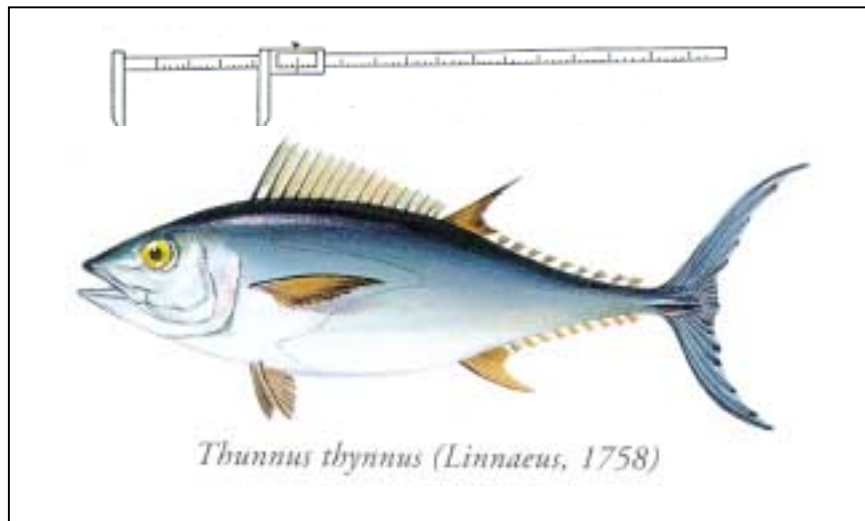


TITLE: "BIOLOGICAL AND FISHING RESEARCH FOR BLUEFIN TUNA (*Thunnus thynnus*) AND SWORDFISH (*Xiphias gladius*) IN THE MEDITERRANEAN".

SAMPLING HANDBOOK

ICCAT METHODOLOGY



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1.- INTRODUCTION

Statistics are gathered in a mechanical and many times confusing manner, because the people in charge of local statistic offices are not necessarily familiarized with the biology of fish offered in the marketplace.

This guide provides a general idea of the external anatomy and main characteristics of tunid species and Swordfish that are captured or can be captured in the Mediterranean.

It also provides the measuring methods and the standard measures that should be used in the fish under study.

Some recommendations are given as well regarding the number of specimens to be measured in each sampling and the effort units demanded from the skippers of the sampled ships, according to the type of gear employed.

The last part is a simple identification code of the main species, as well as the characteristics that can be used to differentiate similar species.

2.- GENERALITIES

Tunids belong to the family Scombridae, whereas Swordfish belong to the family Xiphyidae.

The species of interest for this guide are those that can be caught in the Mediterranean. They are the following:

- | | |
|-------------|---|
| Scomberids: | -Thunnus thynnus - tuna |
| | -Thunnus alalunga - albacore |
| | -Enthynnus aleteratus – atlantic black skipjack |
| | -Sarda sarda – atlantic bonito |
| | -Auxis thazard – frigate tuna |
| Xiphoids: | -Xiphias gladius - swordfish |

3.- EXTERNAL DESCRIPTION

Scomberids have a stocky and fusiform body. The back is dark blue, often patterned, and the silvery sides and belly can sport circles, dots or lines of a darker hue. They have two dorsal fins: (Fig. 1) first and second dorsal fin; an anal fin, a pair of pectoral fins, a pair of ventral fins, and a caudal fin in the shape of a half moon. They also have a series of dorsal and ventral pinnulae (small fins).

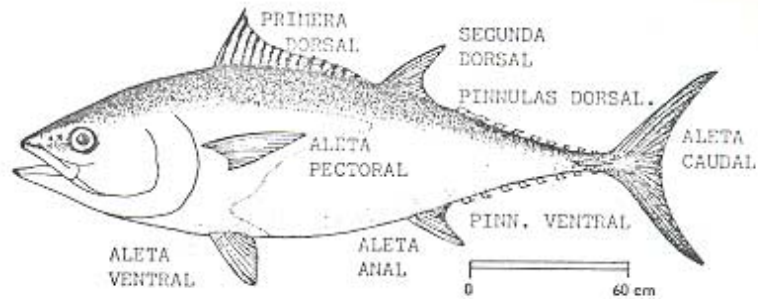


Fig. 1

- FIRST DORSAL
- SECOND DORSAL
- DORSAL PINNULAE
- PECTORAL FIN
- CAUDAL FIN
- VENTRAL FIN
- ANAL FIN
- VENTRAL PINNULAE

Xiphids also have a stocky and fusiform body, characterized by a sword-like elongated upper jaw. The back is dark blue as well, the belly being silverish usually without any kind of pattern.

Adults (Fig. 2) have two anal and two dorsal fins, whereas juveniles have only one of each. They possess a strong caudal peduncle with a spine on each side, a great caudal fin and two pectoral fins.

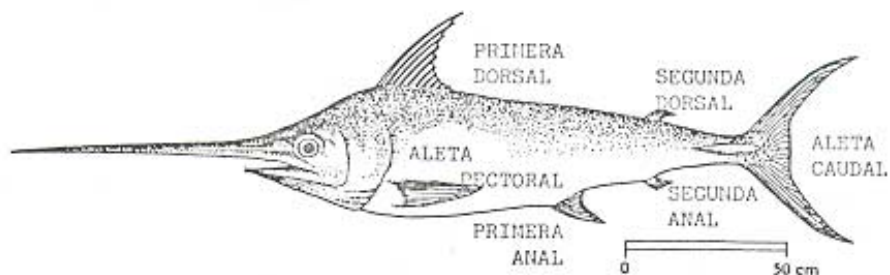
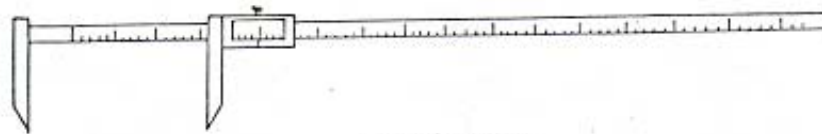


Fig. 2

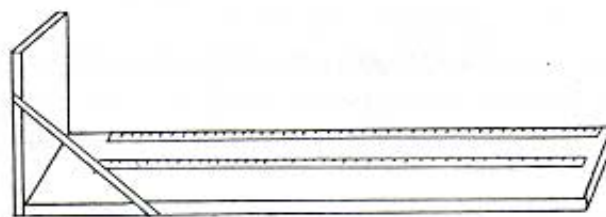
- FIRST DORSAL
- SECOND DORSAL
- PECTORAL FIN
- CAUDAL FIN
- FIRST ANAL
- SECOND ANAL

4.- SAMPLING SYSTEM AND METHOD

The most frequent practice is to perform the sampling in the marketplace, before the auction begins, when fish are being disembarked. In some cases, sampling can be done while fish are still inside the boat or in the transport trucks (particularly in the case of the Basque live bait fleet). Measuring equipment is made of a proper gauge of appropriate dimensions for large fish (mainly tuna and swordfish), or a measuring board known as an ICHTYOMETER, specially useful for sizing small fish.



— Ejemplo de calibre.



— Ejemplo de tablero de medición.

Example of gauge. Example of measuring board

The standard measure for either tunids or swordfish is the span to the fork LH (Fig. 3). This measure shall be taken from the tip of the lower jaw in swordfish, and from the tip of the upper jaw to the fork in all other species (consider as fork point the mid-part of the tail fin. (See picture). This measure LH will always be a straight line without any adjustment to the fish natural contour. The fish must lie on a flat surface, and those with damaged tails or snouts or warped by freezing shall be discarded.

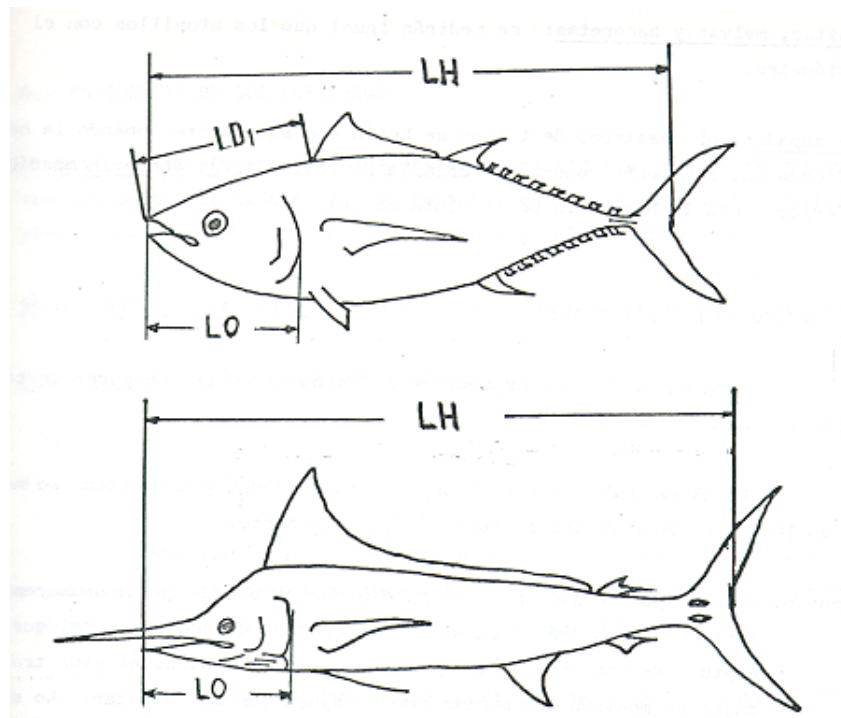


Fig. 3 Measures of fish with tunid body shape: upper jaw - length to fork point LH and upper jaw - first dorsal ray (LD 1); and for Xyphoids: lower jaw - length to fork point LH. Operculum length LO.

In cases of marketplaces where swordfish are sold headless and tailless, measures should necessarily be taken before the cleaning of the fish (head and tail cutting).

Large tuna: (40 kgs. on) When possible the weight of each individual tuna should always be recorded, stating if this is with or without the innards, and if there is any kind of discount for the buyer.

Small tuna: (4 to 40 kgs.) Each specimen shall be measured with the gauge as indicated in the picture.

Very small tuna, "toyinas": (a few gram up to 4kg. tuna). These are mostly captured from August to December, and shall be measured with the ichthyometer. Very small tuna should not be confused with very small bonito. (See species identification code).

Bonito, frigate tuna and atlantic black skipjack: as with very small tuna, they shall be measured with the ichthyometer.

Swordfish: size sampling shall be taken with the gauge considering the previously given reference (LH) as the distance to the **fork point:** from the lower jaw to mid-point of the caudal fin.

5.- NUMBER OF FISH TO BE MEASURED

It may vary greatly in proportion to the number of fish of each species disembarked each day.

In the case of very small tuna, bonito, frigate tuna and atlantic black skipjack only between 10% and 20% of the cargo of one single ship shall be measured.

Example: If four boats reach port the same day to unload bonito, only one boat of the four should be sampled, the one that has neither the most nor the least cargo. If this chosen boat brings in 50 boxes, just 5 boxes of bonitos shall be taken at random. The specimens to be measured should be from all landed sizes, taking neither the smallest nor the largest.

The percentage of fish to be measured shall increase to 20% as the captures become smaller. If a boat brings in two boxes, both shall be measured.

Large tuna: since the daily catch per boat is usually meager, the accounting should be on the total output per day in each port.

Small tuna: if captures are meager all fish shall be measured. If captures are large (for example a good purse seine catch) 10 - 20% of all disembarked tuna shall be measured.

Swordfish: total catch of long line boats landing the sampling day shall be measured. If the chosen day for sampling there is only one boat with scarce captures, sampling should be postponed for a day with more boats.

6.- SAMPLING FREQUENCY

Very small tuna, frigate tuna, bonito and atlantic black skipjack: shall be sampled in representative numbers once every fortnight, so that samplings are not too close to each other, leaving intervals of 10 to 15 days.

Large tuna and small tuna: shall be sampled each and every day of landing.

Swordfish: shall be sampled weekly.

7.- FISHING EFFORT

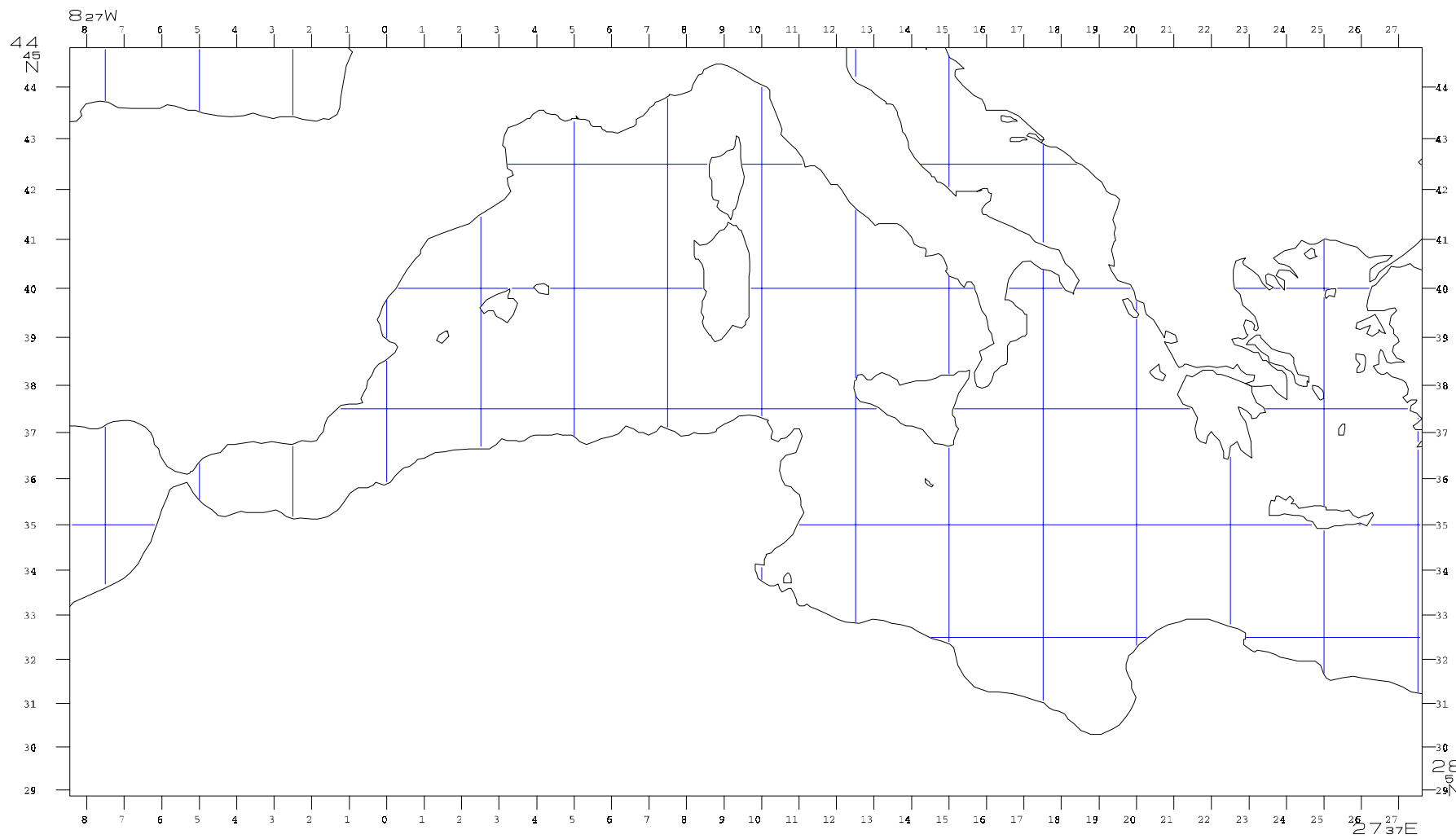
The unit to be chosen should reflect the amount of effort spent during the catch. The applied unit of effort should preferably be the one shown at the foot of the sampling sheet.

The effort is estimated speaking directly with the boat or fishing skipper. The following points should be requested:

- 1.- Number of fishing days. Do not count the days spent coming and going to and from the fishing grounds, as is the case of long line boats.
- 2.- Number of hooks for longline boats, or planks that usually casts the sampled boat on a daily basis.
- 3.- In the case of purse seine boats, length of gear should be inquired.
- 4.- Number of lines used if fishing tuna with hand lines.
- 5.- Length of gear in case of gill net.

7.- FISHING AREAS

The skipper shall also be asked to indicate the location where the catch was hauled. In case there are several fishing zones, each should be noted specifically. In the section "fishing areas" of the logbook the quadrant number where the fish were caught shall be specified according to the map enclosed. Otherwise, any noticeable geographic landmark should be indicated. (Example: 30 miles east of cape San Antonio; three hours south of the port of Tarragona, etc.).



If some of the captures derive from the Atlantic ocean, it should be clearly specified without mixing them with those from the Mediterranean.

9.- OTHER SPECIES

In the case of long line boats, there will be other species besides tuna and swordfish, mainly sharks or some needlefish. The following should be recorded:

- number of shortfin mako sharks and approximate total weight
- number of blue sharks and estimated total weight
- number of large-eyed foxfish shark and total weight
- number of small-eyed foxfish shark and total weight
- number of hammerheads and total weight
- number of any other species that may show up

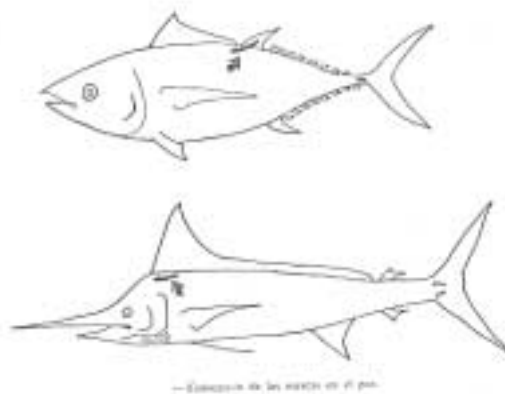
If there should be any fish or turtle with distinctive marks or signs, an effort should (Fig 4) be made to haul it on board, noting the date, the length and weighted, and the fishing area where the marked specimen was recovered. The corresponding information should be reported by phone to the Oceanographic Laboratory in Málaga.



Fig. 4 Types of Marks



The task of marking



Placing the mark on the fish

THE DUTY OF THE INFORMANT

The informant's main duty lies in gathering the daily landed capture of each boat according to the DAILY SALES SHEET of each marketplace.

Captures shall be recorded for tuna, albacore or northern bonito, bonito, frigate tuna, atlantic black skipjack and swordfish.

The following information shall be written in the sampling sheet:

- Landing date
- Name of boat
- Gear or fishing method

- Fishing area or locality according to the map enclosed to the sampling sheets

- Landed species
- Number of tuna and swordfish

- Individualized weights of tuna and swordfish (if any, it should be put in the corresponding sampling sheets).

- Number of boxes and total weight of very small tuna, bonito, frigate tuna and atlantic black skipjack.

- Days of fishing
- Fishing effort as recorded in the logbook.

When longline are in use, it shall be specified, when possible, the number of sharks caught, noting if it is a blue shark, mako, foxfish shark, hammerhead or other, as well as total landed weight of all mentioned species.

SAMPLING DATA SHEETS

1. Capture – Fishing effort per trip
2. Size sampling of bluefin tuna from traps
3. Size sampling (bluefin tuna: LH and swordfish: LJ-FL)
4. Surface longline
5. Tuna purse seine (fishing and landing logbooks)
6. Data for size/weight relationship
7. Gathering of spiney rays
8. Gathering of gonad samples
9. Gathering of genetic analysis samples

10. Data sheet with data on fleet characteristics