International Council for the Exploration of the Sea

C.M. 1976/B:38
Gear and Behaviour Committee

# Fish behaviour in relation to long lines observed by TV

by

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## INTRODUCTION

There have been few studies on the behaviour of fish in relation to passive fishing gears such as long lines, traps and nets. In order to improve the efficiency of a fishing gear it is, however, essential to gain insight into the relationship between the fish and the gear in terms of attraction, avoidance and more specific behaviour patterns. Direct observations of fish behaviour under natural conditions are important in this connection and a valuable complement to comparative fishing experiments and laboratory studies on behaviour. We have, therefore, started an investigation on long lines and traps using underwater TV in the field. The observation method as well as some preliminary experiments on long lines will briefly be presented here.

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## MATERIALS AND METHODS

### Materials

The underwater equipment consisted of a aluminium frame where the test long line and LLLUTV (Low-light level underwater-television-camera) (Hydro products model SIT-125) was mounted. The UTV was kept in a fixed position by ropes and floats. The experimental long line, 2 m long with 2 hooks about 1 m apart, were tied to a monofilament nylon line at each end. By these lines the experimental long line could be set and hauled. Distance between camera and line were about 1.5 metres (see Fig. 1).

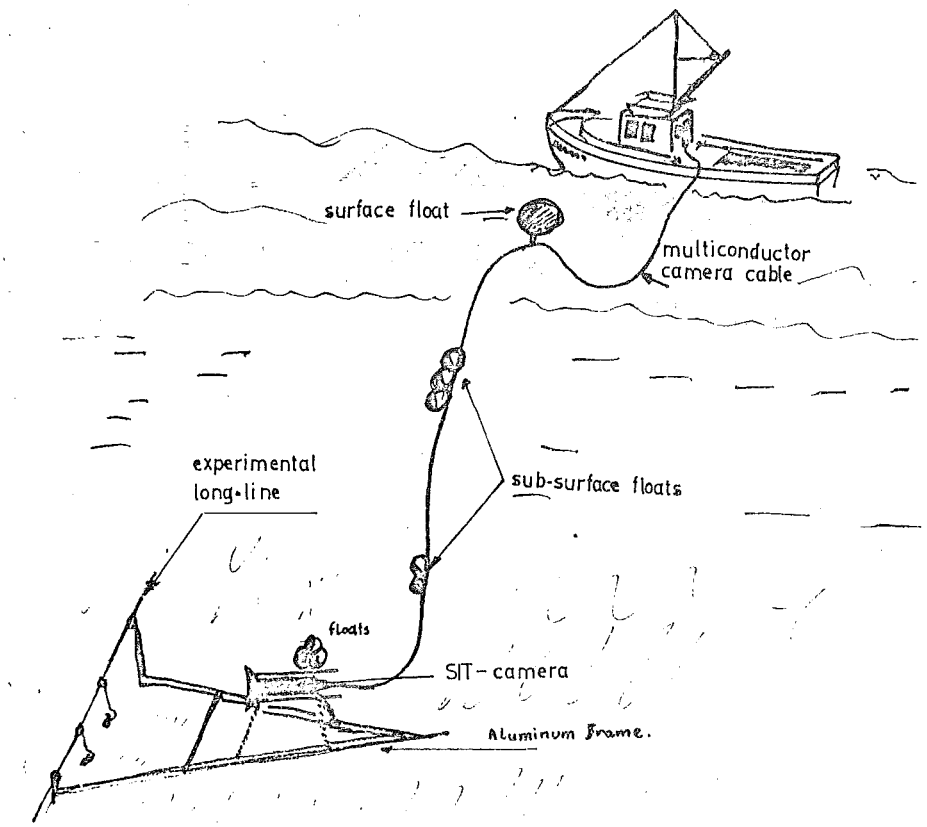


Fig. 1. Observation equipment on experimental long-line.

The experiments were carried out during the first fourteen days of August 1976, at Jarfjorden, East Finnmark. The observation equipment was placed on the bottom at a depth of 25 m. This shallow area was dominated by small (20-35 cm) speciemen of haddock (Melanogrammus aeglefinus) and dab (Limanda limanda). Only small numbers of cod (Gadus morhua) were observed.

Observation method, activity

The experimental long line was set on the bottom and the observation period lasted one hour. The activity through the observation period was assessed by counting the number of fish appearing on the monitor screen for 10 seconds every minute and added up for 10 minutes. The number of bites at the baits were counted continuously and added up every 10 minutes through the hour.

Fish behaviour when attacking the bait, or especially interesting sequences were recorded on video tape and studied in detail later.

The general activity of haddock and dab within one observation day was studied from 6 a.m. to 5 p.m., every experiment lasting one hour.

Using bait bags and baited hooks changes in activity through one observation hour were observed.

Regarding the efficiency of the line, the changes in behaviour and activity of haddock and dab was observed when:
1) the line was set on the bottom
2) the line was set with the bait 30-50 cm above the bottom.

RESULTS

The general activity of both haddock and dab through one observation day (6 a.m. to about 5 p.m.) is presented in Fig. 2. The distinctive features of both species were low mid-day activity and high morning and afternoon activity.

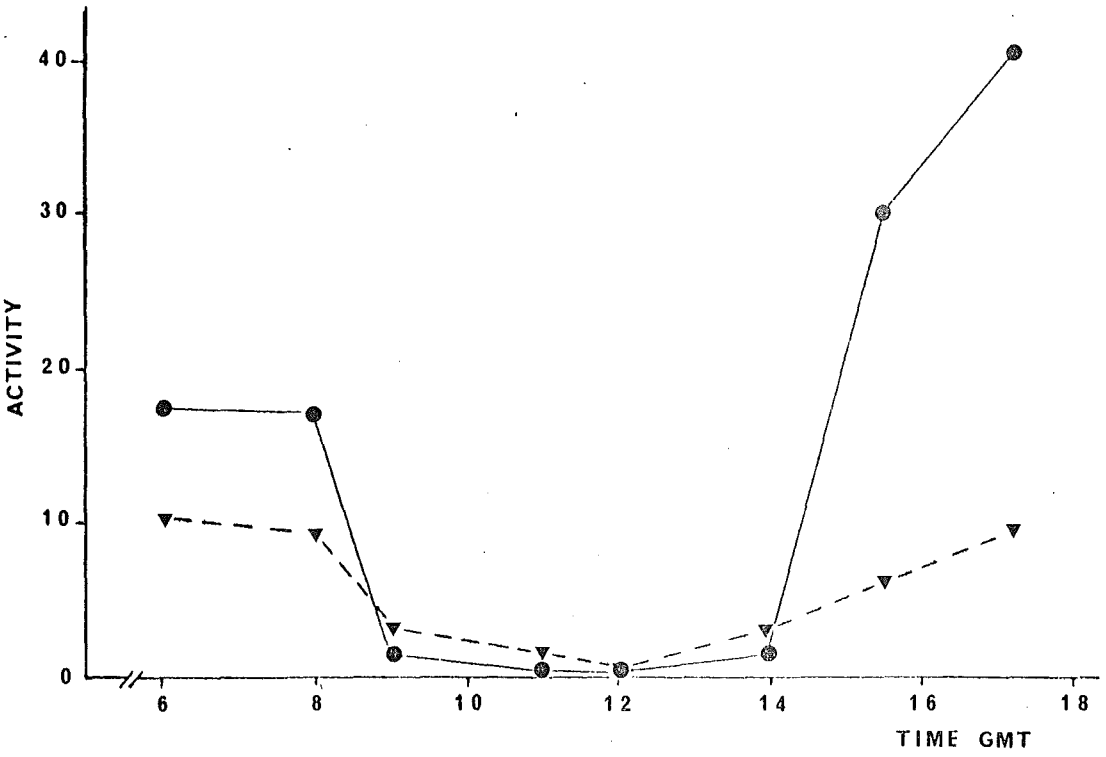


Fig. 2. Changes in activity of haddock (●——●) and dab (▼- - -▼) through one observation day.

The activity through one observation hour (split into 10 minute intervals) is shown in Fig. 3 a and b. During these experiments (Fig. 2 a) we used baitbags instead of hooks. This was done to study the general changes in behaviour and activity because, as will be shown later, a hooked fish would influence the behaviour and activity of other specimens in the area. As shown by Fig. 2 a, both activity and number of bites decreased for both species through the observation period. Fig. 3 b represents the bite response of haddock on baited hooks when no fish were caught during the experiment, and with bait still present on the hook at the end of the experiment. Under such conditions the bite frequency also decreased toward the end of the experiment.

Concerning haddock, a long-line above the bottom was superior to a long-line on the bottom and led to an increased attraction and a higher bite frequency (Table 1). These seemed also to be a positive effect

if one fish was hooked. The results from dab are not so clear-cut concerning different positions of the line. However, for this species as well, a hooked fish seemed to increase the activity and bite frequency.

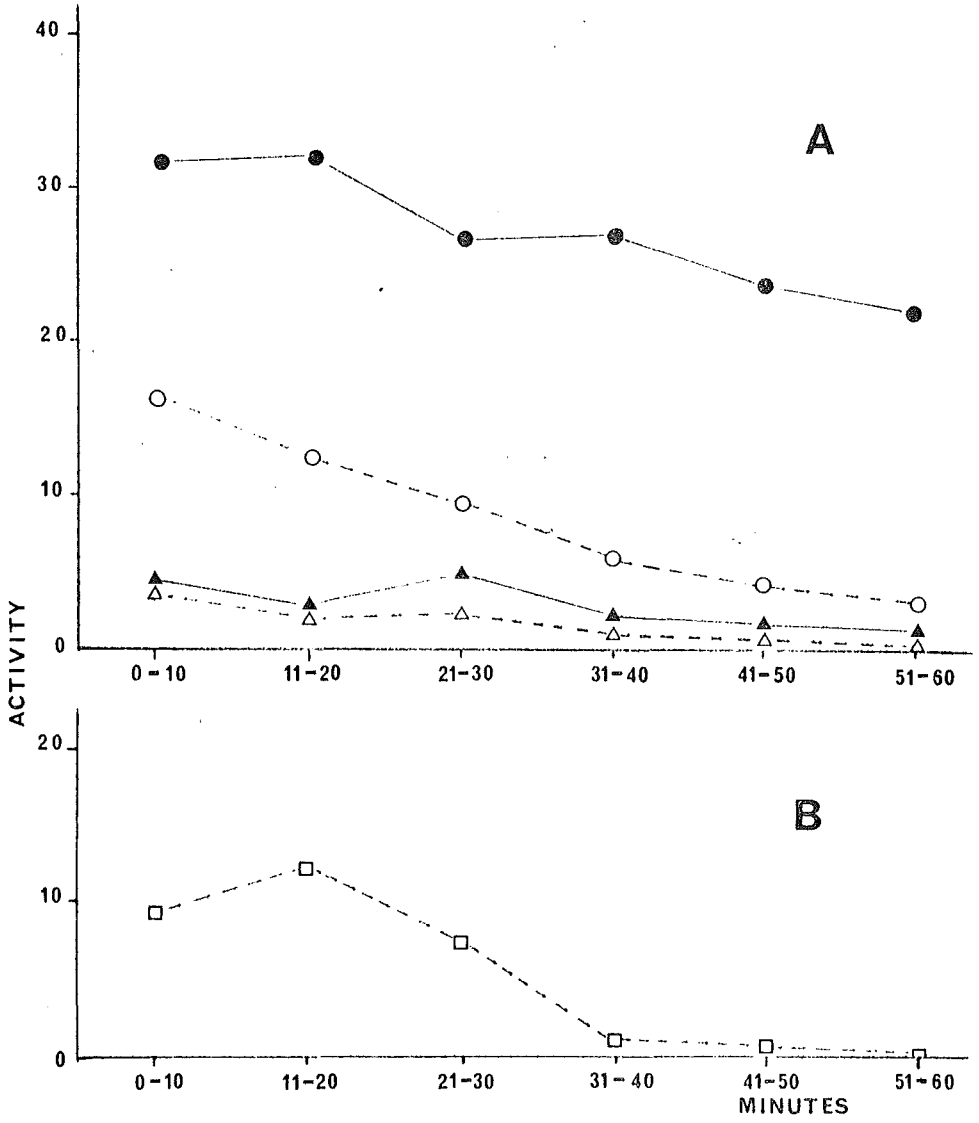


Fig. 3 A and B. Fig. A. Activity and bite response of haddock (●——● activity, o- - - o bite respons) and dab (▲——▲ activity, △- - -△ bite response), using bait bags on the test line. (Mean values of 8 experiments).
Fig. B. Bite response of haddock on baited hooks. (Mean values of 5 experiments.)

Table 1. The effect of position of the test line and hooking of fish on the activity and bite frequency.

| | Line on bottom No fish hooked | | Line on bottom Fish hooked | | Line above bottom No fish hooked | | Line above bottom Fish hooked | |
|---|---|---|---|---|---|---|---|---|
| | Haddock | Dab | Haddock | Dab | Haddock | Dab | Haddock | Dab |
| Mean activity/ 10 min. | 5,8 | 7,0 | 20,5 | 8,2 | 35,2 | 0,5 | 46,4 | 6,6 |
| No. of periods of 10 min. | 23 | | 14 | | 17 | | 20 | |
| Mean number of bites 10 min. | 1,5 | 0,4 | 7,7 | 1,7 | 15,2 | 1,7 | 23,0 | 3,4 |
| No. of periods of 10 min. | 32 | | 17 | | 28 | | 23 | |

## DISCUSSION

The findings reported here present the interesting possibility that visual stimuli may be more important in long line fishing than has been assumed. The setting of a line in the beginning of an experiment as well as the struggle of a hooked fish present other fish with easily detectable movable objects. BRAWN (1969) has earlier demonstrated that movements of food stimulated feeding in cod. A bait above the bottom is also certainly considerably more visible than a bait on the bottom. It must, however, be remembered that the influence of visual stimuli is here demonstrated at a depth of only 25 meters and then for relatively small specimens of two species of fish in a certain physiological state. To what extent the findings are relevant to greater depth and other species of fish remains therefore to be investigated.

The decreasing number of fish in the vicinity of the line after setting is probably due to fish initially attracted by the line gradually leaving the area. The number of bites decreases more rapidly than the number

of fish, indicating a decreased tendency to bite for the fish present. This waning of the bite response may be explained by habituation caused by a lack of reinforcement as a fish receives no food when biting.

The most interesting results from the practical point of view is perhaps the superiority of a line placed some distance over the bottom to a line directly on the bottom in attracting and releasing bites in haddock. The spreading of olfactory stimuli is probably influenced by this difference and bottom-dwelling invertebrates could also reach a bait on the bottom better than a bait above the bottom. The effect is, however, considered to be due primarily to an increased visibility.

## SUMMARY

1. The behaviour of haddock and dab in relation to a experimental long line has been investigated using a low light underwater TV in the field.

2. The maximum attraction of fish and the highest frequency of bites were found in connection with the setting of the line and decreased markedly in the course of one hour.

3. A line above the bottom attracted more haddock and produced a higher bite frequency than a line on the bottom.

4. A hooked fish seemed to have a positive attraction for other fish.

## REFERENCE

Brawn, M. V. 1969. Feeding behaviour of cod (Gadus morhua). J. Fish. Res. Bd Canada, 26: 583-596.