institute, 2018). In addition, the existence of wild fish and natural spawning was recently reported in many rivers over Japan (Miyakoshi et al. 2012; Morita et al. 2013; Aoyama 2017; Iida et al. 2018), although the chum salmon stock has long been believed to consist of the hatchery-origin fish. Therefore, there is a need to evaluate the status of chum salmon populations of both wild and hatchery-origin fish.

On the Sanriku coast (the side of the Pacific Ocean of the Japan’s mainland), Japan, there are two contrasting rivers, the Otsuchi and Koduchi Rivers, in terms of implementation of stock enhancement program. These two rivers are similar-sized, and next to each other at their river mouths. For the former, a large-scaled hatchery-based stock enhancement program has long been implemented with releasing about 20 million juveniles annually whereas for the latter, it has been suspended since the 2011 off the Pacific coast of Tohoku Earthquake and the following tsunami. This situation allows us to assess and compare the population status of chum salmon with and without stock enhancement.

In the present study, in order to evaluate the current status of chum salmon populations in rivers with and without hatchery-based stock enhancement program, adult fish, their spawning redds and carcasses were assessed through the whole spawning season in 2017–2018 in the Otsuchi and Koduchi Rivers on the Sanriku coast, Japan. A quantitative survey was performed from 1 September 2017 to 21 February 2018, once every ten days in the Otsuchi River and one to three times a week in the Koduchi River to collect tissues and scales from fresh carcasses. The study area was 0.5 to 1.0 km upstream from the hatchery weir in the Otsuchi River and 1.0 to 4.0 km upstream from the river mouth in the Koduchi River. Adults, their spawning redds and carcasses were visually counted while walking gently and slowly along or in the survey reaches. In the Otsuchi River, a total of 106 spawning redds were found from 10 November 2017 to 31 January 2018, and the total number of adults and carcasses was 170 and 214, respectively, suggesting that the hatchery weir unexpectedly allowed some fish to pass upstream to spawn. In the Koduchi River, at least 363 spawning redds were counted from 10 October 2017 to 31 January 2018, and returning adults and carcasses were 2,044 and 1,764, respectively.

The present study suggested that most of the returning adults to the Otsuchi River were caught by the hatchery weir for the stock enhancement and natural spawning was less abundant than the Koduchi River. This indicated that the population in the Otsuchi River consisted of mostly the hatchery-origin fish whereas those in the Koduchi River should be wild. As the hatchery weir catch in the Otsuchi River in this season was officially reported to be 2,787, the stock of the Otsuchi River was obviously larger than that of the Koduchi River. It is, however, noteworthy that the difference in the numbers of returning adults between these two rivers was considerably smaller compared to that in the numbers of juveniles with and without hatchery release.

REFERENCES


