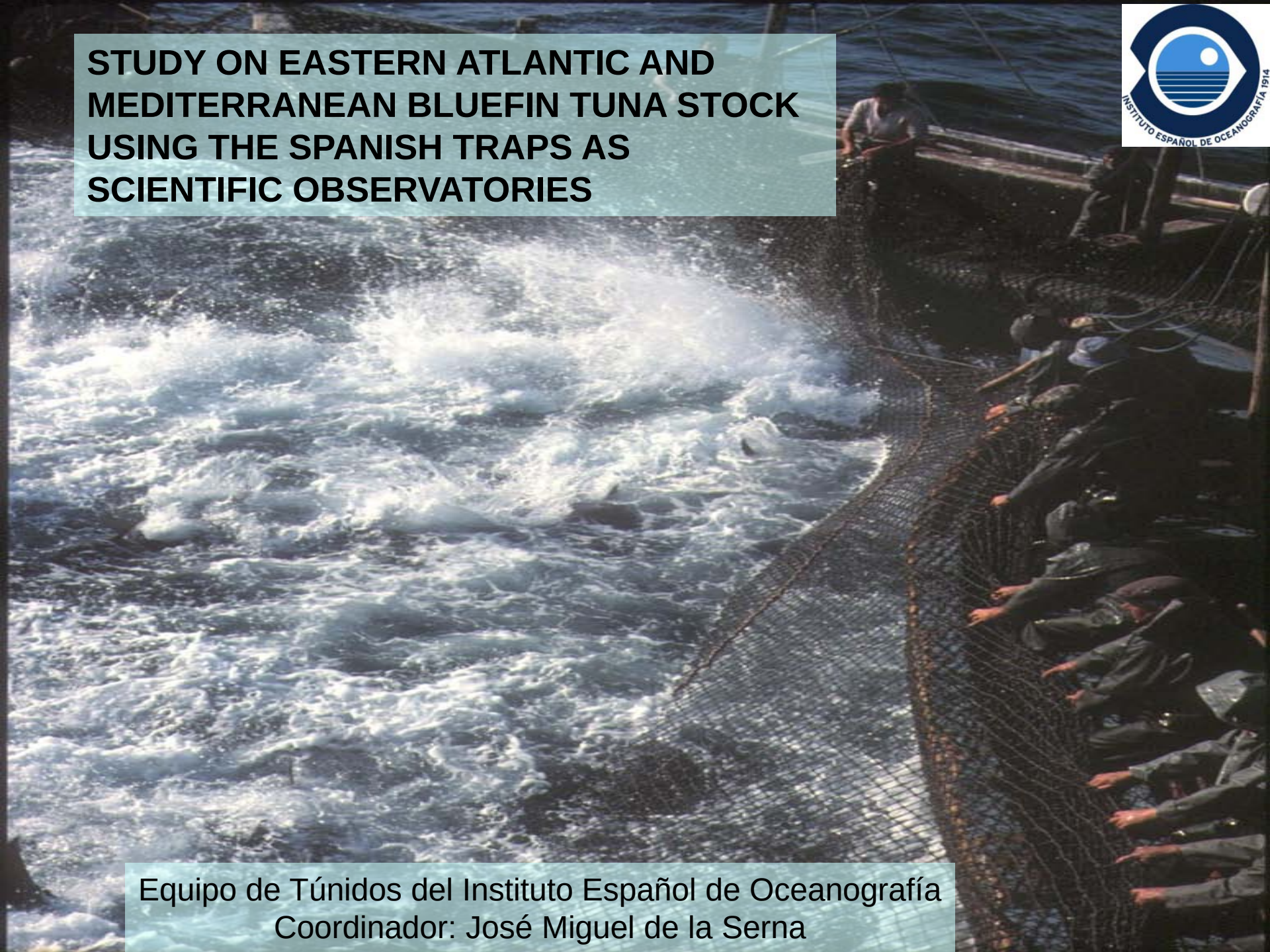
STUDY ON EASTERN ATLANTIC AND MEDITERRANEAN BLUEFIN TUNA STOCK USING THE SPANISH TRAPS AS SCIENTIFIC OBSERVATORIES



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Introduction

Bluefin tuna has been historically exploited in a sustainable way in the Eastern Atlantic and Mediterranean Sea.

Traps were the most traditional fishing gears, with catches going down from the second half of XXth century.

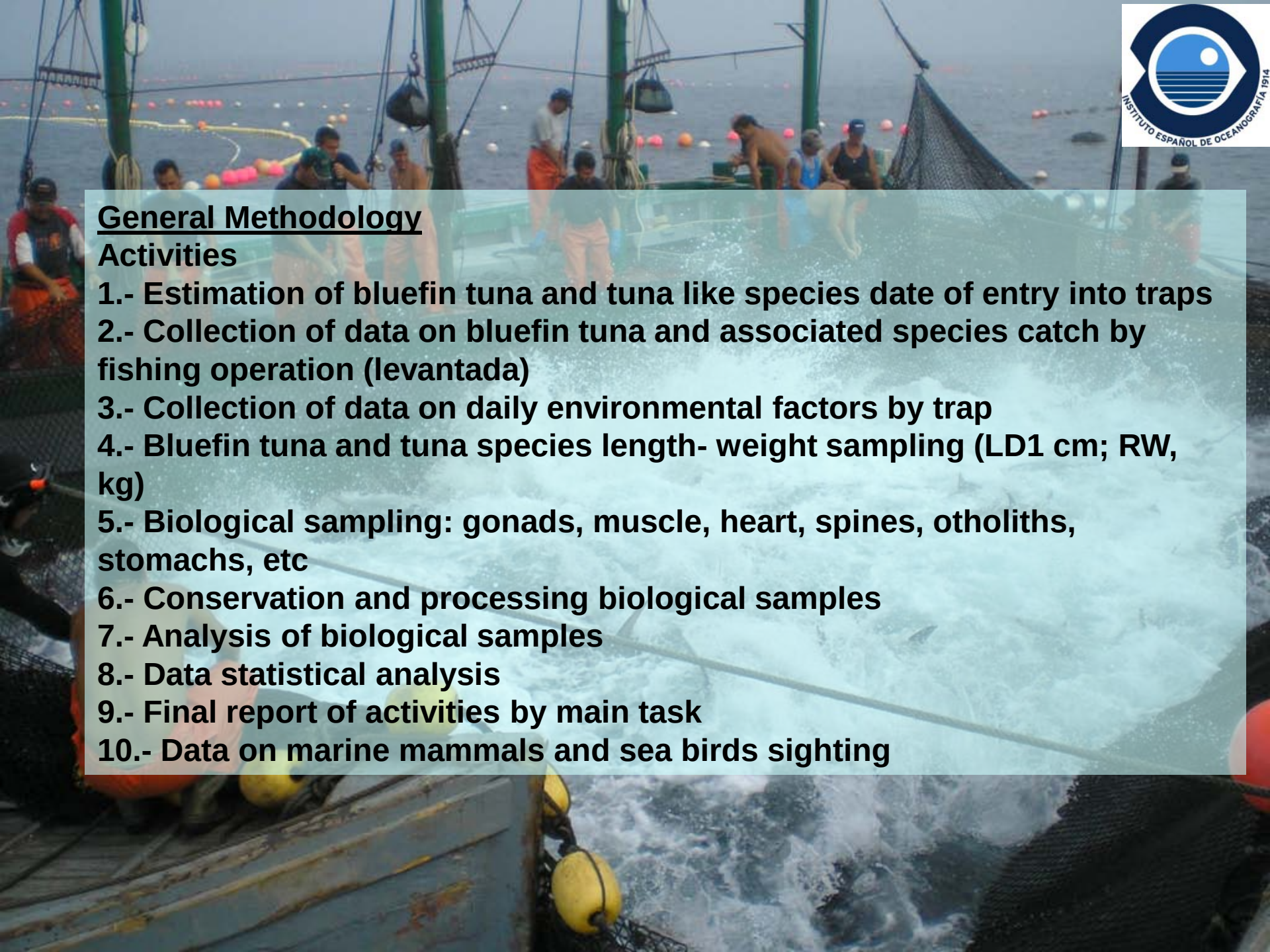
Traps are the source for the relative abundance index used during stock assessment and supply information on the effect of ICCAT RECOVERY PLAN.

Eastern bluefin tuna stock evaluation indicates high levels of overexploitation: ICCAT RECOVERY PLAN.

The Secretaria General del Mar (SGM) entrusted a study on bluefin tuna, using the traps as an scientific observatory, to the IEO with the collaboration of Organización de Productores Pesqueros de Almadrabas (OPP/51).

OBJECTIVES

A.- Study on stock structure an migratory behaviour
B.- Growth
C.- Reproduction
D.- Feeding
E.- Biometric relationships
H.- Associated species and by-catch
I.- Data mining, historical data collecting
J.- Comparative studies with bluefin tuna from other areas- fleets
K.- Trap technical description



General Methodology

Activities

1.- Estimation of bluefin tuna and tuna like species date of entry into traps

2.- Collection of data on bluefin tuna and associated species catch by fishing operation (levantada)

3.- Collection of data on daily environmental factors by trap

4.- Bluefin tuna and tuna species length- weight sampling (LD1 cm; RW, kg)

5.- Biological sampling: gonads, muscle, heart, spines, otholiths, stomachs, etc

6.- Conservation and processing biological samples

7.- Analysis of biological samples

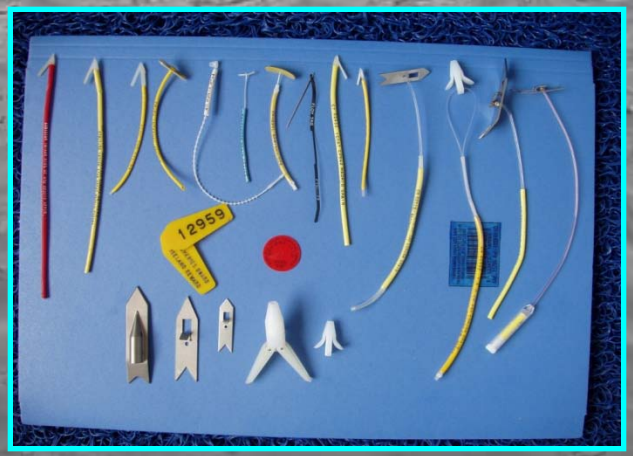
8.- Data statistical analysis

9.- Final report of activities by main task

10.- Data on marine mammals and sea birds sighting

STOCK STRUCTURE

Electronical tagging: 50 pop-up and internal tags will be deployed
In addition, 100 bluefin tuna will be tagged with ICCAT conventional tags



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Results

A. Stocks Characterization



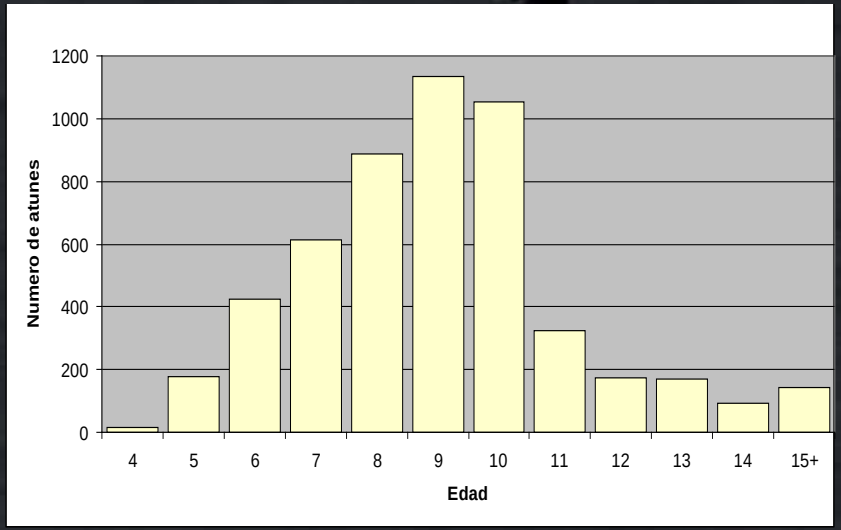
It has been found for the first time trematodes of the subfamily didimozoidos Nematobothriinae in the eye socket of the bluefin tuna. This species is probably unknown to date due to host specificity and habitat. A study released this detailed taxonomic species.

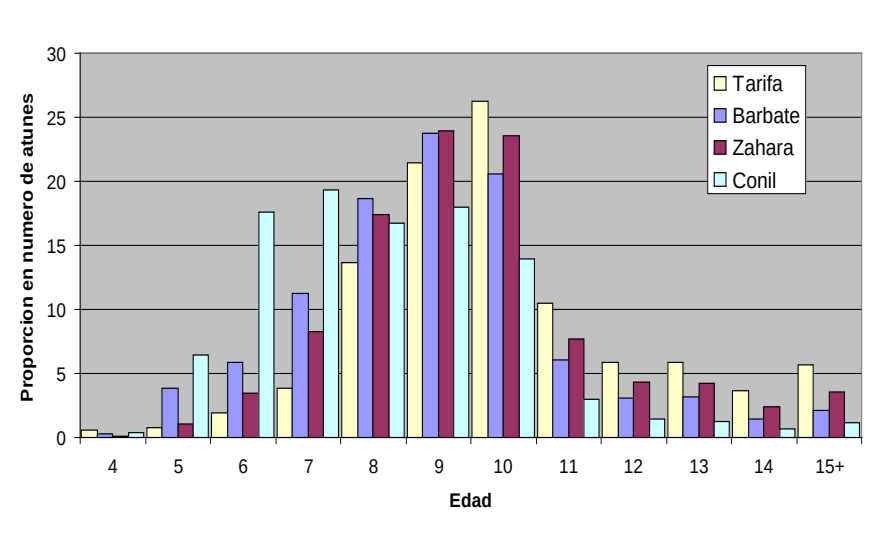

Our early results indicate that there is less diversity and prevalence of parasitological fauna in adult bluefin tuna caught by traps, in comparation to juvenile tuna caught in the Bay of Biscay, despite differences in size.

Results

B. Age and Growth

Our results shows that most of the catches of the Spanish Atlantic traps consist of ages 7 to 10 years. These results are consistent with previous annual demographic composition of the traps, which shows that the ages 7 and up are well represented in the capture and that from the age 10 are fully recruited to the art.

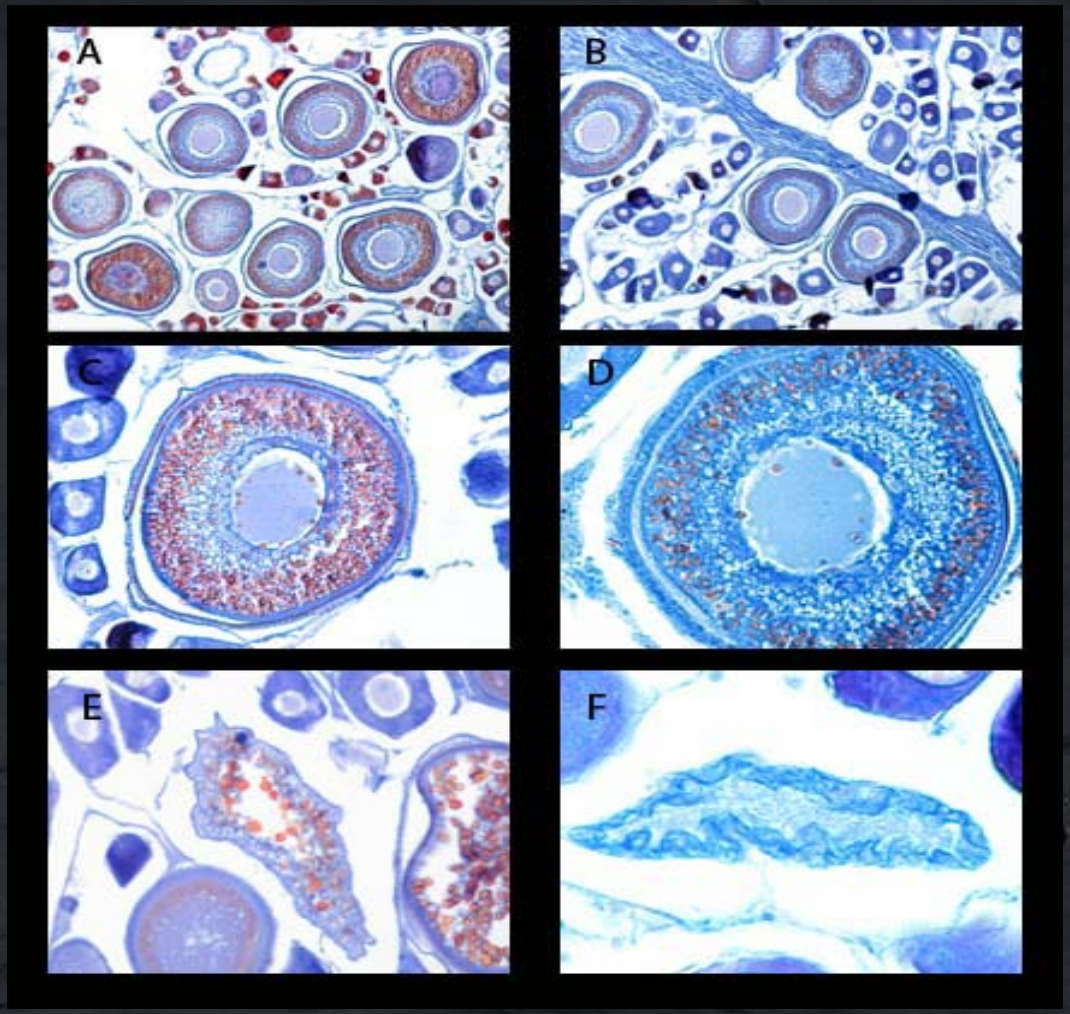




The graphic Shows that the trap of Tarifa captured the older specimens, mostly ages 9 to 10 years. However, the trap of Conil captured younger specimens of 6 to 7 years.

Results

C. Reproduction



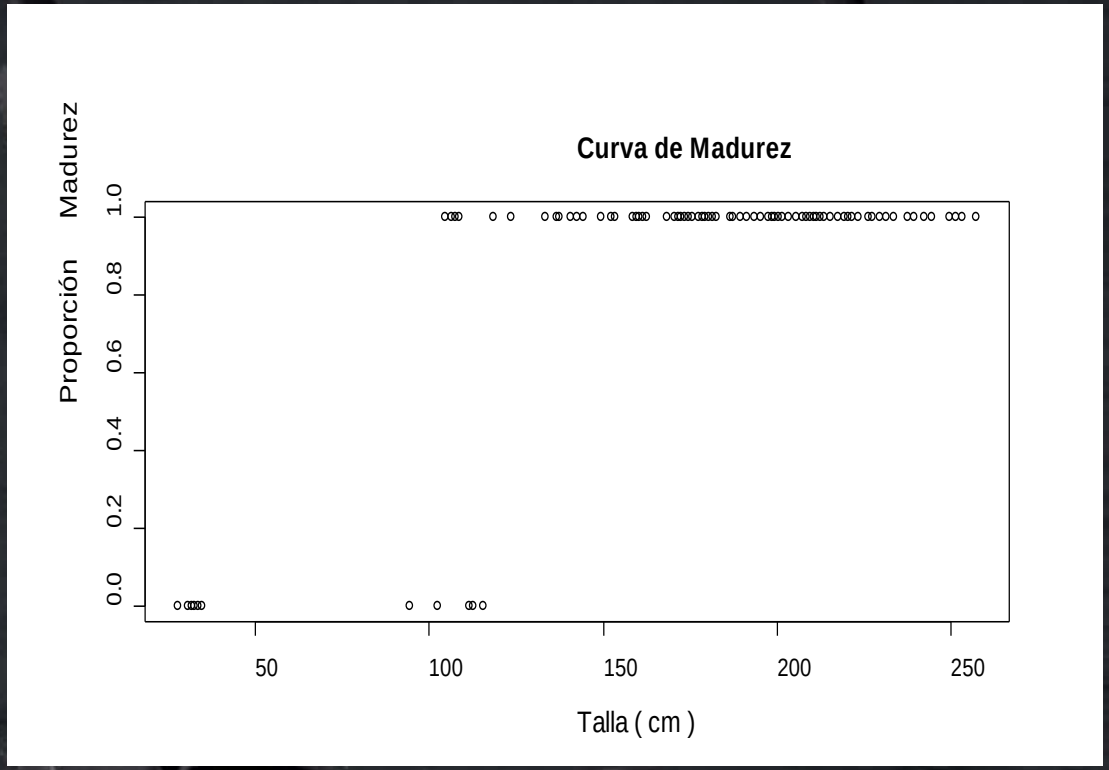
Of the 61 females examined, all were classified as inactive mature, ie, in the ovaries were only observed previtellogenic or early vitellogenic oocytes (with little yolk) plus alpha atresia and / or beta atresia.

Results

C. Reproduction

The size at first maturity estimated from the data was 108,004 cm. The L_{50} estimated from the bootstrap was slightly lower: 107,928 cm.

The estimated L_{50} corresponds with tuna for 3-4 years and an estimated weight of 26 kg. Nevertheless and due to the low number of smaples around the size at first maturity used in the study this value could be underestimating the size at first maturity.



Results

D. Diet composition

Prey species consumed in the trap and present in 10% of the stomachs of tuna tested (n = 91).

Prey	Weight (g)	n
	143,15	2
	488,4	6
	268,86	1
	1935,35	10
	382,58	1
	523,93	3

Main Groups	Hard Pieces	Taxa
Fishes	Otolits	
Crustaceans	Pincers	

Hard pieces found in 9% of the stomachs of tuna tested (n = 91).

Results

D. Diet composition

Our preliminary results indicate that the relative abundances of Delta (15N/14N) and DeltaC (13C/12C) of the samples from the traps do not differ from samples from other sampling sites, as the traps of Larache and Puse seiners of the Balearic Islands.
These results indicate that the prey species are very similar.

Prey	$\delta^{13}C_{LE}$	$\delta^{15}N_B$
sp (n=1)	-19.20	9.o
Scomber scombrus (n=3)	-18.78 0.78	10.19 0.90
(n=3)	-18.55 0.50	9.54 1.46
(n=3)	-18.53 0.29	9.13 1.20
(n=3)	-18.05 0.87	10.09 0.79
(n=3)	-18.24 0.81	9.35 1.42

Prey	mean sd
sp (n=1)	0.48 0.06
Scomber scombrus (n=3)	0.14 0.04
(n=3)	0.14 0.11
(n=3)	0.09 0.07
(n=3)	0.08 0.06
(n=3)	0.07 0.05

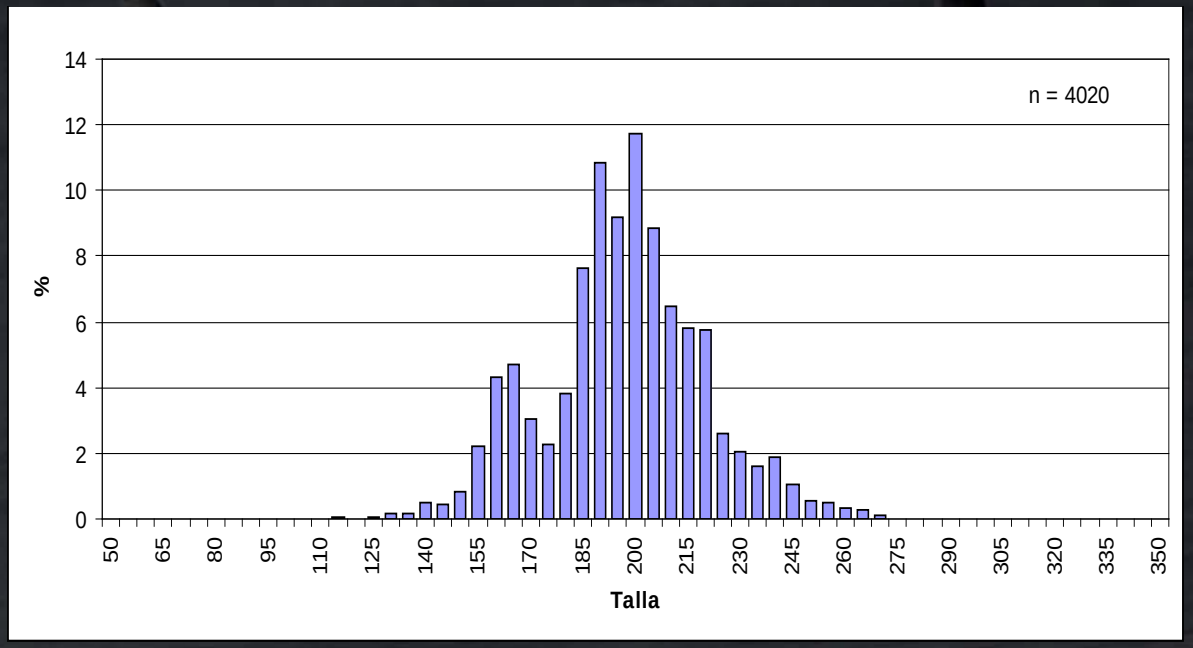
Results

E. Biometric Relationships

The estimated data showed average values of LH of 223.37 cm for males and 204.16 cm for females.

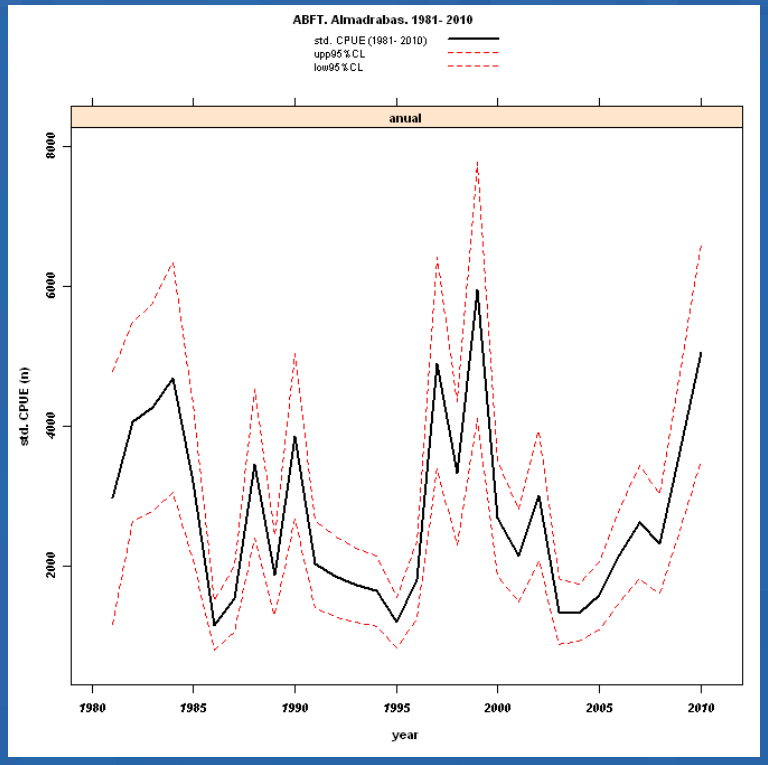
With regard to the total weight, the values were, 199.88kg for males and for females 152.20kg.

Biometric values were found higher for males than for females.



Round Weight = 0.00029 x **LH**$^{2.48515}$

Round Weight = 1.9655 x **LD1**$^{2.784}$

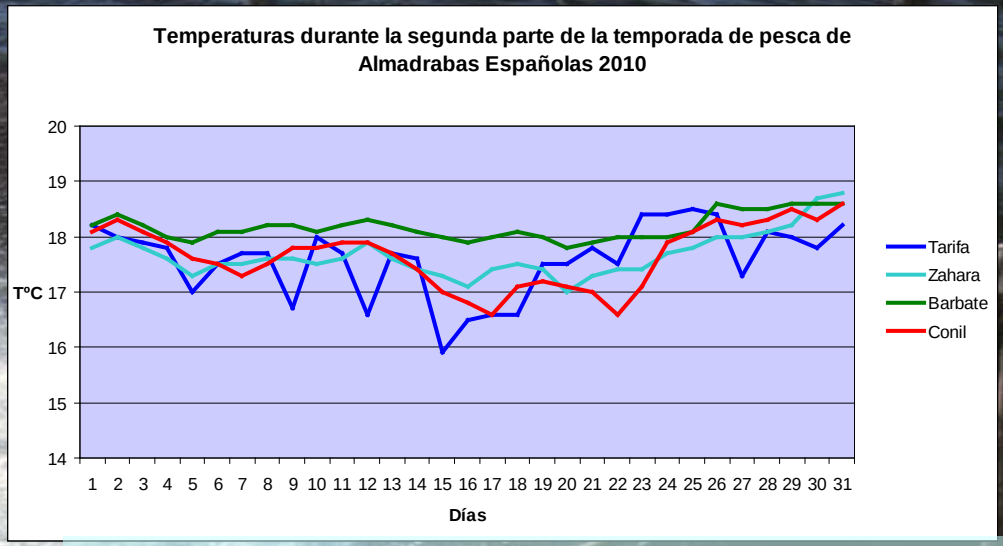


RESULTS

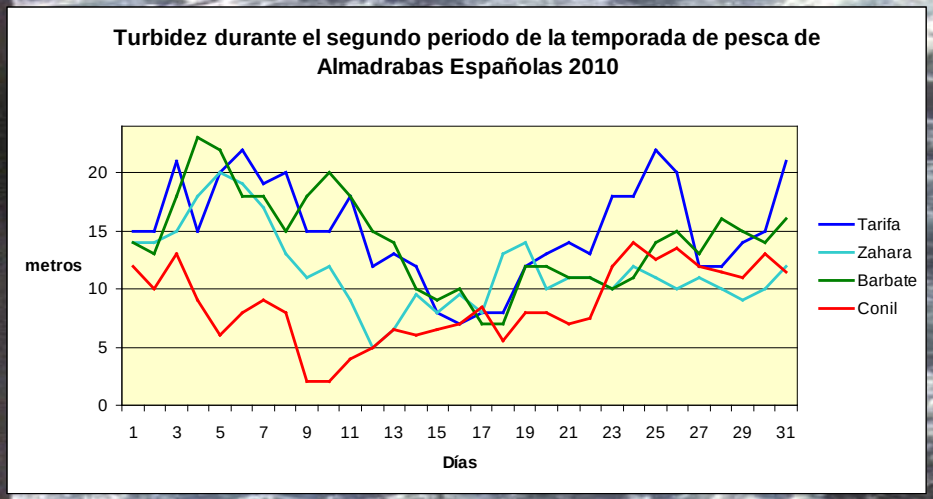
Standardized index of relative abundance
49 fishing operations with 5218 bluefin tuna. In addition, 9550 individuals were released. A total of 14 768 individuals were caught, which is a value higher than the average catch for the last decade.
As for the relative abundance index used in stock assesment, it is observed a stable trend for the last years, with some variability between years.

ENVIRONMENTAL FACTORS

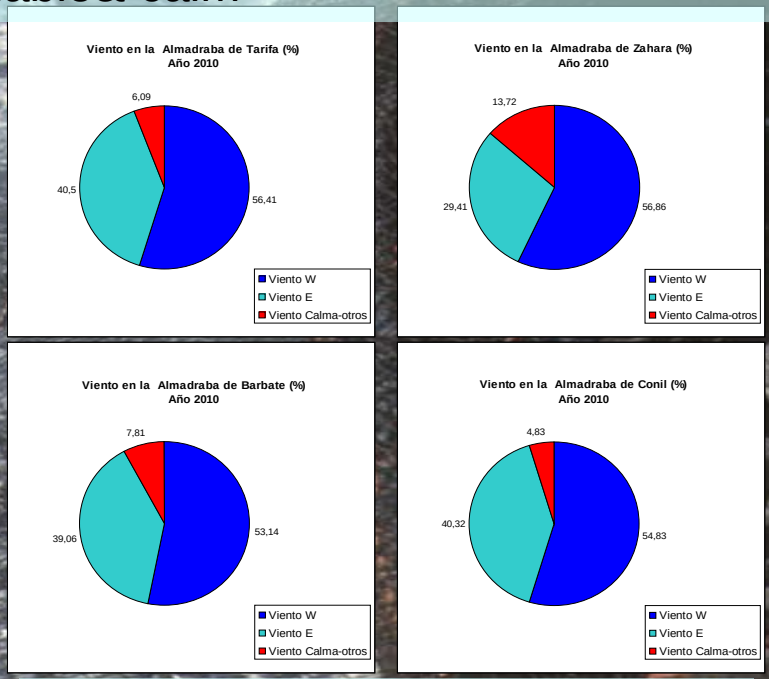
Sea surface temperature in the range 16ºC- 20ºC. Sea surface temperature was variable along the fishing period and across traps



Wind: 51 % W, 37 % E y 22 % other & variable& calm



Turbidity in the range 2.5m- 28m, depending on the bottom of the trap.



Wind effect on bluefin tuna catch

ASSOCIATED SPECIES

Main associated species were small tuna and swordfish, as well as a very low frequence of other species

CODIGO	NOMBRE ESPAÑOL	NOMBRE CIENTIFICO
AMB	Pez limóm	Seriola Dumerillii
MOX	Pez luna	Mola mola
MUF	Lisa	Múgil cephalus
FLY	Pez volador	Exocoetidae
YRS	Barracuda	Shyraena sp
TTL	Tortuga boba	Caretta caretta
LTA	Bacoreta	Euthynnus alleteratus
SWO	Pez espada	Xiphias gladius
BON	Bonito del atlántico	Sarda sarda
BLT	Melva	Auxis
MNZ	Rape	Lophius sp.
RPG	Pargo	Pagrus pagrus
SFS	Sable	Lepidopus caudatus
PAX	Besugo	Pagellus spp
SPN	Pez martillo	Sphyrna spp
TTR	Tembladera	Torpedo marmorata
PIL	Sardina	Sardina pilchardus

DATA MINING

Collection of bluefin tuna catch series in number of fish and weight by fishing operation for the period 1975- 2010, for the four operating traps

Comparative studies with other areas and fleets

Comparative studies with other areas and fleets

	Captura en número	Captura en peso (kg)	Rango	Talla media
Almadrabas	5213	885113	100-280	197
Línea de mano	81	13632	160-245	211
Cerco			100-335	190
Cebo vivo del Estrecho	1351	63387	85-265	124
Palangre de superficie	1085	150199	90-275	194

Length Distribution by gear for 2010