THE NORWEGIAN SURVEY METHOD

by

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ABSTRACT

An echo integration system is applied to obtain estimates of relative fish density along the ship's courseline. Frequent trawling provides information on the fish distributions (species, size and age) which are contributing to the integrated echo intensity. Conversion factors between relative and absolute densities are calculated from empirically determined relationships between target strength and fish species and size and the performance figures of the integration system. Finally the total amount (number of individuals and weight) of fish in each category (species, sizegroups or agegroups) are found by area integration of the calculated densities. The method has been used to estimate the capelin stock size in 1971-1975 and the results are in accordance with those from tagging experiments.

DR.P.O.JOHNSON: There is the problem of sampling with midwater trawls particularly in daylight where one tends to get fish stratification by size. When using a trawl do you fish in depth steps or do you take it over a range of depths, or keep it at a constant depth in relation to the shoal. The results could be biassed if one sampled only the smaller fish for example.

MR.NAKKEN: It is necessary to do some stratified sampling and to use the echo intensities as a guide to overcome this problem. On very low intensities we sample very little but on high echo intensities we have a large number of trawl stations at different depth levels.

MR.STEWARDSON: Were you able to estimate fish densities from your results, i.e. the number of fish m^3 ?

MR.NAKKEN: No unfortunately this is not possible. All the intensities are average values over one nautical mile and to estimate the number of fish per m^3 over the nautical mile would have very little meaning.

MR.R.SHOTTON: How far apart were the survey transects and how did you obtain your density count diagrams ?

MR.NAKKEN: .   The transects are 22 every second degree of longitude which means 22 nautical miles between transects on average. Interpretation of data so that the diagram can be produced results in plotting of the total strength of the M value for a nautical mile.

DR.McCARTNEY: You showed empirical data for TS of cod from 7cm to 1m. To get those numbers did you take measurements from a representative range of fish ?

MR.NAKKEN: From 6cm to 80cm we have taken measurements.

DR.McCARTNEY: Do the length coefficients in the TS regression tie up with those of other workers ?

MR.NAKKEN: Yes, very well.

DR.CUSHING: Do you conclude from the mean value you get that numbers are proportional to intensity.

MR.NAKKEN: We try to select a time of year when we do not expect any saturation density because the capelin is young in scattering layers. So we know from the echograms where the seabed echo disappears in wintertime when the capelin

are migrating and we would not use data from such concentrations. We pick a time when the behaviour of the fish suits us; it is also a time when the capelin will not be mixed with other species. There is a contribution of polar cod in the trawl catches of 2 to 5% from year to year.

MR.TRAYNOR: How near to the seabed do you integrate and what proportion of the stock do you think is at the bottom ?

MR.NAKKEN: We use a pulse length of 0.6 milli-second and a beamwidth to the 3dB points of approximately 6°. This means that at 200 m depth with a fairly regular seabed the nearest we can get is 3 m. Some years there is no sign of echo traces at the seabed but in other years a lot of capelin will be there.