Studies on the Chum Salmon Returning to Otsuchi River, Japan
I. Movement of the Tagged Spawning Fish to Rivers from the Coastal Sea Area

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The chum salmon, Oncorhynchus keta (WALBAUM), returns to spawn, in the fall, to Otsuchi River from the open sea through Otsuchi Bay. The conservation of the migratory spawning chum salmon in the sea area, therefore, is necessary for its return and ascending Otsuchi River. In the present study, the movement of the tagged spawning chum salmon to Otsuchi River from the coastal sea areas, outside and inside Otsuchi Bay, has been observed to know its migratory route in the area necessary for its conservation.

Material and Methods

The spawning chum salmon caught by a trap set in the lower course of Otsuchi River were transported to a station inside Otsuchi Bay then tagged with a Peterson-type plastic tag before releasing. The other fish caught by trap nets set outside Otsuchi River were tagged with the same type of tag then released near the place of catch. The recovery of the tagged chum salmon was accomplished by collecting them from the commercial catches along the coast and by catching them by trap sets in several streams where they returned to spawn.

Results

Return of the tagged spawning chum salmon to Otsuchi River. The 19 chum salmon caught by a trap set in Otsuchi River which drains into Otsuchi Bay were transported to Station I inside the bay, then tagged and released there on December 11, 1962. Eighteen tagged chum salmon, or 95 percent, were recaptured within four days after releasing. Among the fish recaptured, 13 were caught in Otsuchi River and 5 inside the bay (Fig. 1).

The 8 chum salmon caught by a trap set in Kotsuchi River which also drains into Otsuchi Bay were tagged and released at Station I inside the bay after being transported there on December 11, 1962. Only 2 tagged male chum salmon, or 25

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percent, were recaptured in Kotsuchi River within a day and 3 days after releasing (Fig. 2).

Another experiment of return of the chum salmon to Otsuchi River was undertaken. The 14 fish caught by a trap set in Otsuchi River were transported to Kotsuchi River on December 13, 1963. After reserving them for 24 hours, these fish were transported again to Station I inside the bay then tagged and released there. Two tagged fish were recaptured in Otsuchi River within 2 days after releasing, but none was recaptured in Kotsuchi River (Fig. 3).

Movement of the tagged spawning chum salmon from the outside of Otsuchi Bay to rivers.

The 11 chum salmon caught by a trap net at Station III outside Otsuchi Bay were tagged and released there on December 24, 1963 to know their movement to the rivers. Nine tagged chum salmon, or 81 percent, were recaptured within 7 days after releasing. Among the fish recaptured, one was caught in Otsuchi River, 2 in Otsuchi Bay and the other 6 fish in rivers and bays other than Otsuchi River and Otsuchi Bay. The fish recaptured in Otsuchi River were found within 2 days after releasing. Two fish were recaptured inside Otsuchi Bay within 3 days after releasing. On the other hand, 2 fish were recaptured in Tsugaruishi River about 30 km north of the release station, Station III, within 7 days after releasing (Fig. 4).
Movement of the tagged spawning chum salmon from the inside of Otsuchi Bay to rivers. The 26 chum salmon caught by a trap net at Station II inside Otsuchi Bay were tagged and released there on December 10, 1962 to know their movement to the rivers. Eighteen tagged chum salmon, or 69 percent, were recaptured within four days after releasing. Among the fish recaptured, 8 were caught in Otsuchi River and one in Kotsuchi River and one in Unozumai River within 2 days after releasing. The other 8 fish were caught inside Otsuchi Bay within 4 days after releasing (Fig. 5).

Discussion

It has been already shown from a number of marking experiments that salmon returns to its parent streams to spawn several years after hatching. Such homing behavior of the salmon has been also proved from the present study in which the chum salmon returns to Otsuchi or Kotsuchi rivers to spawn and these seem to be the parent streams. The same results of the Otsuchi River chum salmon had been reported based upon other experiments. It is also analogous to the result that
Fig. 5. Distribution of recaptured tagged chum salmon which were caught at and released from Station II inside Otsuchi Bay.

spawning area in Brooks and Karluk Lakes, Alaska, and their ultimate destination cannot be significantly altered by conditioning them to a particular spawning tributary after they have entered the lake.2

On the other hand, the spawning chum salmon which were caught by a trap net outside Otsuchi Bay and released there were not recaptured only in Otsuchi River and Otsuchi Bay but also in other rivers and bays situated several ten kilometers from the mouth of Otsuchi Bay. The results indicate that the spawning chum salmon that reached the outside of Otsuchi Bay actually contained several fish groups which ascend different streams. This pattern of return of the spawning chum salmon to rivers in the present experiment is similar to the case of the tagged sockeye salmon released from a coastal area in Kodaik Island in Alaska, it returned to a number of geographical localities along the coast.3

More than half of the tagged spawning chum salmon released inside Otsuchi Bay entered the Otsuchi, Kotsuchi and Unozumai Rivers which empty into the bay, though some fish continued swimming around the bay. The results are similar to the case that most tagged sockeye salmon released from Cold Water Bay in Canada enter Fraser River which drains into the bay though some other fish migrate to other coasts far from the bay.4

Summary

1. Nineteen chum salmon caught by a trap set in Otsuchi Rivers were tagged and released inside Otsuchi Bay. Among them, 13 tagged fish were recaptured in Otsuchi River. Eight chum salmon caught by a trap set in Kotsuchi River were also tagged and released inside Otsuchi Bay. Among them, 2 tagged fish were the coho salmon returns to a certain tributary which the fish ascended once before, if the fish is transferred to the lower course of the river and released there.5 The behavior of the chum salmon that returned to Otsuchi River does not change after reserving the fish in another stream. This case is similar to the results that the sockeye salmon has a homing habit to a particular spawning area in Brooks and Karluk Lakes, Alaska, and their ultimate destination cannot be significantly altered by conditioning them to a particular spawning tributary after they have entered the lake.2
recaptured in Kotsuchi River. The results of the two experiments showed that the chum salmon return to a certain stream which the fish had once before ascended to spawn and this seems to be the parent stream of the fish.

2. Fourteen chum salmon caught by a trap set in Otsuchi River were transported to Kotsuchi River. After reserving them for 24 hours, these fish were transported again to a station inside Otsuchi Bay then tagged and released there. Among them, 2 tagged fish were recaptured in Otsuchi River, but none was recaptured in Kotsuchi River. The results of the experiment showed that the behavior of the chum salmon of returning to Otsuchi River does not change even after reserving the fish in another stream.

3. Eleven chum salmon caught by a trap net outside Otsuchi Bay were tagged and released there. Among them, one was recaptured in Otsuchi River and 2 in Otsuchi Bay, the other 6 fish, however, were recaptured in rivers and bays other than Otsuchi River and Otsuchi Bay. The results of the experiment showed that the chum salmon reached a coast from the off sea and entered its parent stream after moving some distance north or south along the coast.

4. Twenty six chum salmon caught by a trap net inside Otsuchi Bay were tagged and released there. Among them, 8 were recaptured in Otsuchi River and one each were recaptured in Kotsuchi and Unozumi Rivers. The other 8 fish were recaptured inside the bay. The results of the tagging experiment showed that more than half of the chum salmon which entered Otsuchi Bay ascended the rivers emptying into the bay in a short time though some continued swimming around the bay for several days before the ascending rivers.

References