The Use of Acoustic Ground Discrimination as a Precursor to the Estimation of Shellfish Abundance

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Estimates of biomass of highly aggregated, epi-benthic and infaunal populations are frequently biased through sampling error attributable in part to the assumption of spatial homogeneity of density over a given area and the assumption of equal catchability of the target species over the entire area surveyed, related to variable bottom type.

This contribution identifies an opportunity to deploy a seabed classification system (ROXANN)[1] to first assess the nature of the seabed prior to stratification and resource estimation. This becomes particularly useful when very large areas are to be efficiently explored for the presence of a given species prior to any attempt at estimating abundance. Once the equipment is calibrated for a particular bottom type associated with the presence of a species, it can be used in a reconnaissance mode to echo-locate other grounds suitable for the presence of the species without actually fishing. This assists in the stratification of the area to obtain robust estimates of abundance and can result in a smaller variance than simple random samples. If each stratum is homogenous, it is possible to obtain a precise estimate of any stratum mean from a small sample in that stratum.

Separate estimates can then be combined to produce a precise estimate for the megapopulation. We have attempted to use this procedure for the estimation of abundance of two sedentary species in the Newfoundland and Labrador area: viz. The Arctic Surf clam[2], *Mactromeris polynyma* and the Iceland scallop, *Chlamys islandica.*

ROXANN assesses the nature of the seabed by establishing two indices. The first, E1, is created by measuring the signal strength from the oblique back-scatter reflected signals from the first echo return. The second, E2, is created by measuring the signal strength from the second, or double reflection from the sea surface, giving a hardness parameter. In combination, these two indices provide an unambiguous signature for most seabed types, including benthic assemblages containing a given species. In addition to optimization of survey design, there are other benefits as well, e. g. the track file can be re-analyzed to provide contextual bathymetry. Also, the data may be exploited by other user groups, sometimes in ways not originally envisaged.

Specialized software is used for real time data interpretation. Subsequently, the data may be exported in ASCII format, allowing the user to manipulate the information using a variety of standard software.

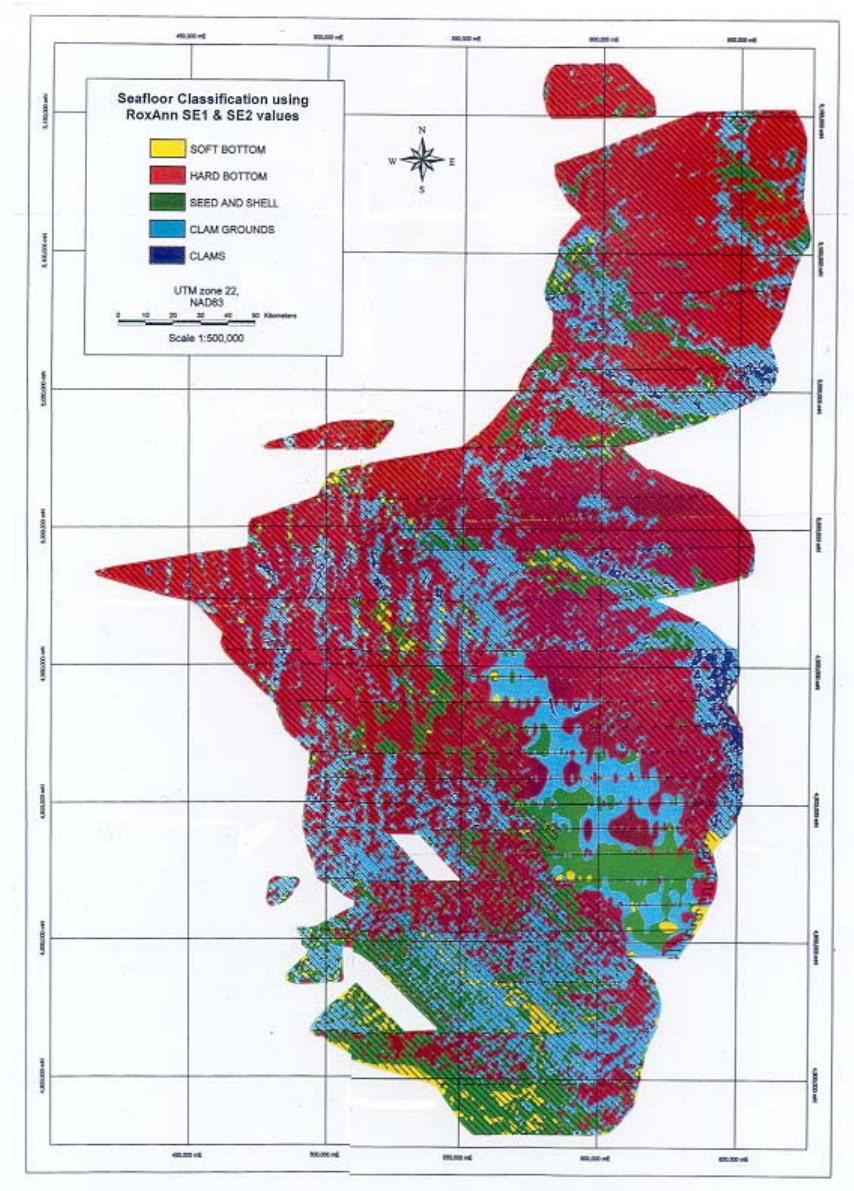
Data on seabed types for any area can be assembled not only during dedicated research missions, but may be supplemented by information collected opportunistically during resource surveys in the area for other species and when the vessel is in transit. The data can be pooled from other vessels to produce a composite of the distribution of seabed types. Examples of how we have assembled such data for the Iceland scallop in the Strait of Belle Isle (NAFO Div. 4R) and for the Arctic surf clam over the vast apron of shelf commonly called the Grand Banks of Newfoundland (NAFO Div. 3LNO) are provided and discussed.

0-933957-31-9 P2736

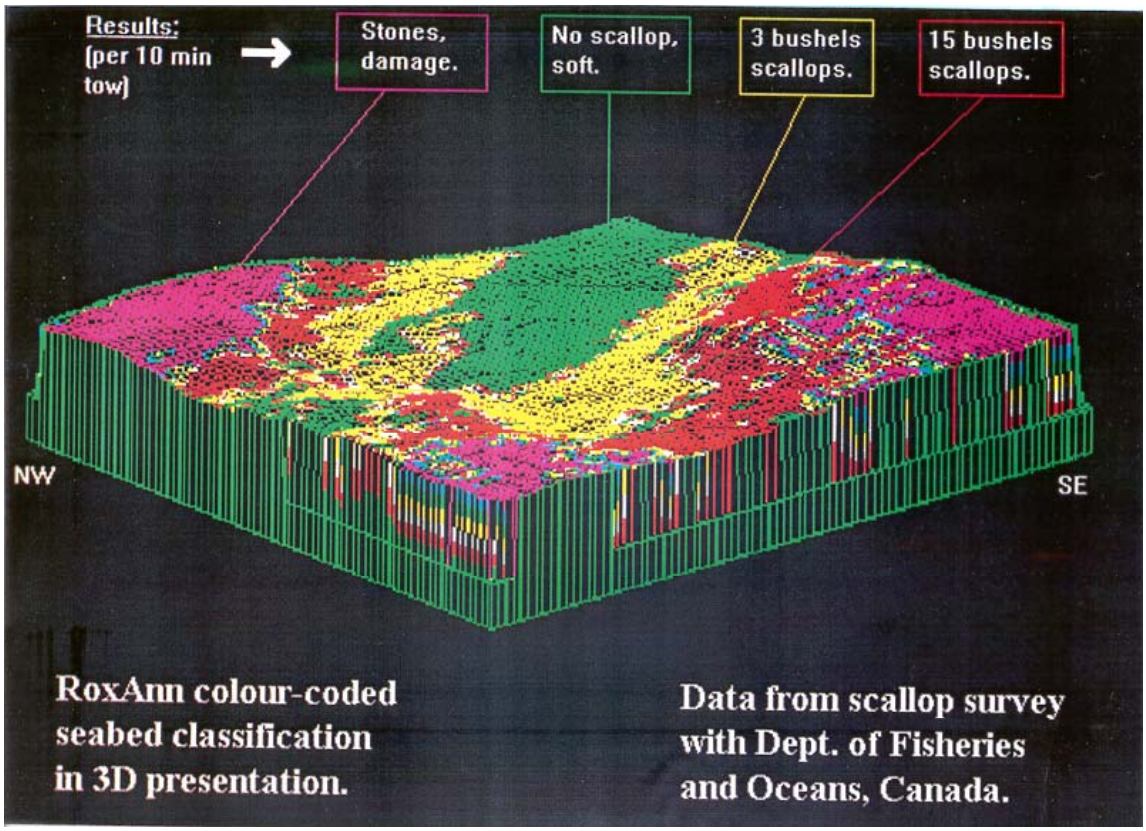
Overall, the acoustic ground discrimination technology is quite promising for a variety of applications involving sedentary shellfish and offers considerable potential for both scientific and commercial use.

[1] Reference to Trade name does not necessarily imply endorsement of product by the Department of Fisheries and Oceans.

[2] ROXANN sweeps for the occurrence of the Arctic surf clam were conducted in partnership with Clearwater Fine Foods Inc. Bedford, Nova Scotia.



Only 3,400 nmi^2 (out of 12,300 nmi^2) over the Grand Banks of Newfoundland <100m depth were found to be suitable for the presence of the Arctic surf clam. Acoustic data from 14,000 linear track miles were used in producing this composite.


Results:
(per 10 min tow)
Stones, damage.
No scallop, soft.
3 bushels scallops.
15 bushels scallops.
NW
SE
RoxAnn colour-coded seabed classification in 3D presentation.
Data from scallop survey with Dept. of Fisheries and Oceans, Canada.