International Council for
the Exploration of the Sea

C.M. 1986/H.70
Pelagic Fish Committee
Ref: Fish Capture Committee
Theme session U

REPEATED ACOUSTIC SURVEYS ON SMALL HERRING IN A FJORD AREA

by

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ABSTRACT

This paper describes an acoustic survey on small herring in a fjord in Northern Norway which was carried out three times during the same night. The survey speed was 4 knots during two of the survey runs and once 8 knots.The integrator output for each of the surveys showed a variation of less than 10% of the mean integrator output.

INTRODUCTION

In order to have any confidence in a method for fish abundance estimation, repeated measurements using this method should of course give comparable results.

Several authors have reported deviations in acoustic abundance estimates from repeated surveys (Aglen, 1983, Thorne, 1977, Buerkle, 1985).

The present paper reports on an experiment where three repeated surveys gave compareable results. The surveys were carried out under good conditions for acoustic abundance estimation. There was a well defined distribution area and scattering layers of varing density.

METHODS

The survey was carried out by the R/V "G O Sars". The vessel is equipped with a 38 kHz echo sounder and a digital echo integrator. The integration system was calibrated by the standard copper sphere calibration method. (Foote et al. 1983).

Fig. 1 gives an outline of the Lavangen fjord. The fjord area is approximately 6 nmi^2 The figure also shows the survey grid which was run 3 times.

RESULTS

The resulting integrator outputs (m^2 reflecting surface per square nautical mile) are given in Table 1.

Figs. 2-4 gives the changes in density distribution of the small herring during the surveys.

Fig. 6 gives jthe length and age distribution of the herring

DISCUSSION

Some of the reasons for deviating acoustic abundance estimates on repeated surveys which have been reported earlier are listed below:

A. Different fish aspect angles during day/night recordings. (Traynor 1986).
B. Change in mean depth between surveys with associated threshold effects. (Aglen 1977).
C. Patchiness.
D. Migration.
E. Dense schools with absorbtion and shadowing.

In the present experiment all surveys were carried out during "night" conditions. The time lag of the experiment was about 6 hours (Table 1) In Northern Norway there are very few hours of daylight at this time of the year, so the light conditions should be practically the same during the whole experiment.

There was similar type of echo recordings in the same depth interval (Fig. 5), and no extreme patchiness was recorded. Sound absorbtion and acoustic shadowing should not be a problem in these recordings.

In the open sea there may be difficult to determine the exact borders of the distribution area. However, in a fjord system as Lavangen, the narrow outlet will be the only possible "escape route" for the herring. During the present experiment there was a certain outward migration of the herring (Figs. 2-4) as time proceeded. The estimate from the last survey run is also the lowest, indicating that some herring may have migrated out of the survey zone.

To summarize,the present experiment was carried out with:

1) Ideal conditions for echo integration.
2) Well defined borders of the herring distribution.
3) Short time interval between the survey runs.

From table 1 it can be seen that the variance in the echo integrator output from the 3 runs was less than 10% of the mean integrator value.

The experiment shows that under conditions which are suitable for acoustic surveys, it is possible to carry out repeatable surveys with comparable results.

Table 1.

Survey	Time (UTC)	Speed (knots)	Integrator output	Average	% of average
1	2143-2350	4	25505		103
2	2350-0124	8	26393	24808	106
3	0124-0344	4	22527		91

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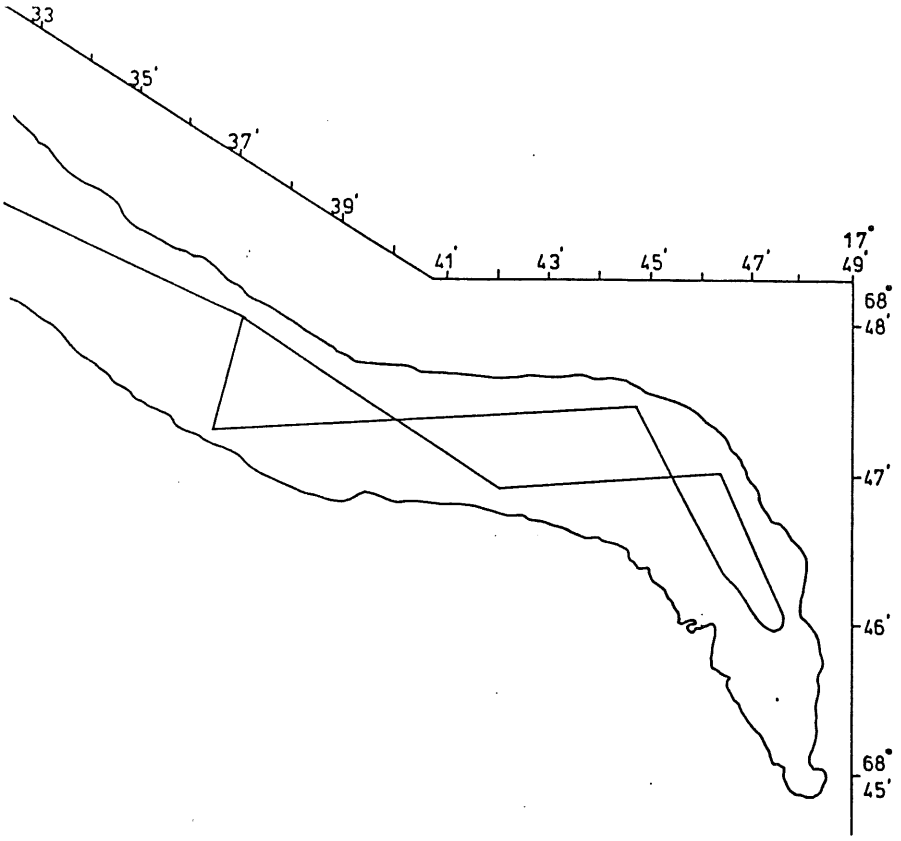

Fig. 1 Geographical outline of Lavangen fjord. Survey tracks indicated.

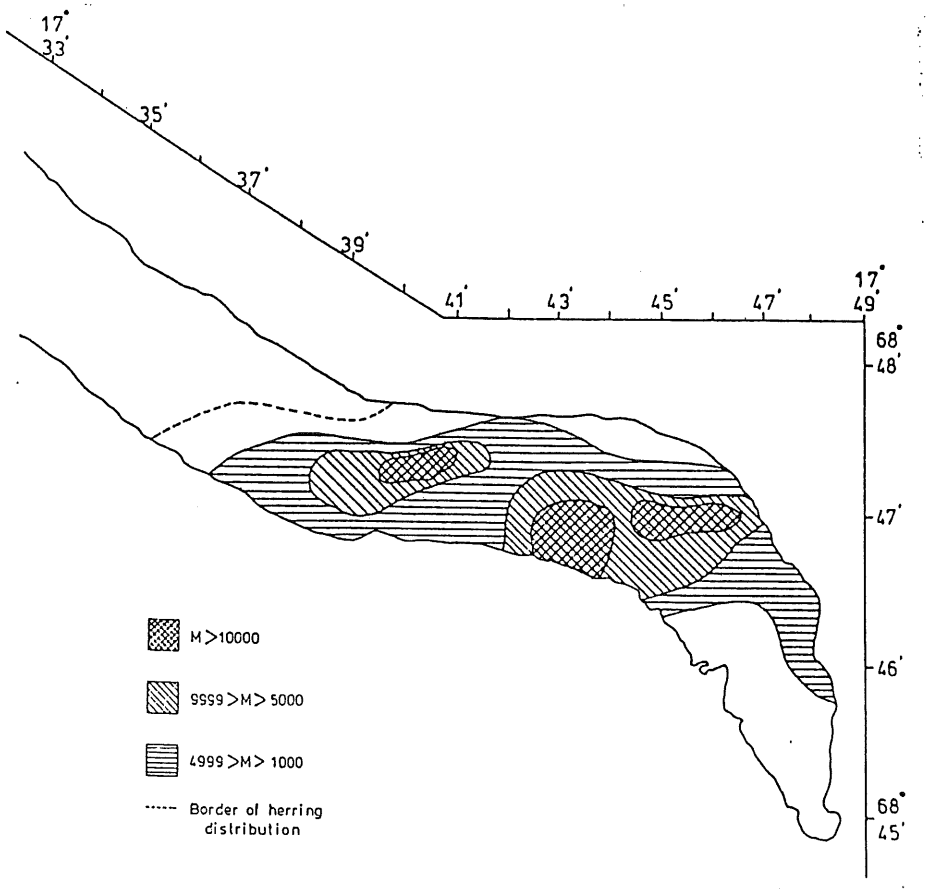

Fig. 2 First survey run. Density distribution (M=integrator output) of small herring.

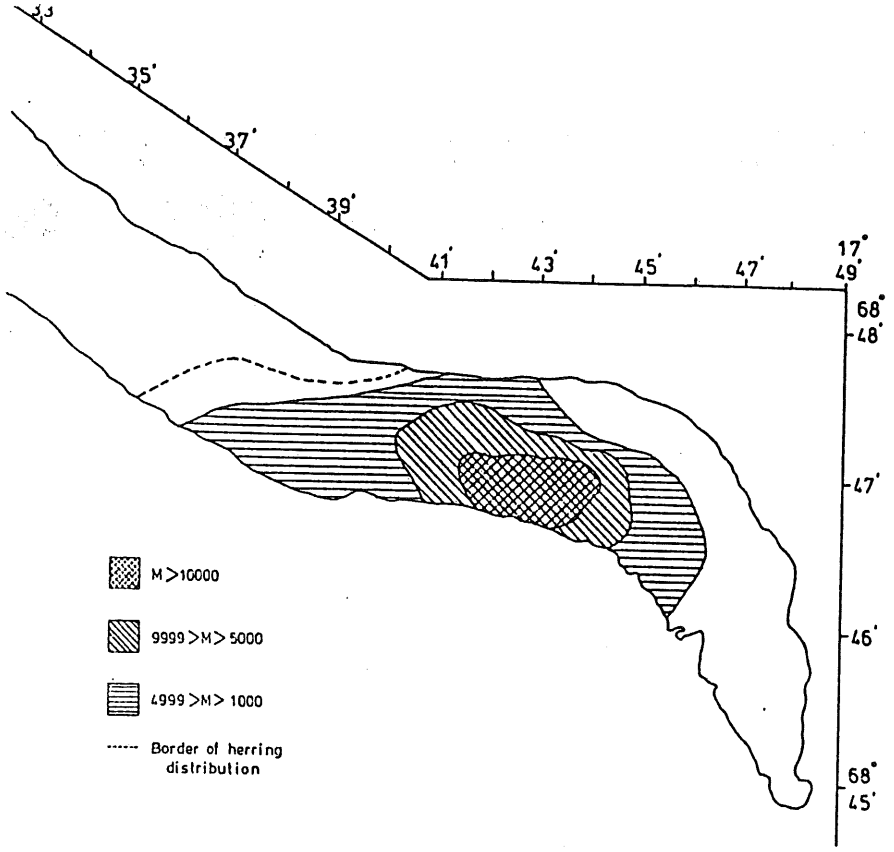

Fig. 3 Second survey run. Density distribution (M=integrator output) of small herring.

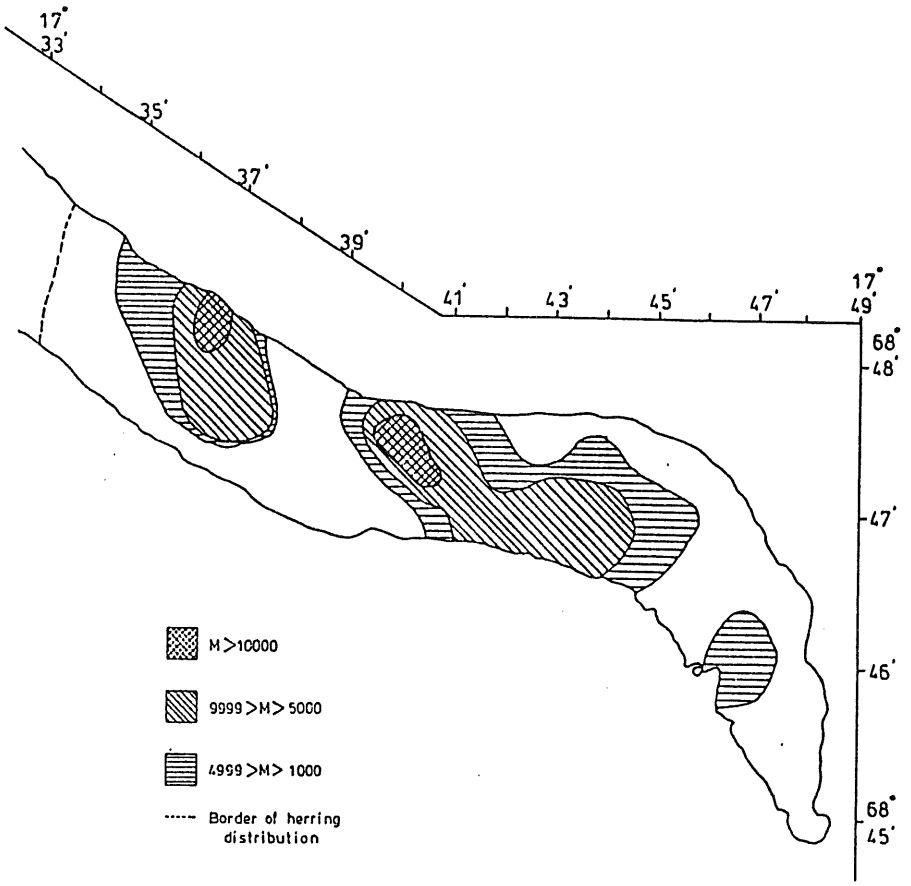

Fig. 4 Third survey run. Density distribution (M=integrator output) of small herring.

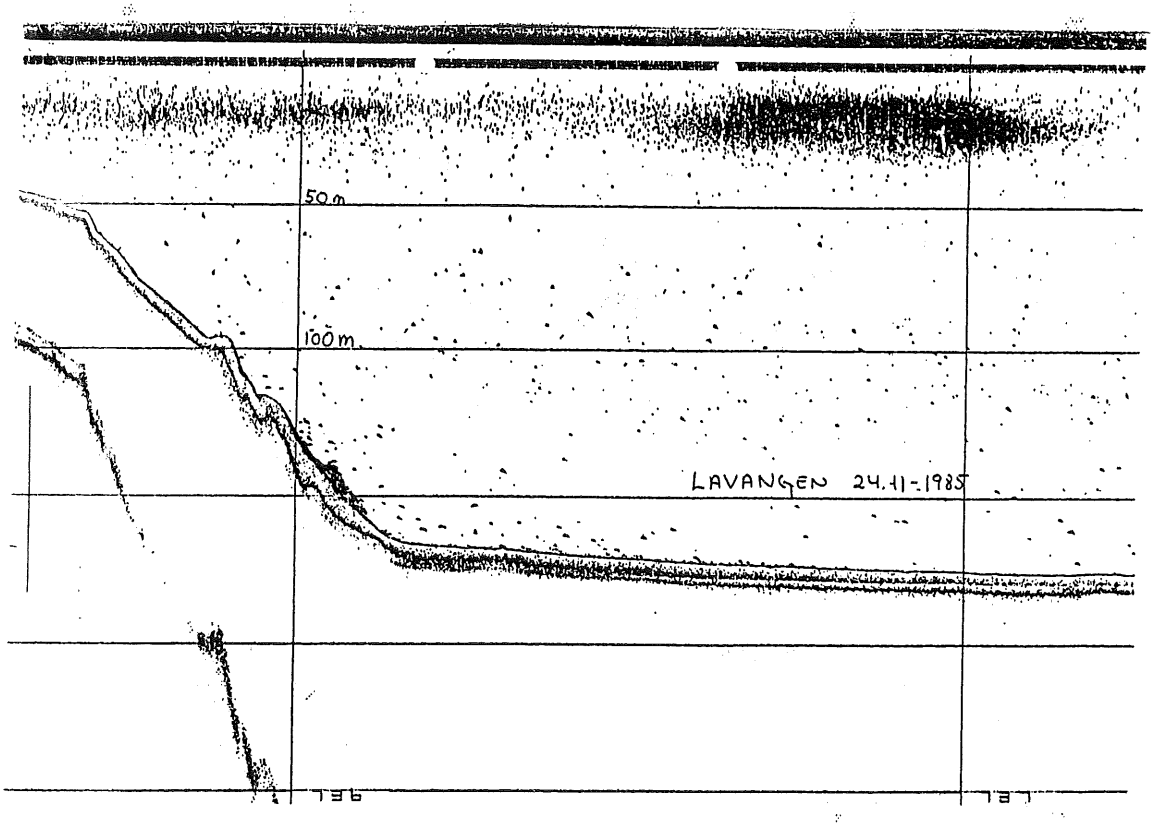

Fig. 5 Typical echogram of a small herring recording

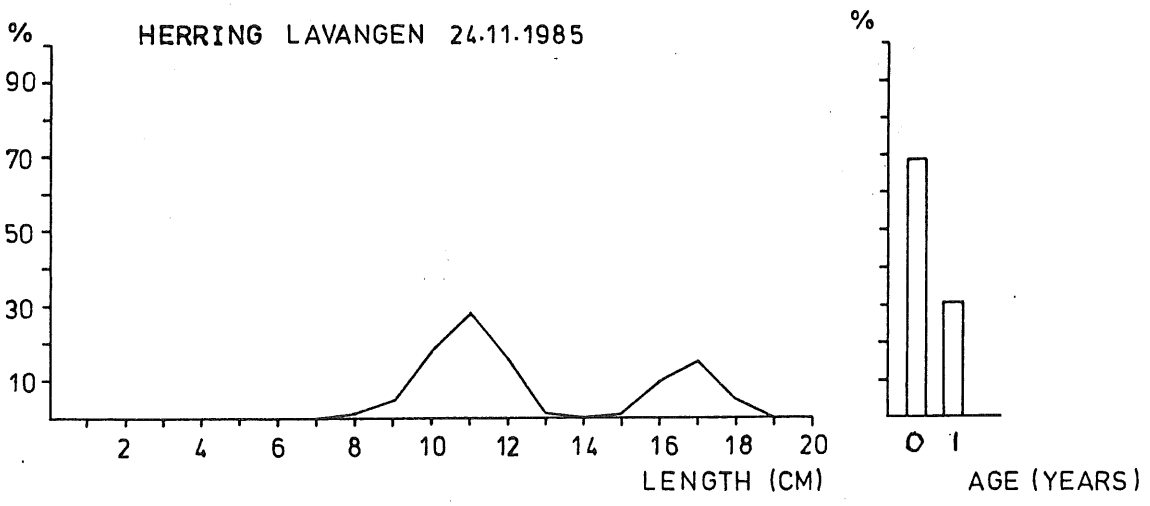

Fig. 6 Length and age distribution of herring, Lavangen, 851124.