

International Council for the
Exploration of the Sea

C.M. 1963
Near Northern Seas Committee
No. 122 C

Preliminary note on the migration of transplanted plaice

by

J.F. de Veen
Netherlands Institute for Fishery Investigations
IJmuiden, Netherlands



Introduction

One of the problems emerging from recent investigations on the existence of subpopulations in the plaice of the Southern North Sea (de Veen, 1962) was the question in which way a maturing fish is able to find its proper spawning ground.

In order to study this problem transplantation experiments were designed and last summer introductory experiments were carried out. Moreover, an extensive study of the literature was started to find out which conclusions could be drawn from old transplantation experiments. Although the analysis of these experiments is not yet completed, some striking points were found which are worth while to be mentioned briefly.

The results of the old experiments fell into a few groups according to the distance over which the fish had been transplanted. In this paper all experiments of transplantation over the same distance are pooled.

For a discussion of the results the data of the transplantation experiments are compared with those of tagging experiments with local plaice in the release areas of the transplanted plaice. Although in a number of cases comparable tagging experiments with local plaice, carried out in the same season and year could be found in literature, such experiments were lacking in other cases. In such instances, comparisons were made with tagging experiments of local plaice carried out in the same season of another year, or, if necessary, with experiments in another season. An inspection of the returns of the transplanted plaice by seasons suggests, however, that in none of the comparisons the differences between local and transplantation experiments described in this paper are due to differences in time of release.

A more detailed study of the seasonal movements of transplanted and local plaice is in progress and cannot be dealt with in this preliminary note.

Results

In the period 1904-1910 a number of transplantation experiments and ordinary tagging experiments on plaice were carried out in the North Sea and in the Baltic by Danish, Dutch, English and German scientists. Various authors published results including Atkinson (1909), Bolau (1906), Borley (1909), Garstang (1909), Johansen (1907), Lee and Atkinson (1909), Redeke (1906, 1912) and Reichard (1910, 1914).

The transplantation experiments used for the orientation study could be pooled in the following groups according to the distance over which transplantation took place.

- table 1 -

Transplantation-experiments

Distance over which trans-plantation took place	Author	Exp. nr.	Date	From		To		Numer of plaice trans-planted
				N	E	N	E	
30-40 miles	Johansen	5	Feb. 1904	55°27'	8° 5'	55°31'	7°21'	200
		7	Feb. 1904	55°27'	8° 5'	56° 1'	7°41'	210
		11	Mar. 1904	57°35'	10°36'	57°25'	11°21'	60
80-100 miles	Reichard	73	June 1908	NW of Heligoland		55° 2'	6°18'	580
	Lee & Atkinson	T 5	Apr. 1905	52°19'	4° 2'	53°12'	2° 3'	200
		T 7	May 1905	52°57'	4°17'	53°43'	2° 8'	274
		T11	May 1906	52°54'	4° 7'	53°54'	1°42'	199
140 miles	Reichard	66	May 1907	N. of Norderney		54°48'	3°50'	1100
	Borley	8	May 1905	52°58'	4°21'	54°37'	1°47'	280
		15	May 1907	52°29'	4°15'	54°38'	1°46'	312
		16	May 1907	52°29'	4°12'	54°39'	2°36'	387
		19	May 1908	Dutch coast		54°38'	1°48'	330
about 200 miles	Borley	9	Apr. 1906	55°26'	8° 7'	54°37'	2°39'	239
		10	Apr. 1906	55°27'	8° 8'	54°36'	1°48'	289
		21	May 1908	Graa & Lister D.		54°39'	2°36'	397
		22	May 1908	Graa & Lister D.		54°38'	1°48'	330

For each group the distribution of the recaptures of the transplantation experiments were compared with those of the tagging experiments with local plaice (see table 1 and 2)

- table 2 -

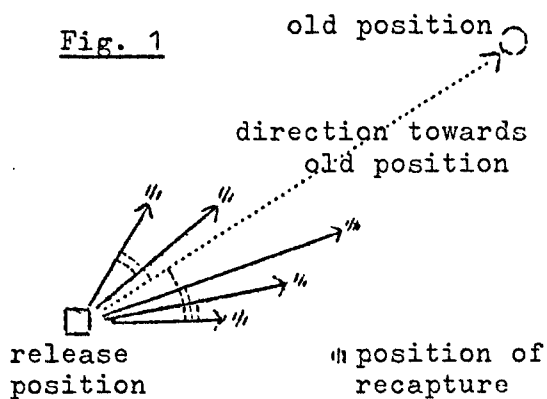
Local tagging experiments

To be compared with: Group	Trans. Exp.	Author	Exp. nr.	Date	Position of local tagging experiment		Number released
					N	E	
30-40 miles							
80-100 miles	73	Reichard	76	Jul. 1908	54°47'	6°15'	99
		Atkinson	60	Apr. 1906	55°16'	6°15'	23
			72	Sept. 1906	55°29'	6°15'	58
	T 5	Garstang Atkinson	57	Sept. 1905	53°15'	1°48'	61
			61	May 1906	53°18'	1°50'	29
			62	May 1906	53°15'	1°53'	59
			63	May 1906	53°28'	1°59'	10
	T 7 T11	Atkinson	79	Mar. 1907	53°56'	1°43'	38
			80	Mar. 1907	53°29'	1°52'	22
	140 miles and 200 miles	66	Redeke	50	Nov. 1907	54°23'	2°34'
8		51		Nov. 1907	54°22'	2°40'	28
15		Reichard	81	Oct. 1908	54°45'	3°11'	457
16			82	Oct. 1908	54°32'	2°32'	33
19		Garstang	32	Mar. 1904	54°33'	2°42'	53
9			33	Mar. 1904	54°43'	2°15'	10
10		Atkinson	58	Apr. 1906	54°56'	3°22'	24
21							
22							

Unfortunately no local plaice was tagged in the case of the 30-40 miles group. For all other groups the distribution of the recaptures of the transplanted plaice appeared to be different from those of the recaptures of the local plaice.

If we determine the directions of the recaptures with reference to a line drawn between release position and the position where the transplanted plaice came from (see fig. 1), we can count the number of returns caught in the various directions and construct angular frequency distributions of the returns from the various transplantation and local tagging experiments. The distance covered by the returned fish is not taken into account in these diagrams. (This will be done in the further analysis of the data).

Fig. 1



In fig. 2 the angular frequency distributions are given for all transplantation and local tagging experiments. In comparing the results of these experiments a number of trends can be demonstrated.

1. - in the groups 30-40 miles and 80-100 miles there is a strong tendency of the transplanted plaice to be recaptured in the direction towards the old position, which tendency (in the case of 80-100 miles) apparently does not exist in the local plaice in the release area.
2. - this "homing" tendency seems to be absent in the groups transplanted over 140 miles or more.
3. - the groups transplanted over 140 miles and over demonstrate a spawning migration different from that of the local plaice in the release area. (i.e. the Doggerbank area). The transplanted plaice was not only recaptured in the direction of the Southern Bight spawning area, as was the case with the local plaice, but showed also a strong tendency to be found back in the direction of the Flamborough Off Ground spawning area, which tendency was absent in the local plaice. Many transplanted fish were in fact caught on the Flamborough spawning ground in the spawning season.

These results suggest that plaice transplanted over a distance up to some 110 miles has a tendency to return to their old area, but loses this homing tendency when transplantation covers a longer distance. If transplanted over longer distances the plaice does not follow the migration of the local plaice in the release area but shows another migration type. Although the migration pattern outside the spawning season is different too, the spawning migration in particular deviates noticeably from that of the local plaice. Furthermore, the spawning area visited by the transplanted plaice is not the area where they normally would have gone to, if not transplanted.

Whereas the factors determining the direction of the spawning migration are still unknown, it may be significant that the direction in which the transplanted plaice migrates for spawning, is similar to the direction which they would have followed to their normal spawning ground if not transplanted.

It should be recorded here that nearly all of the transplanted plaice were small, and one can safely assume that many of those matured for the first time after having been transplanted. This may have affected the direction of the spawning migration.

In future our transplantation experiments will not only include young but also older plaice and the homing tendency over short distances will receive special attention.

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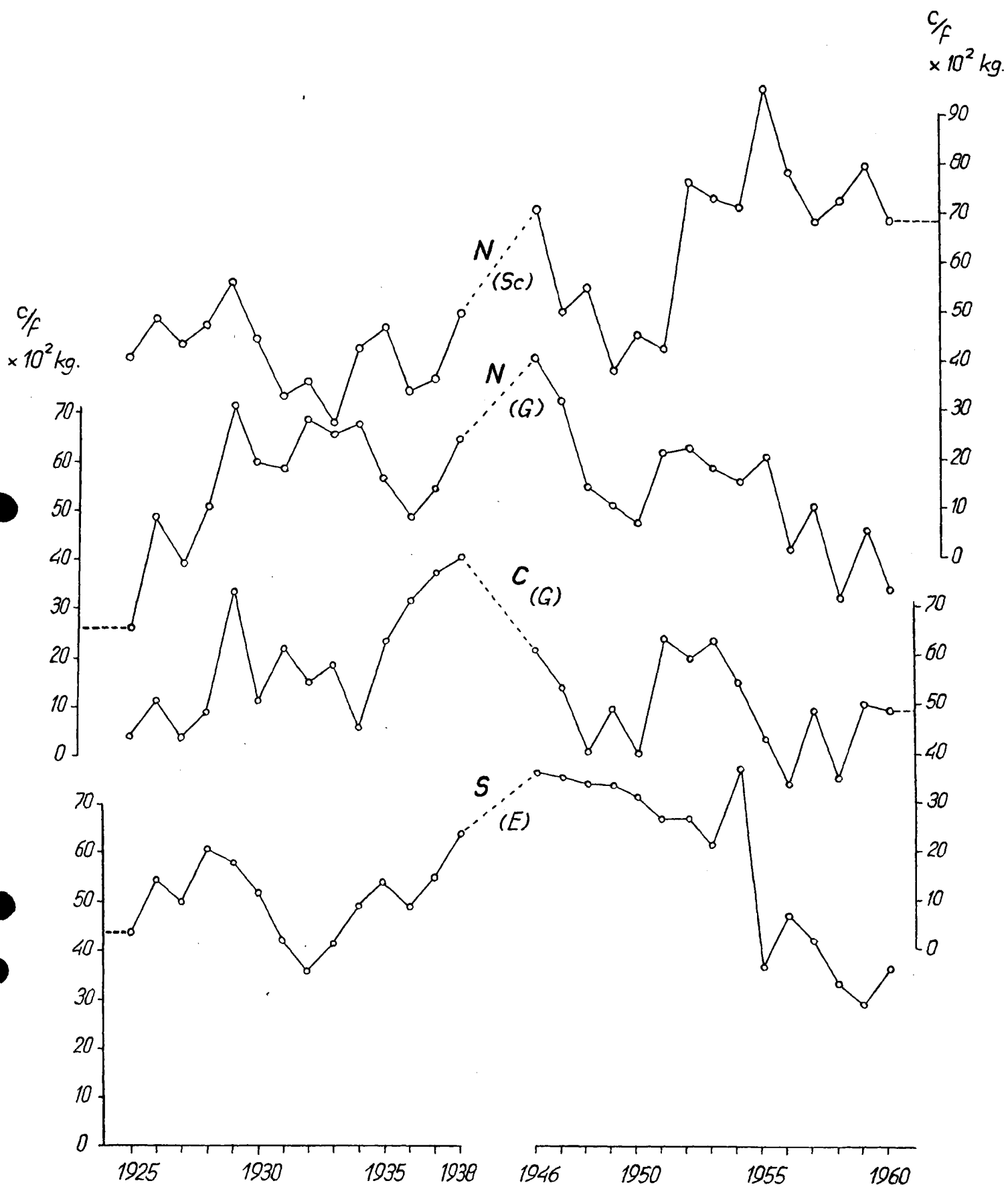


Fig. 2

Catch per effort in:

- $N_{(Sc)}$ Northern North Sea, Scottish driftnet fishery
- $N_{(G)}$ " " " " German trawl fishery
- $C_{(G)}$ Central " " " " " "
- $S_{(E)}$ Southern " " " " English driftnet fishery