SENSORY MECHANISMS OF HOMING IN SALMONID FISH
I. INTRODUCTORY EXPERIMENTS ON THE OLFACTORY
SENSE IN GRILSE OF BALTIC SALMON (SALMO SALAR)

by

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(With 2 Figures)

INTRODUCTION

The homing of salmons have been studied for some time and from different points of view (FAGERLUND et al., 1963; UEDA et al., 1967; GROVES et al., 1968). Some of the evidence for this type of migration in fish has recently been reviewed (HARDEN JONES, 1968). There are, however, some omissions in the review, such as the Baltic populations of the Atlantic salmon and other Baltic salmonids. The migration of these fishes have been studied by fishery biologists (ALM, 1958; CARLIN, 1959; NETBOY, 1968) but a lot of information is still unpublished (PETERSON, 1957-60).

Migrating or displaced Pacific and Atlantic salmons generally return to the home river (GERKING, 1959). Tagging experiments with Baltic Salmon of River Indalsälven and other Baltic rivers have shown the same (PETERSON, 1957-60). The sensory basis for homing in fishes is of great theoretical, practical and economic interest and some accounts have been published in this field (e.g., BRETT et al., 1963; HASSLER, 1966; KLEEREKOPER, 1967; GROOT, 1965). No observations have, however, been reported on the sensory mechanisms of homing in the Baltic salmon or any other Scandinavian salmonids. A project for ecological, ethological and structural investigations on the mechanisms initiating and guiding the homing behaviour in these fishes has therefore been started by BERTMAR. It represents a continuation and widening of his studies on the snout in fishes and tetrapods (BERTMAR, 1969).

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In this paper we present results from a field experiment on "grilse" of Baltic salmon. These fishes are mostly males, sexually mature after one year in the sea. The intention was to study if the homing behaviour was influenced by elimination of the olfactory sense. We have also studied the behaviour of operated fish in comparison with that of unoperated fish.

MATERIAL AND METHODS

On 20-23 September 1967 we started field experiments on 400 "grilse" caught at the fish hatchery of Bergeforsen on the River Indalsälven, 20 km north of Sundsvall (Fig. 1). The experiments were performed in the following way. After initial anaesthesia with MS-222 of all fish the olfactory sense of 200 "grilse" was eliminated. Two operating methods were tested and all fish were tagged (Carlin tag):

1. In the first method we effected anosmia surgically by cutting off the

![Image](image.png)

Figure 1. 200 tagged "grilse" of the River Indalsälven were released at Lörudden and 191 at Ávike in September 1967. 100 of the former and 91 of the latter group were operated. All traumatized and control fish were recaptured either at Bergeforsen or in the Sundsvall Bay area whereas many of the neurotomized and burned fish swam out in the Gulf of Bothnia (Table 1).