

Processing Trawl Survey Catch for Stock Assessment Purposes: Some Proposals for the MedSudMed Project on the Basis of Existing Programmes

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Abstract

Procedures for the processing of data collected during trawl surveys carried out by CNR-IAMC are presented. These procedures combine protocols of Italian (GRUND, CAMPBIOL) and European (MEDITS) research programmes on the demersal resources in the Strait of Sicily and can be considered as a contribution to the discussion on an international coordinated system for the monitoring of demersal resources in the area covered by the FAO MedSudMed Project.

Introduction

Trawl surveys are mainly aimed at gathering information on abundance and age composition of populations at sea (Gunderson, 1993). In the Strait of Sicily, they represent the main source of information on stocks exploited by distant-water trawlers (Levi and Andreoli, 1998). The catch processing is the fundamental step to obtain data necessary to know the species-composition and their spatial distribution. Furthermore, detailed information on sex, length- and age-composition of the target species is a prerequisite for an effective stock assessment of the main demersal resources.

This paper reports the procedures for processing data collected during the trawl surveys carried out by CNR-IAMC in the Strait of Sicily in the most recent years. These procedures combine the protocols of Italian (GRUND, Anon., 1996; CAMPBIOL, Anon., 2002) and European (MEDITS, 1998) research programmes on demersal resources. The procedures reported in this paper, together with those used by other concerned institutions of the countries involved in the MedSudMed Project, should stimulate discussion on the implementation of coordinated trawl survey programmes to assess the demersal resources at the regional level in the Strait of Sicily.

Onboard processing

When the catch is on the deck, after the net has been checked to certify the haul validity, a photo is taken with a digital camera. Each shot reports date, trawl survey code, number of the haul and stratum. Specimens remarkable for their size or for their rarity are photographed individually.

Thereafter, the catch is processed according to the following procedure:

1. remove all large specimens, regardless of the species
2. remove all bulky non-living materials (e.g. rocks, car tyres)

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3. sort the catch by categories:

- *target species* – bony and cartilaginous fishes, cephalopods, and decapod crustaceans
- *non-target species* – bony and cartilaginous fishes, cephalopods, and decapod crustaceans
- *other biological material (trash)* – other invertebrates, algae, sea grass, and biological debris
- human wastes.

Depending on the size of the haul, target species and/or other categories may be sub-sampled. In order to allow a good reconstruction of the length-composition of the target species when different length groups are present, the catch by species may be first of all divided into fractions homogeneous by size. Secondly, samples are randomly extracted from these fractions (two-stage random sampling) (Fig. 1).

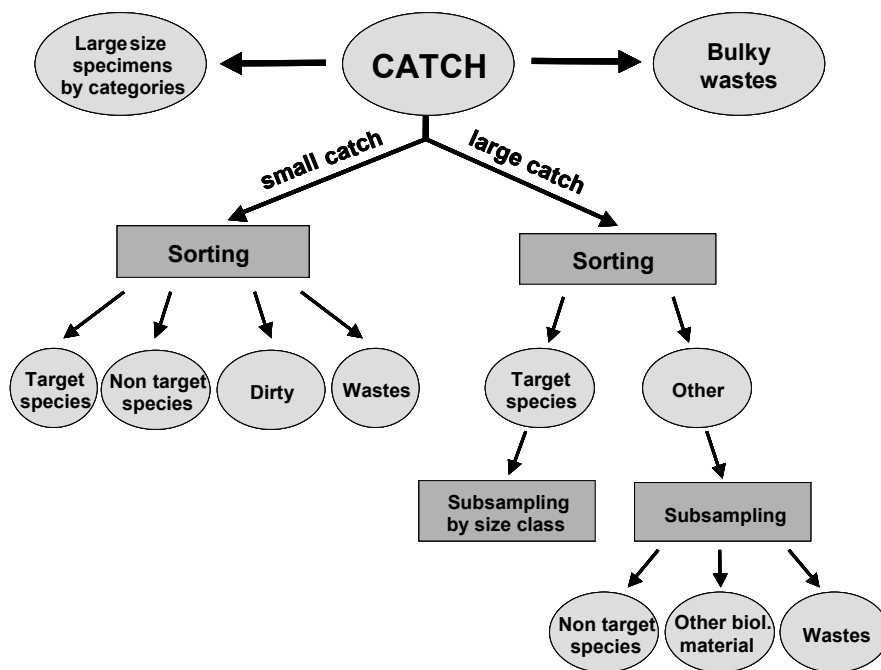


Figure 1. Flow chart showing procedures for processing catches (sorting and sub-sampling)

All the specimens of the target species are processed in the laboratory, with the exception of the big individuals of *Raja clavata*.

After sorting, specimens are stored in wooden or plastic boxes with a label reporting the code of the haul and survey. These boxes are sealed in polyethylene bags and immediately deep-frozen (-40°C). After 24 h, samples are placed in cardboard boxes and stored at -18°C .

The number of individuals and total weight in grams are recorded on board for non-target species. Samples of non-target species may be preserved for further study, within the framework of specific research programmes.

Trash and human wastes are weighed. Samples of trash can be preserved for laboratory analysis in order to gain a rough idea of benthic organisms.

Regardless of the category the sample corresponds to, weight is always measured on board with a steelyard.

Target species

At present, different lists of target species are available, depending on the different programmes:

GRUND (8 bony fishes, 5 cartilaginous fishes, 3 crustaceans, 3 cephalopods)

MEDITS (23 bony fishes, 3 cartilaginous fishes, 4 crustaceans, 6 cephalopods)

CAMPBIOL (11 bony fishes, 2 cartilaginous fishes, 4 crustaceans, 4 cephalopods)

Detailed lists of target species by programme are given in Table 1 (species common to all programmes are in boldface). The existing lists should be combined by the following criteria to choose the MedSudMed list of target species:

- importance for the demersal fisheries in the Strait of Sicily and the Mediterranean
- easiness of routine identification
- vulnerability to fishing pressure
- presence of time-consistent information in the institutions' data bases.

Taking into account the new Italian Fishing Plan and the information stored in the IRMA data base, the following 23 target species are proposed as target species within the framework of the MedSudMed Project (last column in Table 1):

13 bony fishes – *Helicolenus dactylopterus*, *Lepidorhombus boscii*, *Merluccius merluccius*, *Mullus barbatus*, *M. surmuletus*, *Pagellus erythrinus*, *Peristedion cataphractum*, *Phycis blennoides*, *Lophius piscatorius*, *L. budegassa*, *Trachurus mediterraneus*, *T. trachurus*

2 cartilaginous fishes – *Raja clavata*, *R. miraletus*

4 decapod crustaceans – *Aristaeomorpha foliacea*, *Aristeus antennatus*, *Nephrops norvegicus*, *Parapenaeus longirostris*

4 cephalopods – *Eledone cirrhosa*, *E. moschata*, *Loligo vulgaris*, *Sepia officinalis*.

Table 1. Target species adopted by the GRUND, CAMPBIOL and MEDITS trawl-survey programmes, with the target species proposed for the MedSudMed Project. The species boldfaced are common to all four programmes.

Categories	Species	GRUND	CAMPBIOL	MEDITS	MedSudMed
Bony fishes	<i>Aspitrigla cuculus</i>			X	
	<i>Citharus linguatula</i>			X	
	<i>Eutrigla gurnardus</i>		X	X	
	<i>Helicolenus dactylopterus</i>	X		X	X
	<i>Lepidorhombus boschi</i>	X		X	X
	<i>Lophius budegassa</i>		X	X	X
	<i>Lophius piscatorius</i>		X	X	X
	<i>Merluccius merluccius</i>	X	X	X	X
	<i>Micromesistius poutassou</i>			X	
	<i>Mullus barbatus</i>	X	X	X	X
	<i>Mullus surmuletus</i>	X	X	X	X
	<i>Pagellus acarne</i>			X	
	<i>Pagellus bogaraveo</i>			X	
	<i>Pagellus erythrinus</i>	X	X	X	X
	<i>Peristedion cataphractum</i>	X			X
	<i>Phycis blennoides</i>	X		X	X
	<i>Sparus pagrus</i>			X	
	<i>Solea vulgaris</i>		X	X	
	<i>Spicara flexuosa</i>			X	
	<i>Trachurus mediterraneus</i>		X	X	X
<i>Trachurus trachurus</i>		X	X	X	
<i>Trigla lucerna</i>		X			
<i>Trisopterus minutus capelanus</i>			X		
<i>Zeus faber</i>			X		
Cartilaginous fishes	<i>Galeus melastomus</i>	X			
	<i>Mustelus mustelus</i>	X			
	<i>Raja clavata</i>	X	X	X	X
	<i>Raja miraletus</i>		X		X
	<i>Scyliorhinus canicula</i>	X			
Crustaceans	<i>Aristaeomorpha foliacea</i>	X	X	X	X
	<i>Aristeus antennatus</i>		X	X	X
	<i>Nephrops norvegicus</i>	X	X	X	X
	<i>Parapenaeus longirostris</i>	X	X	X	X
Cephalopods	<i>Eledone cirrhosa</i>	X	X	X	X
	<i>Eledone moschata</i>	X	X	X	X
	<i>Illex coindetii</i>	X		X	
	<i>Loligo vulgaris</i>		X	X	X
	<i>Octopus vulgaris</i>			X	
	<i>Sepia officinalis</i>		X	X	X

Laboratory processing

At the end of the trawl survey, the frozen material is stored at the research institution. Before processing, specimens are defrosted overnight at room temperature. Each specimen is measured and weighed. Sex is identified and the macroscopic maturation stage and gonad weight are recorded. This last parameter is not considered for the crustaceans (see detailed procedure in Gristina *et al.*, in the present MedSudMed Technical Document).

Morphometric measurements

In each sample or sub-sample of target species, length and weight are measured for the following categories of organism:

- Fishes – total length (TL) is measured to the nearest half inferior centimetre from the tip of the snout to the end of the caudal fin
- Cephalopods – mantle length (ML) is measured in millimetres along the median line, passing between the eyes, to the apex of the mantle;
- Crustaceans – carapace length (CL) is measured in millimetres from the rear edge of the eye orbit to the rearmost median edge of the carapace.

The length of fishes and cephalopods is measured with ichthyometers, whereas calipers are used for crustaceans. Specimens whose length is not measurable are considered as “broken”.

The body weight (BW), measured with analytical scales, is expressed in grams rounded to the nearest 0.1 g in cephalopods and to the nearest 0.01 g in crustaceans. The BW of fish able to swallow large prey is measured after emptying the stomach.

Nephrops norvegicus, which have lost their chelae during and after the haul, are weighed without chelae; the weight is then converted to total body weight using an *ad hoc* relationship.

Hard structures

Hard structures to be used for age estimation are taken from adequate sub-samples of each haul. Sub-samples are selected in order to cover uniformly the length-range present in the catch. For each haul, the hard structures of at least two specimens, by sex and for each size-class are removed: first rays of dorsal fin (*illicia*) for *Lophius* sp. and otoliths (sagittae) for the other teleosts. Once removed, the hard structures are washed with water and subsequently preserved dry in small containers, with the indication of survey, haul and specimen code.

Otoliths are read *in toto*, except for very small and very large specimens. In these cases, otoliths are processed in order to obtain thin section. The procedure allows the identification of daily rings in juveniles and annual marks in the oldest fraction of the population. Conversely, the dorsal fin rays of angler fish are always read in thin section.

Discussion

The procedures reported in this paper derive from three programmes: the GRUND programme (Relini, 2000), started in 1985 and funded by the Italian Government; the MEDITS programme (Bertrand *et al.*, 2000) supported by the European Commission and started in 1994; and the CAMPBIOL programme, started in 2002 within the framework of the Italian Programme on fishery data, which was added to the GRUND and MEDITS trawl surveys, with the main objective being to study length- and age-composition of landings. Since the above-mentioned programmes originated in different times and contexts, data were collected according to different protocols. The procedures reported in this paper represent the effort made by CNR-IAMC to unify the method of processing catch data. Although data collected within the three programmes are processed following a standardized approach, information is generally given according to the different formats foreseen by each programme (GRUND, MEDITS and CAMPBIOL). Considering the advantage to each country to maintain consistency in time-series of data, the opposite solution could be chosen for the FAO MedSudMed Project; namely, an exchange format could be decided to allow common analyses of selected data sets. Starting from data collected in the national programmes, these analyses could represent a first step in building up coordinated trawl-survey programmes to assess the demersal resources at the regional level.

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