International Council for the
Exploration of the Sea

C.M.1969/B:3
Gear and Behaviour Committee

REPORT FROM THE ICES/FAO ACOUSTIC TRAINING COURSE

HELD IN SVOLVÆR, NORWAY, 2 - 15 March 1969

by

Lars Midttun
(Convenor)

1. General

The ICES/FAO Training Course in the Use of Acoustic Methods in the Study of Fish Stocks, with special reference to abundance estimation, took place in Svolvær, Norway, 2 - 15 March 1969. A list of participants is attached.

The programme was outlined on beforehand by a Working Group (MM. Cushing, Midttun, Parrish, Scherbino (ICES), and Sætersdal (FAO)), and preparations and arrangements were carried out in co-operation with the Institute of Marine Research, Bergen.

During the Course a Steering Group was established (MM. Craig, Cushing, Midttun, Olsen, and Sætersdal).

With smaller modifications the Course was completed in full accordance with the planned programme. The first five days were used for lectures, demonstration and "dry"-training with equipment ashore. The next five days field training onboard the different participating research vessels took place. The last days were used for Working Group activities, data processing, reporting and final discussions.

2. Lectures

The lectures were based on the FAO Manual[x)] made available just in time for the Course.

The following general lectures were given:-

1) Physical principles of sound transmission and reflection in water (by L. Midttun).
2) Description of sonar equipment (by R. Mitson).
3) Description of characteristics of echo-records (by G. Sætersdal).
4) Methods of identifying echo-records (by R. Craig).
5) Abundance estimation from echo-records (by D. H. Cushing).
6) Design and operation of echo-surveys (by R. Craig)
7) New development in sonar technique (by D. H. Cushing).

After each lecture the floor was open for discussions. Reports of the discussions have been prepared.

After the general lecture on Abundance estimation one full day was assigned for some sort of symposium.

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x) Manual of Methods for Fish Stock Assessment. Part V. The Use of Acoustic Instruments in Fish Detection and Abundance Estimation. (B. B. Parrish, ed.). FAO Fisheries Technical Paper, No.83, Rome 1969.

The first and longest part of this section was devoted to discussion of various methods developed to count descrete scatterers.This would also be the objective of the practical exercise of the Course. Secondly, possible methods of measuring the abundance of organisms, when occurring as multiple scattererers, in layers and schools, were discussed. Short lectures were given by:

1) Cushing: The Lowestoft Method
2) Craig: The Aberdeen Method
3) Dowd: The Dartmouth Method
4) Nakken: The Bergen Method
5) Scherbino: Work done in USSR
6) Shibata: Work done in Japan
7) Olsen: The Estimation of School Size from Echo-Traces
8) Bodholt: Quantitative Measurement of Scattering Layers.

3. "Dry"-Training

Equipment for "dry"-training was placed at disposal by the SIMRAD Company. An echo-sounder and some additional equipment were simulated in operation by playing back from a special typerecorder various characteristical echo-records, collected on beforehand during actual echo-surveys. A horizontal Sonar set was also demonstrated.

This part of the Course was conducted by G. Vestnes.

4. Calibrations

A special lecture was given by P. Pettersen on the calibration of echo-sounder and sonar sets. The following day an actual calibration of the "G. O. Sars" equipment was carried out in the Trollfjord, few hours steaming from Svolvær.

5. Field Training

The following research vessels were placed to disposal for the Course:

R/V "Tridens", Netherlands
R/V "Clione", England
R/V "Clupea", Scotland
R/V "G. O. Sars", Norway

Since they carried somewhat different acoustic equipment, it was felt necessary to let all trainees do survey trips on all vessels. Consequently, four working groups were established, each with one group leader, and four surveys were completed by all vessels . S. Olsen was appointed "fleet commander". He designed the survey programme which was repeated all days by all the vessels; "Clupea" made her survey by day-time, whereas the other ships made night surveys.

Attached are short descriptions of the survey programme of each ship. The Canadian programme was carried out onboard the "G. O. Sars".

6. Data Processing and Group Reports

Each group prepared reports from their different surveys; when possible, charts were drawn for fish distribution and density.

7. Discussion

Among the questions discussed during the final section of the Course, three points were of particular importance:

1) The efficiency of the Course could probably have been improved by:

   a) The Manual should have been available on beforehand. (This was by no means possible).

   b) Collecting a more homogenous group of trainees.

   c) Increasing the "dry"-training porgramme. Only one half day was available for this part. In connection with this, the importance of simulator systems was pointed out. A Working Group (Mitson, Vestnes, Forbes) prepared a short specification for such equipment.

2) In connection with the general discussion of biological and engineering aspects, it was pointed out how important it is to have a permament forum in ICES, particularly for acoustics. Since many subjects are covered by the Gear and Behaviour Committee, the experts dealing with the field of acoustics are not always able to attend the ICES meetings. It was recommended that a sub-committee under the Gear and Behaviour Committee should be established, and the Convenor offered to raise the question for discussion in this Committee.

3) It was further recommended that steps should be taken to organize a Symposium on "Acoustic Methods in Fisheries Research", to be held not before 1972.

8. Final Remarks

The Convenor would like to state that, thanks to a good co-operation from the participating persons and organizations, the arrangement went very smoothly. Great credit should be given to the excellent work of the research vessels. The hospitality shown to us by the Norwegian Director of Fisheries, the Major of Svolvær, the SIMRAD Company, and the captains on the research vessels was greatly appreciated by the members of the Course. By his talk on "The Lofoten Fishery down the Ages" Rector Hansen of Svolvær Gymnas gave a charming introduction to one of the most classical fisheries of the World.

A somewhat more comprehensive report from the Course will be prepared in co-operation with the FAO representatives of the Course, and presented to the Gear and Behaviour Committee.

Bergen, 19th April 1969.

2 Appendices

Appendix I

Acoustic Training Course, Svolvær, 2 - 15 March 1969

Revised List of Participants

EXPERTS

Name	Address
Helge Bodholt,	Simonsen & Mustad, HORTEN, Norway.
R. E. Craig,	Marine Laboratory, P.O.Box 101, Victoria Road, ABERDEEN, Scotland. AB9 8DB
D. H. Cushing,	Fisheries Laboratory, LOWESTOFT, Suffolk, U.K.
Richard G. Dowd,	Marine Ecology Laboratory, Bedford Institute, DARTMOUTH, N.S., Canada.
Mars Midttun (Convenor),	Directorate of Fisheries, Institute of Marine Research, Postbox 2906, 5011 BERGEN-NORDNES, Norway.
R. B. Mitson,	Fisheries Laboratory, LOWESTOFT, Suffolk, U.K.
St. Olsen,	Fisheries Department, FAO, Via delle Terme di Caracalla, 00100 ROME, Italy.
B. B. Parrish,	Marine Laboratory, P.O.Box 101, Victoria Road, ABERDEEN, Scotland. AB9 8DB
Per Pettersen,	Simonsen & Mustad, HORTEN, Norway.
Gunnar Sætersdal,	Fisheries Department, FAO, Via delle Terme di Caracalla, 00100 ROME, Italy.
Gudmund Vestnes,	Directorate of Fisheries, Institute of Marine Research, Postbox 2906, 5011 BERGEN-NORDNES, Norway.

STUDENTS

FAO Participants:

Michael Ansa-Emmin,	Fishery Research Unit, P.O.Box B-62, Community 2, TEMA, Ghana, West-Africa.
Percy Cano Iglesias,	Instituto del Mar, CHUCNITO-CALLAO, Peru.

Name	Address
Martin O. Nelson,	Bureau of Commercial Fisheries, Exploratory Fishing and Gear Research Base, 2725 Montlake Blvd. East, SEATTLE, Washington 98102, U.S.A.
José Alindogan Ordoñez,	Marine Fisheries Biology Division, Philippine Fisheries Commission, Real St. Corner Magallanes St., Intramuros, MANILA, Phillipines.
Nelson Roig Perez,	Centro de Investigaciones Pesqueras, Playa Habana, BAUTO, Cuba.
Capt. K. Shibata,	Prof. of Fisheries, Nagasaki University, NAGASAKI, Japan.
ICES Participants:	
Hans Ackefors,	Institute of Marine Research, S-453 00 LYSEKIL, Sweden.
Erling Bakken,	Directorate of Fisheries, Institute of Marine Research, Postbox 2906, 5011 BERGEN-NORDNES, Norway.
Gerard Boonstra,	Fisheries Directorate, Technical Research Department, Huygensstraat, 1 IJMUIDEN, Netherlands.
Janusz Burczynski,	Sea Fisheries Institute, GDYNIA, Al. Zjednoczenia 1, Poland.
Manuel Lima Dias,	Instituto de Biologia Maritima, Cais do Sodré, LISBOA 2, Portugal.
Sinclair T. Forbes,	Marine Laboratory, P.O.Box 101, Victoria Road, ABERDEEN, Scotland. AB9 8DB
Hörður Frimannsson,	Fiskifélag Islands, REYKJAVIK, Iceland.
David Griffith,	Department of Agriculture and Fisheries, Fisheries Division, 3, Cathal Brugha Street, DUBLIN 1, Ireland.
Wolfgang Horn,	Bundesforschungsanstalt für Fischerei, 2000 HAMBURG 50, Palmaille 9, Germany.
Brian W. Jones,	Fisheries Laboratory, LOWESTOFT, Suffolk, England.
Per Kanneworff,	Grönlands Fiskeriundersøgelser, Jægersborgallé 1 B, DK-2920 CHARLOTTENLUND, Denmark.

Name	Address
Armin Lindquist,	Institute of Marine Research, Royal Board of Fisheries, LYSEKIL, Sweden.
Odd Nakken,	Directorate of Fisheries, Institute of Marine Research, Postbox 2906, 5011 BERGEN-NORDNES, Norway.
Marst Scherbino,	VNIRO, V. Krasnoselskaja 17, MOSCOW, USSR.
H. Schultz,	Bundesforschungsanstalt für Fishcerei, 2000 Hamburg 50, Palmaille 9, Germany.
Per Solemdal.	Directorate of Fisheries, Institute of Marine Research, Postbox 2906, 5011 BERGEN-NORDNES, Norway.
Hjalmar Vilhjalmsson,	Marine Research Institute, Skúlagata 4, REYKJAVIK, Iceland.
Olgierd Wrzesinski,	Morski Instytut Rybacki, GDYNIA, Al Zjednoczenia 1, Poland.

Appendix II

ICES/FAO Sonar Training Course

PROGRAMME OF THE FIELD TRAINING

"Clupea" will leave Svolvær on Sunday, Monday, and Tuesday, and Wednesday at 0900, returning at 15.30.

She will carry out an echo-survey for cod shoals in Vestfjord using the 400 kHz sounder, and one conventional echo-sounder. The ship is fitted with a Kelvin Hughes MS 35 sounder and Simrad SK 3 sonar.

In addition, underwater photographic equipment will be available for inspection, and operation will be carried out to try to photograph the Lofoten cod.

Craig

Exercise onboard "G. O. Sars"

1. Select the amplifications of sounder and CRT.

   The sonar equation is: $E = S + T - 2H$

   E can be expressed as: $E = RS - (F_e + F_s) + U$

   RS = receiving sensitivity

   F_e = amplification sounder

   F_s = amplification CRT

   U = CRT-reading.

2. Count the number of recorded fish for each nautical mile (paper count and integrator count) and write the numbers per nautical mile on provided sheets.
3. Obtain distributions of E from CRT-readings and find T.
4. Calculate the sampling volumes (sampling areas).
5. Calculate the number of fish per unit surface area. Draw a chart which shows the density distribution in the area surveyed.

Nakken

Programme of work on R/V "Clione"

Survey will be made using the Humber gear and the Lowestoft 100 kHz sounder. Counters will be used on both equipments yielding numbers of individual fishes and numbers of shoals. Estimates of average signal from fish will be made and hence average size and sampling volume from tables.

A UV recorder will also be used to examine the trace patterns in time.

D. H. Cushing

Programme for use of Canadian counting system by trainer

1. Obtain recorded counts for individual echos logging time and using ships to obtain distance travelled.
2. Study the number of overlaps obtained from repeat counts.
3. Do exercises correcting repeat counts for simple overlap.
4. Make comparisons between Norwegian integration system and counting system correcting for different beam angle of the two units and comparing the counts with voltage level for a single transmission.
5. Do number 4 with different densities of fish.

Dowd

Sea Training Programme onboard R/V "Tridens"

Mapping the cod distribution in the survey area by counting individual fish traces and plotting the results on a map in terms of no. of fish per unit surface area.

This will be done from the echo-records of one or more of the echo-sounders available (Elac, Kelvin Hughes, Simrad), for which the sampling volumes are to be estimated.

S. Olsen