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# Reliability of species identification from mid-water trawl catches during acoustic surveys : a catchability study

by

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## ABSTRACT :

Objective echoes identification is not possible nowadays when several species are present in an area. Mid-water trawl catches are usually used to split fish schools into species during acoustic surveys. Moreover it is well known that because of a lively behaviour of these types of species, the catchability may vary a lot from one species to another. Therefore, in order to verify the reliability of identification by trawling, 68 hauls carried out during 4 acoustic surveys (1991-1994) have been analysed. Five pelagic species (anchovy, mackerel, horse-mackerel, sprat and sardine), observed during these surveys in Bay of Biscay were considered. On the one hand, taking into account the vertical echo-sounder data and the vertical course of the trawl from netsonde data, a theoretical weight was calculated, and compared with the real catch. The results showed that catchability varied a lot between species and within species according to school structure. On the other hand, a vertical avoidance of fish was simulated by changing the vertical trawl position to approach the real catch and study specific behaviours which could bias the identification. As a result, it seems that trawl species compositions could be used with a better precision by applying a correcting factor according to specific catchabilities if completed by an aggregation classification.

## INTRODUCTION

During acoustic surveys, when several species are present in an area and no objective echotraces classification is available, mid-water trawl catches are used to split fish schools into species. Moreover it is well known that because of a lively behaviour of these types of fish, the catchability may vary a lot from one species to another. Compared to catchability studies performed about bottom trawl (Godo, 1994), very few studies exist about catchability with mid-water trawls (Diner & Guerault, 1979; Suuronen, 1988).

Three different situations may occure : (1) One species is present in the area and the trawl catch confirms which species is concerned, (2) two species are present and a sharp discrimination may be done between two different types of echotraces. In this case, the acoustic energies are splitted into species according to the abundance of each echotrace categories, (3) several species are present and no objective criteria allows to split the echotraces into different groups. In this case the mid-water haul catch proportions are the only way to split energies into species (Massé & Rétiere, 1995).

Therefore, if a similar behaviour may be considered from one year to the other, in a similar context (season, geographical location, species associations), a yearly stock abundance relative index series for this area may be accepted for one species, whereas the abundance indices comparison between species for one year may be open to criticism. In areas where two species are closely associated, the more lively species may be strongly underestimated if a catchability correction is not applied.

This study analyses the catchability of several mid-water hauls where one species was predominant or alone. The objective is to determine if a specific correcting factor may be established in order to correct the real catches and therefore to split the acoustic energies into species in better conditions.

## MATERIAL AND METHOD

The data which are considered in this study were collected during 4 acoustic surveys carried out in the Bay of Biscay at spring 1991, 1992, 1993 and 1994. Five predominant pelagic species were studied : anchovy (*Engraulis encrasicolus*, L.), sardine (*Sardina pilchardus*, W.), mackerel (*Scomber scombrus*, L.), horse mackerel (*Trachurus trachurus*, L) and sprat (*Sprattus sprattus*, L.).

From the 123 mid-water hauls carried out during these surveys, 68 were selected according to specific composition where one species was predominant or alone and when a sufficient catch amount was observed (22 for anchovy , 8 for sardine, 8 for mackerel, 12 for sprat and 18 for horse mackerel).

A first visual approach of school structures observed during these fishing operations shows that except for mackerel and sardine, some hauls could be gathered according to aggregation patterns. In this case, for each species, new catchability coefficients may be calculated according to different types of aggregations (table 1). A significant decreasing of coefficients of variation is therefore observed which means that these new catchability coefficients are more suitable.

| | Agregation | C | C.V. |
|---|---|---|---|
| Anchovy | Type A: (n=4) | 42 % | **21 %** |
| | Type B : (n=4) | 16 % | **31 %** |
| | Type C : (n=5) | 11 % | **45 %** |
| | Others : (n=9) | 54 % | **39 %** |
| Horse mackerel | Type D : (n=7) | 46 % | **24 %** |
| | Others (n = 11) | 110 % | **62 %** |
| Sprat | Type E : (n=4) | 25 % | **64 %** |
| | Type F : (n=5) | 5 % | **60 %** |
| | Others : (n=3) | 89 % | **25 %** |

Table 1 - Catchabilities (averages and coefficients of variation) calculated for each species according to aggregation patterns.

A preliminary analysis of echo-traces performed school by school was done with MOVIES-B on five hauls data to try to confirm the previous hypothesis. This restricted approach is of course insufficient to be formally used in this study but it confirmed that the visual classification was obvious.

A particular analysis of anchovy catchabilities condider four different regrouping of hauls according to aggregation patterns (fig. 2 and annex 1-B) :

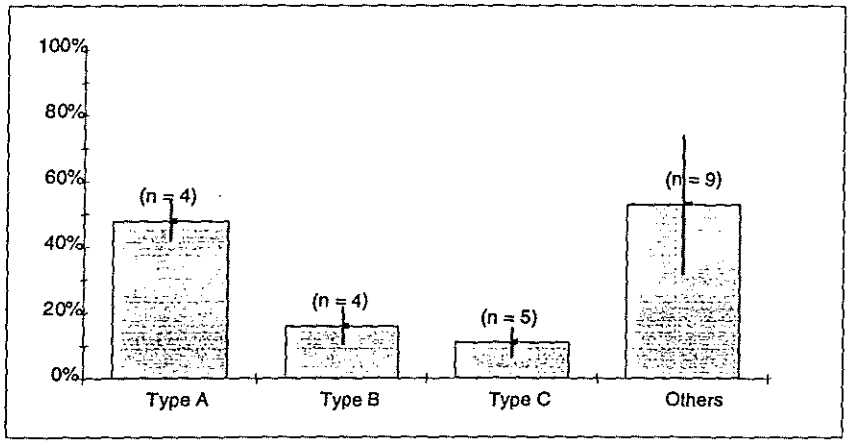



Figure 2 - Catchability (average and standard deviation) for anchovy according to aggregation patterns.

**References**

DINER N., 1982 - Essai d'application de l'échointégration à la mesure de l'efficacité des chaluts. CIEM B 12.

DINER N., A. WEILL, J.Y. COAIL and J.M. COUDEVILLE, 1989. INES/MOVIES : A new acoustic data acquisition and processing system. ICES,Doc. C.M. 1989/B:45.

DINER N. and D. GUERAULT, 1979 - Données préliminaires sur le comportement des petits pélagiques côtiers du Golfe de Gascogne vis-à-vis du chalut pélagique. CIEM.

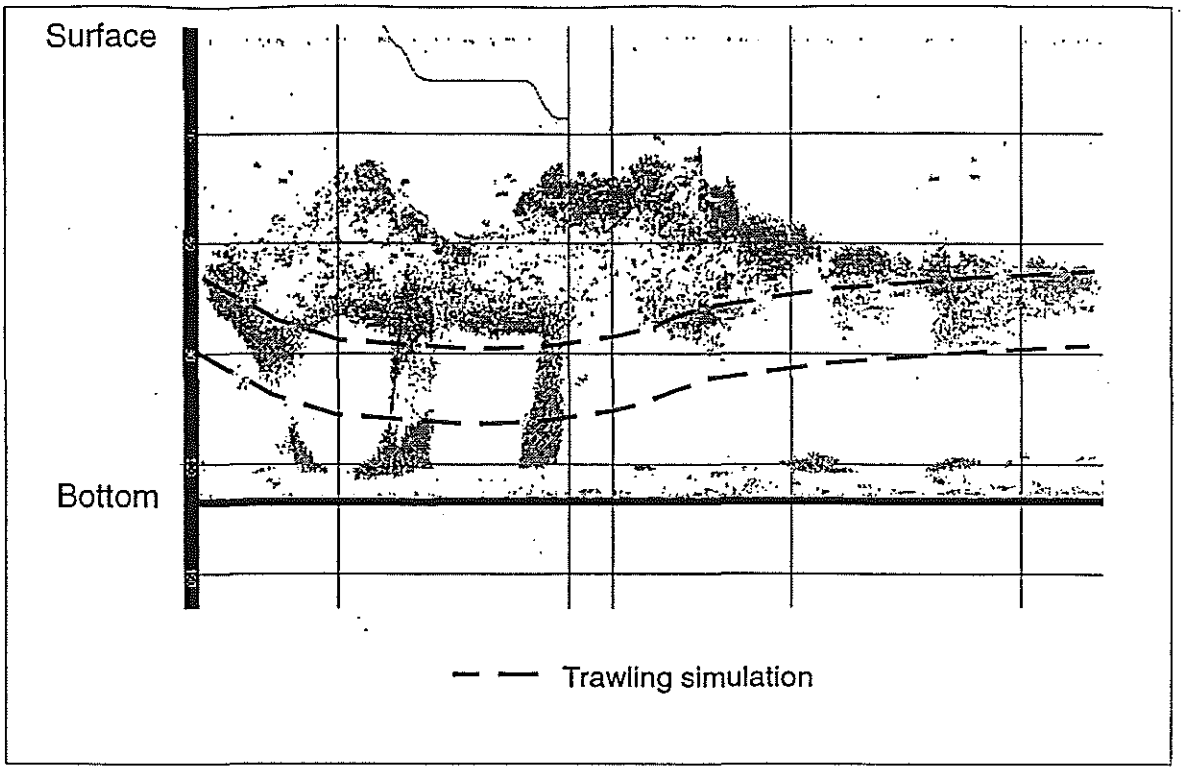
GODOE O. R., 1994 - Natural fish behaviour and catchability of groundfish. ICES G 14.

MASSÉ J. and N. RETIERE, 1995. - "Effect of the number of transects and identification hauls on acoustic biomass estimate under mixed species conditions". Aquat. Living Resour., 1995, 8, 195-199.

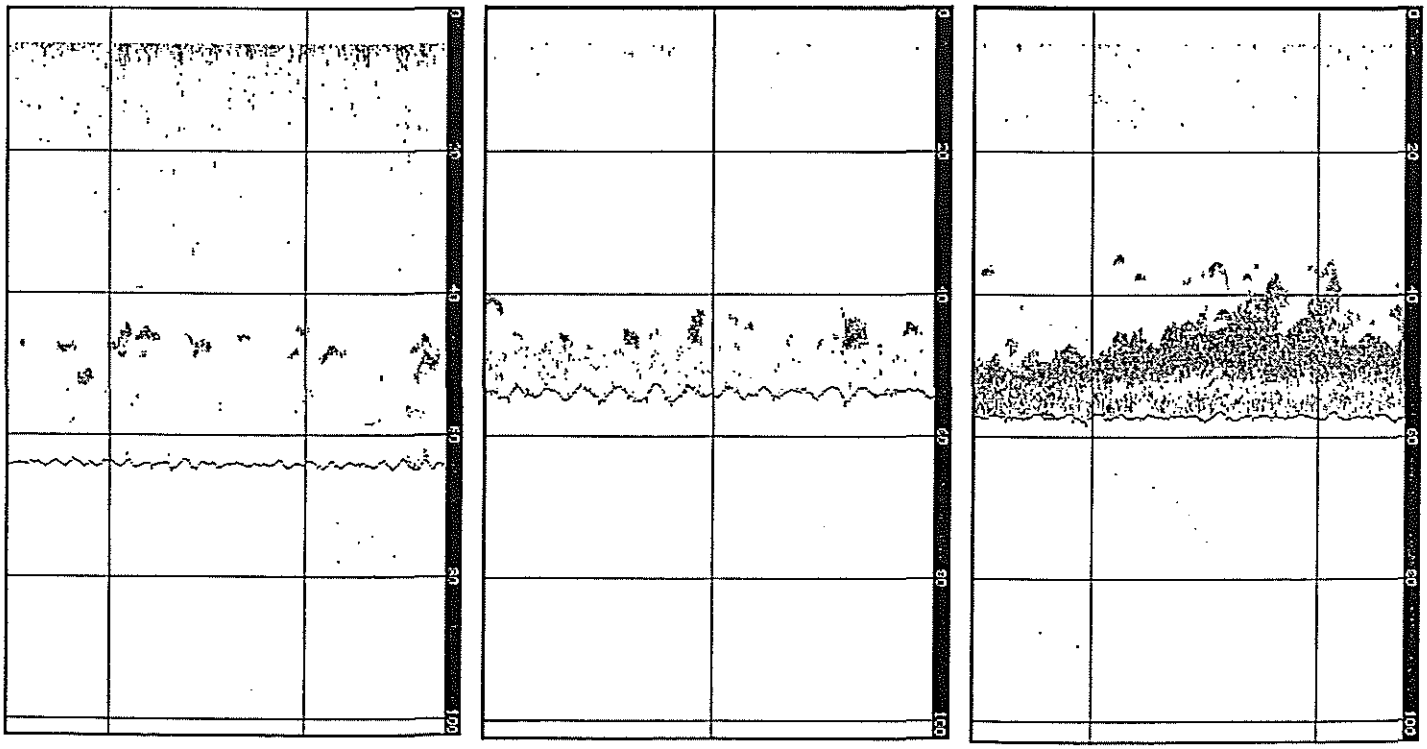
MASSÉ, J., C. KOUTSIKOPOULOS and W. PATTY, 1996 - The structure and spatial distribution of pelagic fish schools in multispecies clusters: an acoustic study. ICES Journal of Marine Science, 155-160.

SUURONEN P., 1988 - Behaviour of Baltic Herring in front of and inside midwater trawls as revealed by echo-sonding. ICES, B 43, Sess. P, Fish Capture Committee.

WEILL A., C. SCALABRIN, N. DINER, 1993. MOVIESB : An acoustic detection description software. Application to shoal species classification. Aquat. Living. Resour., 6, 255-267.




Annex 1- A - Calculation of theoretical catch by mid-water trawl.



Type A Type B Type C

Annex 1- B - Anchovy aggregation types as observed during acoustic surveys in the Bay of Biscay.