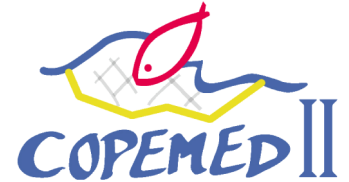




FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS



OCCASIONAL PAPER

3

**ACTIVITIES CARRIED OUT BY COPEMED ON
DOLPHINFISH (*Coryphaena hippurus*) AND THE
NATIONAL FISHERIES ASSOCIATED IN THE
PERIOD 2000-2005**

A CopeMed II contribution to:

**CopeMed II - MedSudMed Workshop on Fisheries
and appraisal of *Coryphaena hippurus***

5-6 July, 2011

Palermo, Italy

Juan A. Camiñas

FAO-CopeMed II, Coordinator

and

Ignacio de L. Fernández

FAO-CopeMed II, Consultant

Málaga (Spain), November 2011

CopeMed II Occasional Paper N° 3 **(GCP/INT/028/SPA – GCP/INT/006/EC)**

CopeMed II (*Co-ordination to Support Fisheries Management in the Western and Central Mediterranean*) is a project under the responsibility of the Fisheries and Aquaculture Department of the Food and Agriculture Organization of the United Nations (FAO), executed by the Marine and Inland Fisheries Service and Coordinated from the Office of the Project in Málaga (Spain).

CopeMed II is financed by the DG Mare of the European Commission and the Government of Spain.

CopeMed II Occasional Papers is a series of non peer reviewed documents prepared in the frame of the activities of the Project in cooperation with the CopeMed II countries, other FAO Mediterranean projects or by other reasons for: technical support to international meetings, working group meetings, joint assessment meetings on shared stocks within the CopeMed region and with other FAO projects; and report concerning other activities.

The documents included in the Occasional Papers series are based on work carried out by researchers from the institutions involved in CopeMed II, on contributions prepared by external experts to the project and on joint works organized by or with the support of other FAO projects.

CopeMed II Occasional Papers are available on the website of the CopeMed II Project www.faocopemed.org

For reference, this document should be cited as follow:

Camiñas J.A. and Fernández I, 2011. Activities carried out by COPEMED on Dolphinfish (*Coryphaena hippurus*) and the national fisheries associated in the period 2000-2005. A CopeMed II contribution to the CopeMed II - MedSudMed Workshop on Fisheries and appraisal of *Coryphaena hippurus* (Palermo, Italy. 5-6 July, 2011). GCP/INT/028/SPA-GCP/INT/006/EC. CopeMed II *Occasional Paper* N° 3: 13 pp.

1. Summary

This report summarizes the work carried out by the "CORY" Program, in the framework of the FAO - COPEMED regional project, to study Dolphinfish fishery in central-western Mediterranean in 2000-2005 fishing seasons. A working group¹ aiming at improving knowledge transfer and conducting a preliminary joint assessment of the *C. hippurus* stock in the Mediterranean Sea was established. It was the first joint analysis for the Mediterranean Dolphinfish. The tasks carried out under the program were directed toward the collection of information and data to improve knowledge on the biology and fleet dynamics, on effort and catch levels, on the estimation of the catch length composition and on catch-at-age data. A considerable improvement on the knowledge of the biology of the species and the characterization of the fishing activity and exploitation was achieved. A preliminary assessment was carried out as an attempt to provide guidance on the management of the Dolphinfish fisheries in the Mediterranean Sea.

In March 2004, the last advances² on the work achieved in 2003, describing the results accomplished and the main needs, was presented at the GFCM-SAC Subcommittee on Stock Assessment (SCSA) meeting. The SCSA recommended to continue with the activities on *C. hippurus* fishery. COPEMED decided to set a new Pilot Study, to deepen the analysis of this fishery, which has significant features such as: being mono-specific and targeted by a well defined type of fleet in a specific area of western-central Mediterranean. This pilot study was focused on the application of Operational Units concept to identify and characterise the Operational Units of Spain, Tunisia and Italy involved in the *C. hippurus* fishery, and on the long term, to test alternative management measures based on effort control by Operational Unit. The work started at the beginning of the fishing season, in August 2004, and finished in March 2005.

The training part was carried out in several workshops and hands on exercises. The field data were collected with the aim of analysing the *C. hippurus* fishery in the same season and an exploratory evaluation of the data and of the stock state. The joint analysis data was justified by the genetic homogeneity of Dolphinfish found along its Mediterranean distribution.

2. Introduction

A traditional small-scale fishery is carried out in the central Mediterranean (Sicily, Malta and Tunisia) and western part of the basin (Majorca Island) during summer-fall using fishing aggregation devices (FADs) and directed to the Dolphinfish (*Coryphaena hippurus*). The fishery of this epipelagic species is relevant to all areas, both by the amount of catches (Malta), or by the seasonality allowing rotating target species making the annual recruitment of the species highly variable. This migratory middle size pelagic fish seems to be a single stock in the central-western Mediterranean Sea and should be jointly managed.

Previous information was obtained for this fishery in Sicily and Majorca in the framework of two DG XIV EU Projects. However, there was a relatively scarce

¹ First COPEMED Working Group "Pilot Study on Operational Units for *Coryphaena hippurus* fishery".

² Annex 7 of the GFCM's Report of the Sixth Stock Assessment Sub-Committee meeting (SCSA). Málaga (Spain), 10-12 May 2004.

information in Malta and very scarce in Tunisia. Thus, this fishery was considered to develop a FAO-COPEMED project involving the four countries (Italy, Malta, Tunisia and Spain).

Although it is well acknowledged that important sport fisheries are developed along the study region by fleets from different countries during the professional fishing period, no information on such sport fisheries is included in this document. A specific document on the Spanish sport fisheries targeting Dolphinfish prepared by CopeMed II is also presented to the workshop³.

3. Participants

The COPEMED CORY Program was conducted by a team of scientists from the involved countries. The team leaders and main experts involved in CORY Program:

- Dr. Leonardo Cannizzaro, IRMA Mazara del Vallo (Italy), providing technical support for biological data and catch and effort sampling design, as well as for data analysis.
- Dr. Carles Pla, Laboratory of Genetics, University of Gerona (Spain), in charge of genetic analysis.
- Ms. Amina Besbes, INSTM, scientist in charge of the programme in Tunisia. She is in charge of the organization and realization of all the activities to be carried out in Tunisia, under supervision of Dr. Amor el Abed, director of INSTM and COPEMED's national representative.
- Mr. Matthew Camilleri and Ms. Alicia Mosteiro, DG of Fisheries of Malta, scientists in charge of the tasks to be realized in Malta, in close collaboration with national authorities and COPEMED national representative, Mr. Anthony Grupetta, General Director of Fisheries and Aquaculture of Malta.
- Dra. Beatriz Morales-Nin and Dra. Marta Linde, IMEDEA-CSIC/UIB Mallorca (Spain).
- COPEMED Project staff, providing general logistic support and managing the necessary funding for the diverse activities.

4. FAO-COPEMED Project

COPEMED was a Food and Agriculture Organization (FAO) regional project financed by Spain (Spanish Agency for International Development Cooperation, AECID) under the responsibility of the Fisheries and Aquaculture Department (FIRF) of the FAO.

Various scientific studies have shown that many fish populations in the Mediterranean are subject to excessive exploitation, with signs of overfishing and overcapacity, degradation of living resources, loss of income for fishermen and reduction of marine resources in certain areas.

The overall objective of the second phase of COPEMED is to maintain the sustainability of the marine resources in the central and western sub-regions and its ecosystem, taking into account environmental, biological, economical, social and institutional issues, particularly throughout the promotion of scientific cooperation among the countries.

³ J. Camiñas. Dolphinfish (*C. hippurus*) recreational fishing in the Mediterranean Sea, a theoretical tool for scientist and managers.

5. Dolphinfish fishery research in central-western Mediterranean: “CORY” Program

In the framework of the FAO-COPEMED regional project, the CORY Program aimed to study the Dolphinfish fishery in the central-western Mediterranean Sea. The work carried out by the CORY Program, under COPEMED, was the first joint analysis for the Mediterranean Dolphinfish. Main activities were focused on the collection of data for studies on the biology of the species and fleet dynamics, on effort and catch levels, on the estimation of the catch length composition and on catch-at-age data. A considerable improvement on the knowledge of the species biology, its exploitation and the characterization of the fishing activity was achieved. A preliminary assessment was conducted as an attempt to provide guidance on the Dolphinfish fishery management in Mediterranean waters.

A Pilot Study was set up for the period 2004-2005 to deepen the analysis of this fishery which has significant features such as: being mono-specific, targeted by a well defined type of fleet in a specific area of western-central Mediterranean. This pilot study, focused on the application of Operational Units concept, had as the main objective the identification and characterization of the Operational Units involved in the four countries (Spain, Tunisia, Malta and Italy) sharing the species, and on the long term, to test alternative management measures based on effort control by Operational Units. The work started at the beginning of the fishing season, in August 2004, and finished in March 2005. In July 2004, a workshop was held in Malta to draft the sampling schemes and the data management system.

6. Study area

The small-scale fishery is carried out in the central Mediterranean (Sicily, Malta and Tunisia) and western part of the basin (Majorca Island).



COPEMED *Dolphinfish* (*Coryphaena hippurus*) fishery study area: Majorca (Spain), Sicily (Italy), Malta and Tunisia

7. Summary of the CORY Program main conclusions

The effort developed in the COPEMED CORY Program to jointly analyse the exploited resources in the four fishing areas of this epipelagic fish, which is an important fishery for the small scale fleet, resulted in the detection of different states of knowledge, data

compilation and analysis in each area. For instance, the basic data such as landings and effort (measured as number of boats) are registered by the Fishing authorities only in three areas, while in Sicily data were not available.

Fishing regulations are also variable. In Malta and Majorca there is the maximum control (sorting of the fishing places, opening of the fishery, total dedication to the fishery for the boat during the season, gear, etc) while in Sicily and Tunisia there is less control. For instance, in Tunisia, boats could have on board different gears and use them indistinctly.

The capture of very small fish on July carried out in Tunisia and Sicily is an unwise practice because these fish will provide the fishermen with a better yield in September-October. The sampling effort has been somewhat limited mainly in the length composition due to limitations in budget and available personnel.

This fishery has great difficulties in controlling the effort, moreover the biology of the species make difficult to assess the stock. Anyhow, CORY Program has represented the first joint analysis of *C. hippurus* in the Mediterranean and a first step to an integrated study.

The participation of all the member countries sharing the stock (Spain, Italy, Malta and Tunisia), with a periodical provision of data and regular revision of the TAE (Total Allowable Effort), according to annual stock assessments and to technological findings, is highly recommended.

8. Working Groups meetings

A series of coordinated WG were organized by COPEMED during the Program producing important reports that can be downloaded from the CopeMed II webpage (http://www.faocopemed.org/old_copemed/es/activ/research/Dolphinfish.htm#biblio) and summarized here:

- **REPORT of the 1st COPEMED Working Group “Pilot Study on Operational Units for *Coryphaena hippurus* fishery”. St Julian, Malta, 20th and 21st July 2004**

All participants agreed on the main objectives of the Pilot Study: to draw up an inventory of Operational Units targeting *Coryphaena hippurus* in the GSAs of the western and central Mediterranean; to define a correct segmentation of the fleet according to the criteria of the SCESS; to harmonize data collection schemes for catch and effort, biological and socio-economic data; to store available data in an appropriate database especially designed to manage data on Operational Units. And the Working Group objectives were to know data sources of the countries Operational Units, identifying gaps; to design a common frame and catch and effort surveys for the season filling the gaps and incorporating socio-economic data; to design the data structure for a flexible use of them; to identify needs in terms of personnel, meetings, etc.; to draw up a possible chronogram to start working in August and foreseeing an end of the study in 2005. The workshop was attended by experts from different fishery administrations of Italy, Malta and Spain.

- **REPORT of the 2nd COPEMED Working Group “Pilot Study on Operational Units for *Coryphaena hippurus* fishery”.** *FAO HQ, Rome, 28 and 29 April 2005*

The meeting highlighted the objectives of the study, the working group achievements, the activities carried out, the work in progress and an overview on the work to be done and a rough time schedule given the circumstances of the COPEMED project closure and the opening of a new one CopeMed II.

- **GFCM SAC Sub-Committee of Stock Assessment form sheets - Dolphinfish (2004).** *Beatriz Morales-Nin & Manica Azevedo*

This summarizes the work carried out by the CORY Program in the framework of the FAO-COPEMED regional project to study Dolphinfish fishery in central-western Mediterranean for 2000-2001 fishing seasons. This work represents the first joint analysis for the Mediterranean Dolphinfish and was the first step in an integrated study. The tasks carried out under the Program were directed towards the collection of data for studies on the biology and fleet dynamics, on effort and catch levels, the estimation of the catch length composition and catch-at-age data. A considerable improvement on the knowledge of the biology of the species and the characterization of the fishing activity and exploitation was achieved. A preliminary assessment was carried out as an attempt to provide guidance on the management of Dolphinfish in Mediterranean waters.

9. Research activities by country

MALTA

Pilot Study on Dolphinfish. Final report (2004). *M. Camilleri, A. Mosteiro*

The Pilot Study, under the CORY Program, showed the tasks carried out for data collection on the biology and fleet dynamics studies, on effort and catch levels, the estimation of the catch length composition and catch-at-age data. A considerable improvement on the knowledge of the biology of the species and the characterization of the fishing activity and exploitation was achieved with this study to introduce the COPEMED countries to a responsible management of Dolphinfish fishery; to acquire data on Malta and Tunisia Dolphinfish fishery; and to obtain an overview over this fishery in Mediterranean waters with research in Malta, Tunisia, Sicily and Majorca during the same fishing season.

Catch and effort data of the Maltese Dolphinfish fishery (2001). *SCRS/02/049 (2002).* *M. Camilleri, M. Darmani*

A brief description of the gear used, the type of fishing vessels and the management of the Dolphinfish fishery, together with the catch and effort data for 2001 are presented in this paper. Catch and effort data for the Maltese traditional Dolphinfish fishery have been collected by stratum since 2000 within the framework of the FAO sub-regional COPEMED project.

Poster: Overview of Lampuki research project

Overview of Lampuki research project with the aim of establishing the basis of future international management regime of Dolphinfish in the Mediterranean, from Malta Centre for Fisheries Sciences.

Poster: How to estimate the age of a Lampuka

Main steps to estimate the Dolphinfish age by reading otoliths, from Malta Centre for Fisheries Sciences.

TUNISIA

Contribution to the study of Operational Units targeting Dolphinfish *Coryphaena hippurus* in Tunisia (2005). A. Besbes, R. Besbes

Following the COPEMED CORY Program, to improve knowledge on the biology and the central-western Mediterranean Dolphinfish fishery, the Marine Living Resources Laboratory of the National Institute of Sciences and Technology of the Sea (INSTM), developed a new program to study the Operational Units operating in the region through monitoring the 2004 fishing season. This document represents the final report of the mission that shows the main steps carried out and the results provided.

Monitoring results of the 2000 fishing season of *Coryphaena hippurus* in the Tunisia Stratum. A. Besbes, A. El Abed

This report, under the COPEMED CORY Program for Malta and Tunisia (2000-2001), presented the results and the later discussion of the 2000 fishing season data in the East Stratum of Tunisia, particularly at the ports of Monastir and Teboulba. Its primary objective was improving knowledge of Dolphinfish fishery in the Mediterranean and advancing in cooperation for the international management of this migratory species. These results were incorporated to the report of the intermediate Project, that was held in IMEDEA (Spain) in 2001.

ITALY

Study to improve the knowledge of the Dolphinfish fishery in the South-East of Sicily. (2002). L. Cannizzaro

This report shows the results of the project “Study to improve the knowledge of the Dolphinfish fishery in the South-East of Sicily”, whose main objectives were the assessment of Sicilian Dolphinfish fleet fishing by Fishing Aggregating Devices near the Maltese Dolphinfish fishing area; catch-effort analysis; length composition of the catch; age and growth.

Among the participants, experts from many institutions and also numerous fishermen co-operated not only by providing detailed information on their fishing activities, but also by helping to convince the less forthcoming and more diffident fishermen to co-operate too.

SPAIN

The Dolphinfish fishery in Majorca Island. Report 2004. *B. Morales-Nin, M. Linde, M. Valls*

This report gives an overview of the Dolphinfish fishery in Majorca island in 2004 fishing season and provides data on location of the Fishing Attracting Devices' mooring lines by port; estimation of the fleet activity (catch and effort); evolution of landings and prices in the fishing season; collection of biological samples; length frequency distribution; morphometrics, age and growth; and socioeconomic data.

10. Other activities carried out

Final report of the FAO-COPEMED CORY03 Mediterranean Dolphinfish fishery (2003). *B. Morales-Nin, M. Azevedo, L. Cannizzaro, A. Besbes, R. Besbes, C. Camilleri, M. Camilleri, S. Deudero*

This report summarizes the work carried out, in the framework of FAO-COPEMED, to study Dolphinfish fishery in the Mediterranean in 2000-2001 fishing seasons. The work included both a knowledge transfer and a preliminary assessment of the stock in the Mediterranean Sea. Training was carried out in several workshops and hands on exercises. The field data were collected in Malta and Tunisia. Data were also collected in Sicily and Majorca, in 2001, with the aim to provide a general analysis of the fishery in the same year.

Genetic analysis of two Mediterranean fisheries of *Coryphaena hippurus* from Malta and Tunisia. (2002). *C. Pla Zanuy*

The aim of this study was the analysis (protein electrophoresis) of Dolphinfish samples from Malta and Tunisia to assess the state of these fisheries, including the comparison with the general distribution of the species in the Mediterranean Sea.

Fishery, biology and management of Dolphinfish (*Coryphaena hippurus*) in Malta and Tunisia - Report of the activities for the year 2000. *B. Morales-Nin*

This report was drafted in a workshop held at the IMEDEA and is based on the data collected by Maltese and Tunisian scientists, showing the activities undertaken on the 2000's fishing season corresponding to the proposal submitted in March 2000 to COPEMED. The activities were related to the following proposed objectives: to introduce the COPEMED countries to a responsible management of Dolphinfish fishery; to acquire data on Malta and Tunisia; and to obtain a global vision of Dolphinfish fishery in the Mediterranean Sea.

Workshop on Dolphinfish otoliths preparation and reading. *Palma de Mallorca (Spain), January 21 to February 8th 2002*

The workshop objectives were to train the participants in otolith extraction, mounting and preparation as well as on otoliths reading for Dolphinfish; to transfer the know-how from IMEDEA to the other participants in the COPEMED project; and to give guidelines on the material necessary for an age determination laboratory. The workshop was attended by experts from Malta, Tunisia and Spain.

COPEMED / IMEDEA Workshop on Dolphinfinh fishery sampling. Palma de Mallorca (Spain), 11 - 12 July 2000

The workshop aim was to design the adequate sampling strategy for the future assessment and management of the Dolphinfinh fishery in the Mediterranean and the first step to establish the appropriate institutional mechanisms for international cooperation in Dolphinfinh management. It was also important to introduce the COPEMED countries (Malta and Tunisia) to a responsible management of this fishery; to acquire data on these poorly studied areas; to obtain a global vision of Dolphinfinh fishery in Mediterranean waters; and to adapt the strategy to the characteristics of both target study areas. The workshop was attended by experts from different administrations of Italy, Malta, Tunisia and Spain.

11. COPEMED Project reports

1. REPORT of the 2nd COPEMED Working Group Pilot Study on Operational Units for *Coryphaena hippurus* fishery.
FAO HQ, Rome, 28 and 29 April 2005
2. REPORT of the 1st COPEMED Working Group Pilot Study on Operational Units for *Coryphaena hippurus* fishery.
St. Julian, Malta, 20th and 21st July 2004
3. GFCM SAC Sub-Committee of Stock Assessment Assessment form sheets - Dolphinfinh (2004).
Beatriz Morales-Nin & Manica Azevedo
4. FAO/COPEMED Cory03. Final report Mediterranean Dolphinfinh fishery (2003).
B. Morales Nin, M. Azevedo, L. Cannizzaro, A. Besbes, R. Besbes, C. Camilleri, M. Camilleri, S. Deudero
5. Genetic analysis of two Mediterranean fisheries of *Coryphaena hippurus* from Malta and Tunisia. (2002).
C. Pla Zanuy
6. Fishery, biology and management of Dolphinfinh (*Coryphaena hippurus*) in Malta and Tunisia - Report of the activities for the year 2000.
B. Morales Nin
7. Workshop on Dolphinfinh otoliths preparation and reading.
Palma de Mallorca (Spain), January 21 to February 8th 2002
8. COPEMED / IMEDEA Workshop on Dolphinfinh fishery sampling. *Palma de Mallorca (Spain), 11 - 12 July 2000.*
 - a - Meeting Report including technical papers on biological and effort sampling methodology
 - b - The Mediterranean Dolphinfinh fishery from the management point of view

Malta

9. Pilot Study on Dolphinfinh. Final report (2004).
M. Camilleri, A. Mosteiro
10. Catch and effort data of the Maltese Dolphinfinh fishery (2001). SCRS/02/049 (2002).
M. Camilleri, M. Darmanin
11. Poster: Overview of Lampuki research project.
12. Poster: How to estimate the age of a Lampuka.

Tunisia

13. Contribution à l'étude des unités opérationnelles dans la pêche de la coryphène *Coryphaena hippurus* en Tunisie (2005).

A. Besbes, R. Besbes

14. Résultats de suivi de la campagne de pêche 2000, de *Coryphaena hippurus* dans la strate est Tunisie.

A. Besbes, A. El Abed

Italy

15. Study to improve the knowledge of the Dolphinfish fishery in the South-East of Sicily. (2002)

L. Cannizzaro.

Spain

16. The Dolphinfish fishery in Majorca Island. Report 2004.

B. Morales Nin, M. Linde, M. Valls

12. Bibliography⁴

Addis P., A. Cau, E. Massutí, P. Merella, M. Sinopoli and F. Andaloro.- 2006. Patterns of assemblage in FAD-associated fish species in the Western Mediterranean. *Aquatic Living Resources*, 19: 149-160.

Andreoli M.G., D. Levi, L. Cannizzaro, G. Garofalo, e G. Sinacori (1995) - Sampling statistics of Southern Sicily trawl fisheries (MINIPESTAT): methods - N.T.R.-I.T.P.P. Special Publication N° 4, vol. I

Andreoli M. G., N. Campanella, L. Cannizzaro, G. Garofalo, G. B. Giusto, P. Jereb, D. Levi, G. Norrito, S. Ragonese, P. Rizzo, & G. Sinacori (1995). Sampling Statistics of Southern Sicily Trawl fisheries (MINIPESTAT): Data Report. N.T.R. - I.T.P.P. Special Publication N° 4, vol. II 1995.

Alemaný F. and E. Massutí.- 1997. First record of larval stages of *Coryphaena hippurus* (Pisces: Coryphaenidae) in the Mediterranean Sea. *Scientia Marina*, 62(1-2): 181-184.

Bazigos G.P. (1974) - The design of fisheries statistical surveys inland waters - FAO Fish. Tech. Pap., (133): 122 p.

Bazigos G.P. (1974) - Applied fisheries statistics - FAO Fish. Tech. Pap., (135): 164 p.

Bazigos G.P., N. Cingolani, S. R. Coppola, D. Levi, J. Mortera, G. Bombace (1984) - Studio di fattibilità per un sistema di rilevazione campionaria delle statistiche della pesca (PESTAT). Parte I: Statistiche sulla flotta da Pesca - Quaderni dell'Istituto Ricerche Pesca Marittima, 4 (1 Suppl.): XVI + 358 p., Ancona

Caddy J.F., and G. P. Bazigos (1985) - Practical guidelines for statistical monitoring of fisheries in manpower limited situation - FAO Fish. Tech. Pap., (257): 86 p.

Cannizzaro L., G. Lembo, E. Bracci (1996) - Database and system for management of fisheries data (SFIDA) - Report, Contract U.E. n° 94/113.

Cannizzaro, L., F.d'Andrea, A.Potoschi, M.Scalisi (1999). Economic aspects of fishing of Dolphinfish in Sicily. *Sci.Mar.* 63(3-4): 459-464.

Carbonell E., J.J. Castro and E. Massutí.- 1998. *Floriceps saccatus* plerocerci (Trypanorhyncha, Lacistorhynchidae) as parasite of Dolphinfish (*Coryphaena hippurus* L.) and pompano dolphin (*Coryphaena equiselis* L.) in western Mediterranean and eastern Atlantic waters. Ecological and biological aspects. *Journal of Parasitology*, 84(5): 1035-1039.

Carbonell E., E. Massutí, J.J. Castro and R.M. García.- 1999. Parasitism of Dolphinfishes, *Coryphaena hippurus* and *Coryphaena equiselis*, in the western Mediterranean (Balearic Islands) and central-eastern Atlantic (Canary Islands). *Scientia Marina*, 63(3-4): 343-354.

Cochran W.G.,(1977) - Sampling Techniques - New York

Deudero S.- 1998. Relaciones tróficas en las comunidades ícticas asociadas a dispositivos agregadores de peces. PhD thesis, Universitat de les Illes Balears.

⁴ This Bibliography includes the documents selected by COPEMED and the new documents included by CopeMed II in the Palermo Workshop.

- Deudero S., P. Merella, B. Morales-Nin, E. Massutí and F. Alemany.- 1999. Fish communities associated with FADs. *Scientia Marina*, 63(3-4): 199-207.
- Deudero S.- 2001. Interspecific trophic relationships among pelagic fish species underneath FADs. *Journal of Fish Biology*, 58: 53-67.
- Farrugio H., G. Le Corre (1985) - Strategie D'Echantillonnage des Peches aux "Petits Metiers" en Mediterranée - Rapport Final Convention C.E.E. XIV-B-1 83/2/M09 P1
- Lleonart, J., B.Morales-Nin, E.Massutí, S.Deudero, O.Reñones, 1999. Population dynamics and fishery of Dolphinfish (*Coryphaena hippurus*) in the western Mediterranean. *Scientia Marina* 63(3-4): 447-457.
- Massutí, E. & B. Morales-Nin, 1991. La pesca de Llampuga (*Coryphaena hippurus*) en Mallorca. *Informes Técnicos Inst. Español Oceanografía*, (106):19 pp.
- Massutí E. y O. Reñones.- 1994. Observaciones sobre la comunidad de peces pelágicos asociados a objetos flotantes en aguas oceánicas de Mallorca. *Boletín del Instituto Español de Oceanografía*, 10(1): 81-93.
- Massutí, E. & B. Morales-Nin, 1995. Reproduction and migration patterns of Dolphinfish (*Coryphaena hippurus*) in the Mediterranean Sea. *Scientia Marina* 59(2):357-364
- Massutí, E. & B.Morales-Nin, 1997. Reproductive biology of Dolphinfish (*Coryphaena hippurus* L.) off the island of Majorca (western Mediterranean). *Fisheries Research* 30: 57-65
- Massutí E.- 1997. Biology of *Coryphaena hippurus* Linnaeus, 1758 (Pisces: Coryphaenidae) in the Western Mediterranean. PhD thesis, Universitat de les Illes Balears.
- Massutí E., S. Deudero, B. Morales-Nin and P. Sánchez.- 1998. Diet and feeding of Dolphinfish (*Coryphaena hippurus*) in western Mediterranean waters. *Bulletin of Marine Science*, 63(2): 329-341.
- Massutí, E., B.Morales-Nin, S.Deudero, 1999. Fish fauna associated with floating objects sampled by experimental and commercial purse nets. *Scientia Marina* 63(3-4): 219-227.
- Massutí E. and B. Morales-Nin (Eds.).- 1999. Biology and fishery of Dolphinfish and related species. *Scientia Marina*, 63(3-4): 181-475.
- Massutí E., B. Morales-Nin and J. Moranta.- 1999. Otolith microstructure, age and growth patterns of Dolphinfish (*Coryphaena hippurus*) (Pisces: Coryphaenidae) in the western Mediterranean. *Fishery Bulletin*, 97: 891-899.
- Morales-Nin B., L. Cannizzaro, E. Massutí, A. Potoschi and F. Andaloro.- 1999. An overview of the FADs fishery in the Mediterranean Sea. *IFREMER Actes de Colloques*, 28: 184-208.
- Morales-Nin B., M. Di Stefano, A. Potoschi, E. Massutí, P. Rizzo and S. Gancitano.- 1999. Differences between the sagitta, lapillus and vertebra in estimating age and growth in juvenile Mediterranean Dolphinfish (*Coryphaena hippurus*). *Scientia Marina*, 63(3-4): 327-336.

Morales-Nin B., P. Oliver, J.J. Castro, L. Cannizzaro, A. Potoschi, C. Pla (1996) - Biology and Fishery of Dolphinfish in the Western Mediterranean and Canary Island Area - Report, Contract U.E. n° 94/031.

Morales-Nin B., P. Oliver, J. J. Castro, L. Cannizzaro, A. Potoschi, C. Pla (1998) - Dolphinfish biological and fishing data in the western Mediterranean - Report, Contract U.E. n° 95/073.

Morales-Nin,B., M.DI Stefano, A.Potoschi, E.Massutí, P.Rizzo, S.Gancitano, 1999. Differences between the sagitta, lapillus and vertebra in estimating age and growth in juvenile Mediterranean Dolphinfish (*Coryphaena hippurus*). *Scientia Marina* 63(3-4): 327-336

Mortera J., Levi D. (1981) - Present progress of the PESTAT Programme: a sample surveysystem for the quality chek of the catch an effort fisheries statistics in Italy (GFCM) - Annex (E) BB of the report of the second technical consultation on stock assessment in the Adriatic. FAO Fisheries Report n° 253 : 179-186.

Pla,C., J.M.Pujolar, 1999. Genetic homogeinity of Dolphinfish (*Coryphaena hippurus*) in the western Mediterranean and the estern Atlantic. *Scientia Marina* 63(3-4): 337-341.

Reñones O., E. Massutí, S. Deudero and B. Morales-Nin.- 1998. Biological characterization of pilotfish (*Naucrates ductor*) from the FADs fishery off the island of Mallorca (Western Mediterranean). *Bulletin of Marine Science*, 63(1): 249-256.

Vella; A.(1999). Dolphinfish fishery in Maltese Islands. *Sci.Mar.*63(3-4): 465-467.

Zaouali, J., H.Missaoui (1999). Small-scale Tunisian fishery for Dolphinfish. *Scientia Marina* 63(3-4): 469-472.