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Fish distribution studies around offshore installations

by

Steinar Olsen and John Willy Valdemarsen
Institute of Fishery Technology Research
Box 1964, N-5011 Nordnes, Norway

It is well known that many species of fish are attracted to structures situated on or above the seabed. In the North Sea this is particularly apparent in locations of sunken shipwrecks, and a commercial "wreck fishery" has been developed. The numerous reports by people engaged in the North Sea oil exploration of large concentrations of fish around the offshore installations constructed by this new industry therefore came as no big surprise.

Reliable quantitative data on the extent of fish attraction by these offshore structures, however, are not available and practically nothing is known about diurnal and seasonal variations, differences in attraction with regard to species etc. Such information is rather vital for the assessment of any negative as well as positive effects that the oil activity might have on the North Sea fisheries, and a program for a detailed study of these matters has therefore been initiated in Norway.

With assistance from Phillips Petroleum Company Norway, the Institute of Fishery Technology Research during one week in May 1977 made observations and conducted fishing experiments within the 500 security zone around the Ekofisk installations in the North Sea.

Fishing was done with traps, jiggers and vertical baited lines at different distances and directions from the installations of the Ekofisk complex.

The trap experiments were restricted to an area between 100 m and 1000 m S-SW from the "Alfa" structure, a production rig situated about one nautical mile south of the Ekofisk complex. A few number of ling (Molva molva L.) were caught in traps, but no significant difference in catches was observed at from different distances from the rig.

The experimental jigging trials, however, gave some useful information about the distribution of fish around the Ekofisk complex (Table 1).

Table 1. Catch data of cod from jigging trials at various distances from the Ekofisk complex.

Distance in metres	0-50	50-100	100-200	200-500	500
Total fishing time (in hours and minutes)	5 ⁴⁵	1 ⁰⁰	0 ⁴⁵	0 ³⁰	0 ³⁰
Average no. of fish per 15 minutes	3.3	1.7	0.6	0	0
Minimum " " "	1	1	0	0	0
Maximum " " "	6	6	1	0	0

These trials, except for one at the "Alfa" rig, were carried out around the Ekofisk complex, which is composed of as much as 12 installations on the bottom in a rather restricted area.

Cod (Gadus morhua L.) between 35 and 65 cm was the only species of fish caught during the jigging experiments. This,

however, was not surprising as the kind of jig used is known to be very selective for cod and the availability of other species in the area therefore still have to be questioned.

Although the reliability of the jigging method for quantitative distribution studies is questionable, it seemed to be clear that cod was aggregated in substantial numbers in the proximity of the installations, whereas only scattered concentrations were present in the surrounding areas. This situation is of course only valid for the period these investigations were carried out. In other seasons of the year the situation might be totally different. These first results are, however, very consistent with reports from supply- and stand by-vessels operating in the area throughout the year. They always have high catch rates of cod close to the platforms and small catches of cod further away than 500 metres from any installation.

An interesting observation from these experiments was that krill (Meganyctiphanes norvegicus) dominated the stomach contents in cod. This might be related to the high level of artificial lights at Ekofisk, but eddies in the currents on the leeward side of the installations might also concentrate planktonic food organisms.

The experience from these preliminary investigations have demonstrated that the following points are particularly important and will be studied in detail during our further experiments:

1. Reliable methods are to be developed for estimating gradients in fish density at any distance from the installations within approx. 5000 m, as well as for determining density differences with regard to species of fish.
2. Annual variations in the distribution of fish are to be investigated by systematic sampling during a period of at least one year.

3. Estimates are to be made of the total amount of different species of fish unavailable for fishing inside the safety boundaries around oil installations.
4. The amount of food organisms near the installations needs to be compared with that in the surrounding areas.
5. Studies are to be made of whether fish in the proximity of the installations are stationary for longer periods. This can probably best be done by tagging.