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MIGRATORY BEHAVIOUR OF REARED NORWEGIAN COASTAL COD AND NORTH EAST ARCTIC COD

by

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ABSTRACT

This paper is based on experiments to test if differences in migratory behaviour of Norwegian coastal cod and north east Arctic cod is related to parental origin or, alternatively, is related to the environmental experienced during the premature stages. Earlier experiments have shown that when wild fish from the two groups are transplanted and released at a new location, their behaviour after release differ distinctly. The two groups of cod in the present study were raised in captivity under identical conditions. Mature fish were tagged with acoustic transmitters and their behaviour studied during a week's period after release. Methods and design were the same as in the earlier experiments, and the results signified no behavioural differences between the two groups of fish. This might be an indication of strong environmental influence on migratory behaviour in cod. The number of released fish were low and the results have to be verified by new trials.

INTRODUCTION

Norwegian coastal cod (CC) live and spawn along the Norwegian coast and migrate only short distances for feeding and breeding. In contrast north east Arctic cod (NAC), which as well spawn along the Norwegian coast, travel up to several thousand kilometres yearly between spawning and feeding areas (Bergstad *et al.* 1988). Earlier experiments have shown that when wild fish from the two groups are transplanted and released at a new location, their behaviour after release differ distinctly (Godø *et al.* 1994, Godø 1995). Coastal cod settled and become stationary at the new location while north east Arctic cod left the location and moved towards the open sea.

If this difference is of genetic origin, a similar behavioural difference would be expected from a comparison of laboratory raised fish. This paper summarize the first study in testing this hypothesis.

MATERIAL AND METHODS

The study area, methods, equipment and procedures were the same as in previous experiments (see Godø 1995). The experiment was carried out in Fanafjord in February 1995. Five individuals, two CC and three NAC, were tagged with acoustic tags (produced by VEMCO), transmitting at frequencies between 50 and 77 kHz. The tags were attached with nylon strings along the first dorsal fin. The position of an acoustically tagged fish was automatically recorded when it

3112 / 6 2585

remained within range of a triangle of hydrophone buoys located at 400 m - 600 m distance from each other. When outside the range of the buoy system, the fish were tracked by a manually operated directional hydrophone lowered from a small vessel.

Totally five fish were tagged with acoustic transmitters (Table 1). The two first individuals were release on February 20 and monitoring continued until February 27. The other three were released the following two days and followed until the same date.

In addition 15 cod (7 CC and 8 NAC) were released with conventional tags (Lea type, Anon 1953) at the same position as the acoustically tagged cod.

All fish were raised under identical condition from parents of known origin (Terje Svåsand, Institute of Marine Research, Bergen, pers.com.). They were mature age 2 fish from 48-64 cm. Sex and maturity stage were tested by biopsies. Information about the acoustically tagged fish is given in Table 1.

Table 1: Information about acoustically tagged fish.

Fish numb.	Identity	Length	Sex	Recapture information
1	CC	62	Male	Recaptured March 3
2	NAC	51	Male	Recaptured March 6
3	CC	48	Female	Recaptured March 4
4	NAC	55	Female	Recaptured February 28
5	NAC	52	Male	

RESULTS

The released fish behaved similar independent of origin. After a some initial movements immediately after release, the fish became relatively stationary (Fig. 1). One NAC started to move out of the fjord and into the neighbouring fjord in south at the end of the study period. One CC was lost during the study period but was recaptured in similar distance north of the Fanafjord. The other fish kept in the fjord during the study period. After the study period an additional three acoustically tagged fish were recovered; one NAC in the Fanafjord one CC south of Fanafjord and one NAC north of Fanafjord (see Fig. 1).

Of the conventionally tagged fish, three were recovered in the Fanafjord and three outside the fjord as indicated in Fig. 1d. These fish were of both CC (2) and NAC(1) origin.

DISCUSSION

CC in this study were substantially more mobile compared to what has been observed in earlier studies (Godø 1995). In contrast, NAC were more stationary and, hence, the two groups of fish apparently behaved similarly after release.

The present study was carried out during the spawning season and all fish were spawning or ready to spawn. This contrast the conditions during preceding experiments which were in early December, and might have contributed to the higher mobility of the CC in the present study compared to the previous ones (Godø *et al.* 1994). The lack of an immediate migratory response of NAC as observed earlier, is considered a result of the artificial rearing condition experienced during the premature stages. Although totally 9 fish were recaptured outside the Fanafjord, there are no tendency of the NAC to be more mobile than CC. As the raising conditions were most comparable to what local CC experience in the wild, the observed coastal cod migration behaviour of both types of fish is supposed to be caused by the environments.

The present study include information from very few fish, however, it is a first indication of the importance of the environmental conditions for the development of migratory behaviour. If later experiments confirm present results, it appears that the environment experienced before maturation rather than genetic background determines cod migration.

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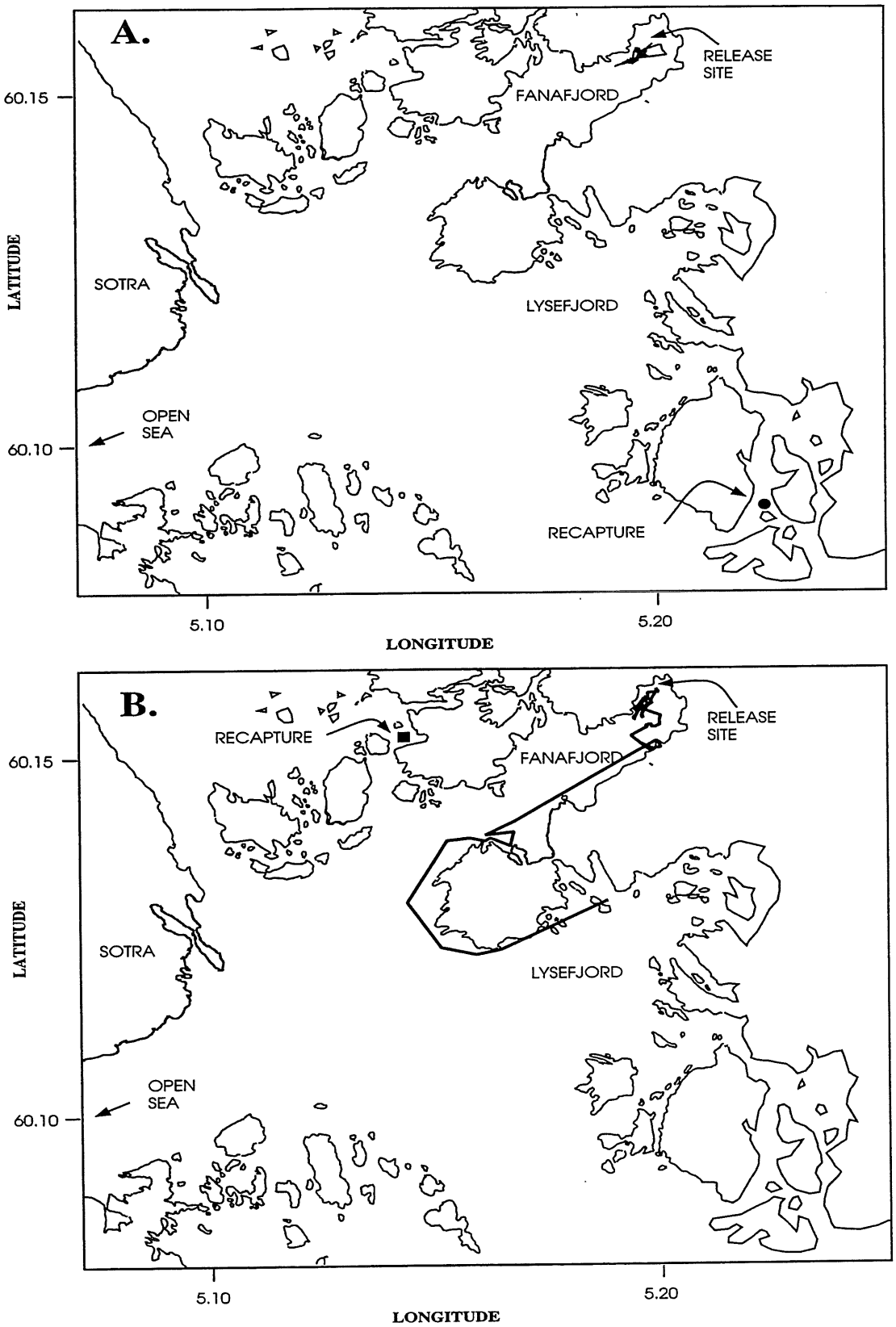
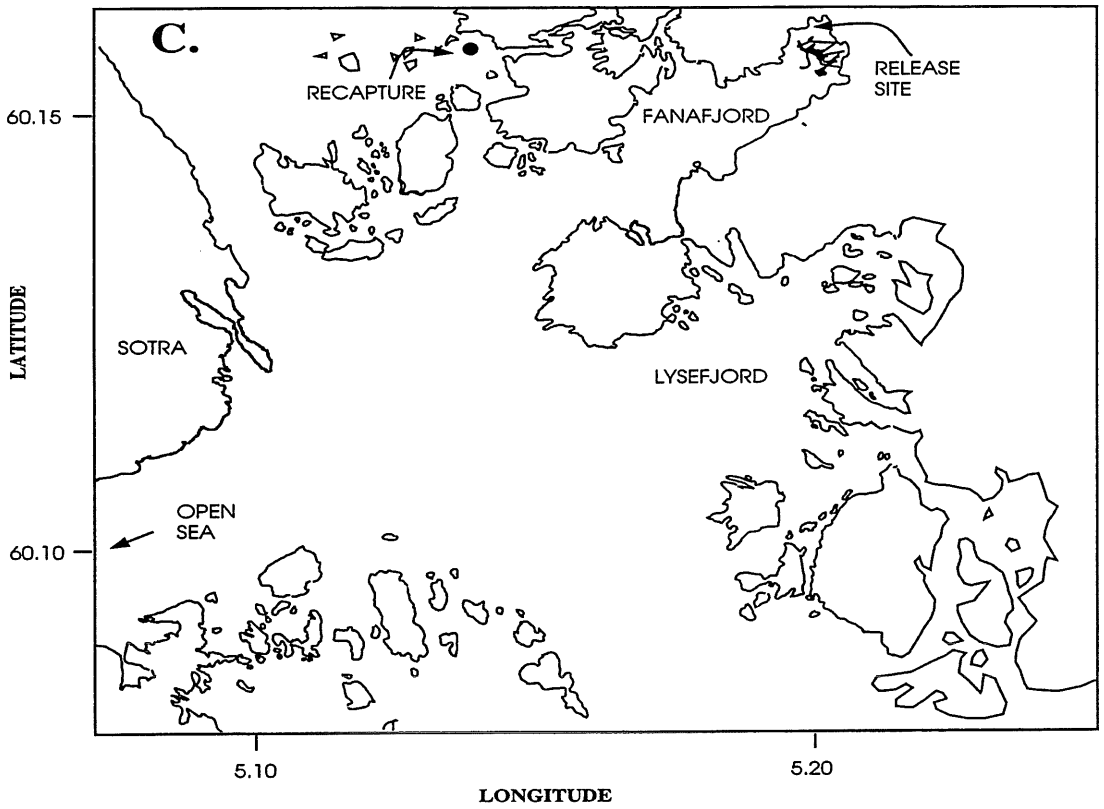


Fig. 1. Tracking information of fish 1-5 (a-e). When known, recapture positions are indicated with a square for NAC and a dot for CC. In Fig. 1e is also shown recapture position of conventionally tagged CC (star) and NAC (dimond).



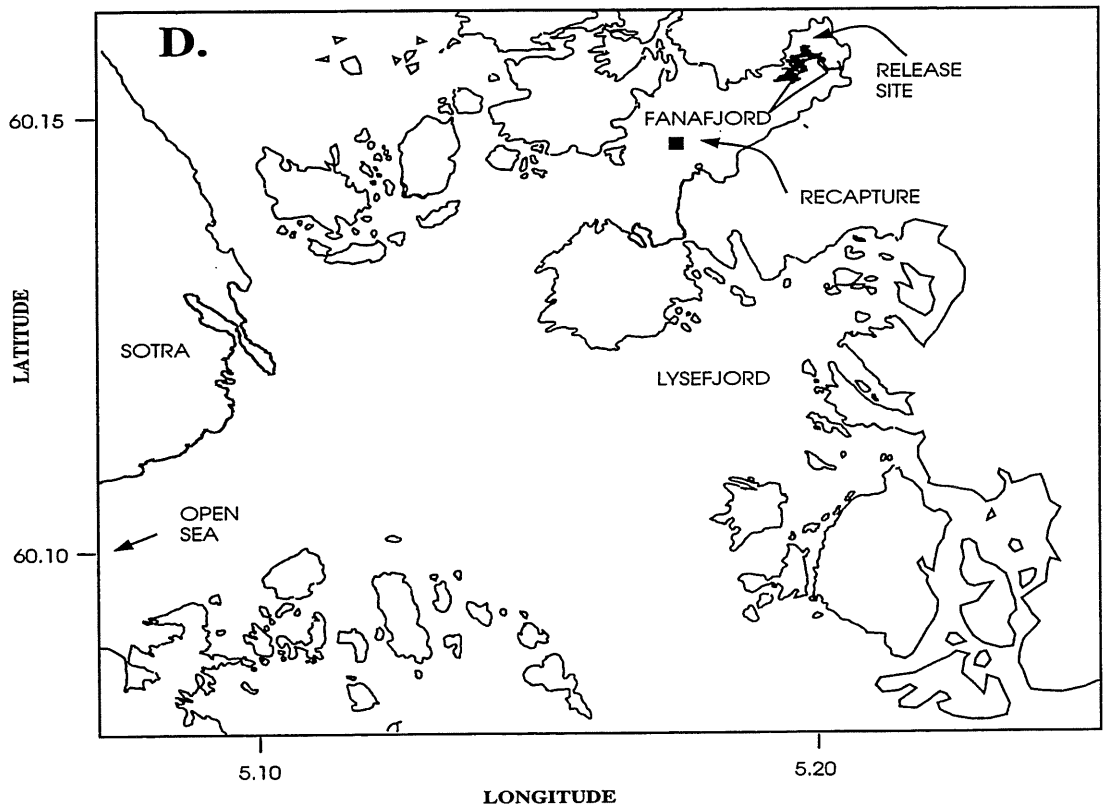
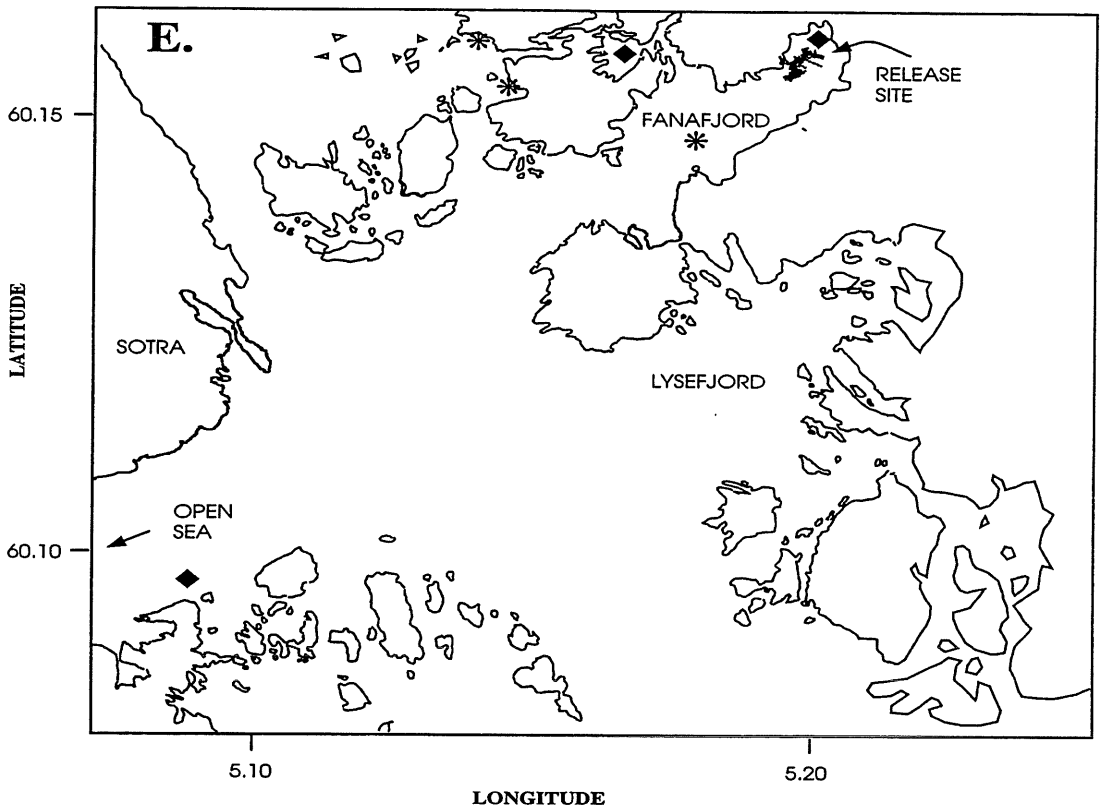


Fig. 1(continued). Tracking information of fish 1-5 (a-e). When known, recapture positions are indicated with a square for NAC and a dot for CC. In Fig. 1e is also shown recapture position of conventionally tagged CC (star) and NAC (dimond).



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