Information that Could Be Obtained from Ancillary Activities during Trawl Surveys

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Abstract

Ancillary activities could be carried out during the routine operations of a trawl survey; while, in general, the information is marginal to the principal aim of the research, it comes at almost no extra cost. Among the many possibilities, such as the measurement of physical-chemical parameters, simplified echosounding, checking of discards, utilization of other fishing gear, study of the bottom biocenoses, qualitative collection of eggs and larvae, improved evaluation of maturity, diet analysis, parasitology, ecotoxicology, the most rewarding potential seems to lie in mark-recapture experiments.

Introduction

Scientific trawl surveys, aimed at assessing abundance and evaluating the population parameters of fishery resources, are highly demanding in monetary terms, mainly because of the high cost of vessel time. Two approaches are possible to lower the cost of the information gathered during the surveys: reduce the sample size, or increase the amount of "information items" collected in a fixed-cost campaign. Since a sound experimental design is already conceived to eliminate redundancies and excessive data collection, only the second approach proposed is feasible. Besides, while many more data can be obtained with only a small increase in "hard" costs, their production for eventual users may require long (and costly) additional hours for handling and processing.

As a working definition, an "ancillary" activity is something that is not routinely considered part of the traditional "stock assessment" procedure, or something "ordinary" but which is carried out in more detail than usual; in fact, something ancillary during the trawl surveys may be considered essential in other scientific circumstances.

The amount, quality and synergic effects of the "extra" knowledge must justify the increase in hard costs, laboratory use and personnel time; of course, the collection of ancillary information should not interfere with the "normal" activities of the trawl survey.

There are ancillary activities which can be carried out on board the experimental trawl-survey vessel, in the “dead” times between hauls, and others which may be conducted on preserved samples in laboratory conditions, between fishing campaigns. Broadly speaking, contemporary catch-and-effort surveys may be ancillary to the offshore activities, and genetic analyses could be employed to discriminate stocks.

Measurement of physical (and chemical) parameters

Bottom-water temperature is now routinely registered with miniloggers during the Italian and European trawl surveys; if deemed necessary, other oceanographic parameters could be easily measured with multisensor probes to discriminate among water types. Even though bottom-water

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temperature is cheap and easy to measure, a few recent studies have failed to show a correlation of this particular parameter with the state of the biological resources, at least at the local scale.

Echosounding

Stock assessment with echo-locating devices is above the practical possibilities of a classical trawl survey; nevertheless, a simple correlation between the catch and the integrated output of an echo sounder may produce interesting results. An in-and-out use of hydroacoustics would not interfere with the fishing operation, and a good-quality research echo sounder is now an affordable investment.

Mark-recapture

Tagging and subsequently recapturing animals could be the most rewarding of the feasible ancillary activities; if the time lapse after the release is sufficient, recaptured specimens will provide information on migration and short-range movements, on actual growth, on true abundances, even on mortalities (though in special cases only). Many situations do influence the outcomes of a mark–recapture experiment, among which, the species biology, the behaviour of tagged animals, the amount of tagging effort, the intensity of fishing, the fishermen's attitudes in reporting. Without considering special (and expensive) tags, such as storage tags, radio tags, active and passive sounders, transponders and so on, or out-of-fashion ones (Petersen disks, opercular clips, rubber-banding, batch marking, etc.), three kinds of individual tags could easily be utilized: magnetic microwires, freeze branding, "spaghetti tags" (a.k.a. T-bars, streamers, Floy tags). Regarding tagging during trawl surveys, recaptures would probably come from commercial fishing; therefore, only the easy-to-read type of tag (“spaghetti tags”) could be employed.

Many models exist, but in essence the "spaghetti tag" consists of a plastic tubing, carrying a unique code and information for the casual retriever (this information usually comprises the name of the "owner" of the experiment, phone numbers to call, rewards, etc.), with a short anchoring line; this line is inserted intramuscularly (and in general, dorsally) with the help of a tagging gun. With some practice, and using medium-sized animals, it is possible to tag a few hundreds animal per hour, without anesthesia or complicated care.

First, fishermen of the southern Sicilian fishing fleets will be informed of the programme, directly and by the posting of notices, and offered a consistent reward (worth the extra care and handling required) for recovered tags.

Sturdy fish, such as dogfishes and skates, more able to tolerate the stress of a survey trawl, will be sorted out from the catch as soon as possible, and put into a water tank; after rapid classification, sexing, measuring and tagging, the animals will be released on the same spot. To enhance the chances of recovery, at least a few hundred fish must be released in each campaign.

Even a few recaptures will provide qualitative, but still useful, insight into growth and movement; more recaptures will allow a quantitative assessment and an idea of migratory patterns. Moreover, specimens recovered by the research vessels will provide information on the absolute abundance of the species.

Providing that the recovery rate is interestingly large, more species may be tagged, because this kind of high-quality information will be well worth the extra effort and money for this ancillary activity.

Discards

Fishermen discard part of their catch for different reasons, with a very subjective and variable attitude. Nevertheless, discards are "dead fish", whose death must be attributed to the overall fishing mortality (F), and not to the natural mortality (M). Estimating the amount and quality of the discards is important for any study based on landings. A real, true evaluation of discards, valid for the entire fishery, requires an *ad hoc* programme, but in the meantime the research team carrying out a trawl survey could ask the fishermen to sort the catch as they would do in a commercial fishing operation, and make a preliminary assessment of the rejects in terms of weight, number and species composition.

Other fishing gear

Trawling is only a part of the fishing effort, and in some instances targets only a particular component/fraction of the resources; in theory, it will be of great importance for a real stock assessment to fish also with different gears, such as trammel and gill nets, bottom longlines or baited traps. On the other hand, the interference with the ordinary work would be maximal if these other techniques were utilized on the same vessel; maybe the only non-disruptive activity is nocturnal jigging (for cephalopods).

Biocenoses

The catch from trawling is composed mainly of animals permanently linked to the sea , either real bottom-dwellers (the so-called benthos) or species living entirely close to the sea bottom (the so-called demersal species) or living there occasionally (e.g. for spawning), the so-called dermerso-pelagic species. The knowledge of the sea-bottom biocenoses is therefore essential in understanding the ecology of fishes of commercial interest. The collection of non-commercial benthic invertebrates may proceed by dredging or grabbing samples of the sediments; both procedures are disruptive of the daily routine of the trawl survey, especially when the sampling occurs at greater depths. In any event, grabbing seems an easier way to proceed. Only a van Veen grab (0.1 m^2), a steel cable and a power winch are needed as hardware, but this activity requires both onboard and laboratory time; to be of value, the taxonomical classification must reach at least the genus level. Besides the biological study, the grab sample should provide information on the bottom sediments.

Collection of eggs and larvae

Non-quantitative, non-depth-related samples are easy to collect, creating only a minimal interference with the at-sea activities; to be "ancillary", the study must be limited to the teleost component of the zooplankton. Using a Bongo 40 net (less than 0.25 m^2 mouth opening), the amount of material to be subsequently classified (at least to family level) in the laboratory should be minimal; however, this activity requires qualified personnel, trained in taxonomy. For simple classification purposes, the ichthyoplankton can be preserved in formaldehyde; liquid nitrogen should be used if counting daily rings in the otoliths is required.

Another approach to collect swimming fish larvae and early juveniles is to attract them into a sort of trap "baited" with chemicals and/or with lights (night fishing); the fishing vessel, when near the coast or over the fishing banks, can drop a few traps at night, and take them back in early morning.

This activity is aimed at finding nursery areas, relating them to the oceanography and larval migrations and establishing spawning periods.

Maturity

Besides the routine sexing and macroscopic assessment of maturation stages, microscopic analyses of the gonads and gonado-somatic indexes can be performed on a few species of greater interest, using a focused sub-sampling. This study will be useful in validating the existing macroscopic maturity scales, in creating new and better ones, and in measuring relative and absolute fecundity.

Diet

In-depth studies of the trophic web to which the commercial species belong are generally outside the expertise of fishery biologists; still, even a qualitative knowledge the ecology of foraging and of the fish prey may be worth the effort of examining and classifying, in the laboratory, the stomach content of at least the most important commercial species. The seasonality of the samples must be considered, given that presence of certain species may represent the result of an active search for prey or just of a temporal/geographical abundance of the prey item. This kind of ancillary research could produce very useful results, especially if carried out in association with studies on the bottom biocenoses.

Parasitology

Since some parasitologists are actively seeking fish samples from deep fishing grounds, and/or for sharks, to conduct studies on parasitic flatworms, it should be easy to deep-freeze whole specimens or specific organs, for further studies.

Ecotoxicology

Considering the role of certain long-lived animals in the trophic web and their capacity for biomagnification, samples of their flesh could be analysed for heavy metals, pesticides, PCBs and other contaminants, using biomarkers (such as the cytochrome P_{450}-A1, metallothionein, ALA-D) and/or the DNA-adduct techniques. These analyses, however, require specific equipment and skilled staff.