TAGGING PROGRAMME 2013 ATLANTIC-WIDE RESEARCH PROGRAMME ON BLUEFIN TUNA (ICCAT/GBYP – PHASE 4)

TASK E:
Conventional tagging of adult bluefin tunas in traps in the Mediterranean Sea, Sardinian waters

DRAFT FINAL REPORT

July 19, 2013

Consortium partners:

Com. Bio. Ma.
Centro di Competenza sulla Biodiversità Marina

Via Ing. Tomaso Fiorelli 1 - 09126 Cagliari, ITALY
Phone (39) 070 675 8000 - Fax (39) 070 675 8022
Email: combioma_scrl@legalmail.it

COMPAGNIA TONNARE SARDEGNA – Srl

Via Molise 6 – 09127 Cagliari. ITALY
Phone (39) 0781 855163 – Fax (39) 0781 850039
Email: tonnaresulcitane@tiscali.it

CARLOFORTE TONNARE P.I.A.M. – Srl

Via Arezzo 2 – 09125 Cagliari – ITALY
Phone (39) 0781 855163 – Fax (39) 0781 850039
Email: giuliano@liguresarda.it

DRAFT FINAL REPORT

July 19, 2013

Summary

CONTACTS

Prof. Angelo Cau (Administrator) +39 070 675 8050 cau@unica.it
Co.Bio.Ma. – Centro di Competenza sulla Biodiversità Marina
c/o Department of Life Science and Environment, University of Cagliari
Via Fiorelli 1, 09126 Cagliari, Italy
Tel. +39 070 675 8000 – Fax +39 070 675 8022 – Amm. +39 070 675 8040

TAGGING COORDINATOR

Dr. Piero Addis, Senior Scientist in Ecology - University of Cagliari
Via Fiorelli 1 - 09126 Cagliari, ITALY
Phone: (39) 070 675 8082, Fax: (39) 070 675 8022
E-mail: addisp@unica.it

TAGGING STAFF

Dr Marco Secci	Scientist Com.Bio.Ma. – Tagging staff PhD Candidate – University of Cagliari
Dr Rita Cannas	Scientist Com.Bio.Ma. – Tagging staff Senior researcher in Zoology– University of Cagliari
Dr Andrea Sabatini	Scientist Com.Bio.Ma. – Tagging data base Senior researcher in Ecology – University of Cagliari
Dr Francesco Palmas	Scientist Com.Bio.Ma. – Tagging staff PhD Candidate – University of Cagliari
Dr Ricardo Melis	Scientist Com.Bio.Ma. – Tagging staff PhD Candidate – University of Cagliari
Dr Jacopo Culurgioni	Scientist Com.Bio.Ma. – Tagging staff PhD Candidate – University of Cagliari
Mrs Viviana Pasquini	Tagging staff Student – University of Cagliari
Mrs Elisabetta Mereu	Administrative officer Com.Bio.Ma.

ICCAT/GBYP 01/2013 (PHASE 4 - 2013)

"TAGGING PROGRAMME 2013"

FOREWORD

The proposal for the "ICCAT-GBYP Tagging programme 2013 - TASK E: Conventional tagging of adult bluefin tunas in traps in the Mediterranean Sea, Sardinian waters" was submitted on March 25 by the consortium composed by the Centro di Competenza sulla Biodiversità Marina (Com.Bio.Ma.), which represents the leading entity (Coordinator), the Consociazione Tonnare Sardegna (CTS) and the Carloforte Tonnare PIAM (CTPIAM). The last two entities represent the two trap companies that manage the Sardinian traps of Isola Piana, Capo Altano and Porto Paglia. The Com.Bio.Ma. (formally recognized by the Italian Ministry of University, Education and Research) has a documented multi-year experience in bluefin tuna and large pelagic species studies, nevertheless is the first time that the institution is involved in tagging activities on bluefin tuna. On the other hand the institution has long experience in tagging research for spiny lobster and other marine invertebrates living in Sardinian waters. The challenge of this project comes from the common will of the institution of research and by the trap companies to cooperate, and view the tagging and release of bluefin tuna as responsible conduct in the species conservation.

The tagging programme effectively began on April 19, 2013 after the proposal was awarded by the ICCAT secretariat; the contract signed by the ICCAT secretariat was received on May 28.

On June 30 a short report (Del. # 1), together with an update of the short report (Del. # 2) were submitted to ICCAT.

In agreement to Deliverable #4 of the tagging programme, the present report summarize the activities carried out by July 15, 2013. An update PowerPoint presentation has also been attached at the report to inform the SCRS on the activities carried out in Sardinian traps.

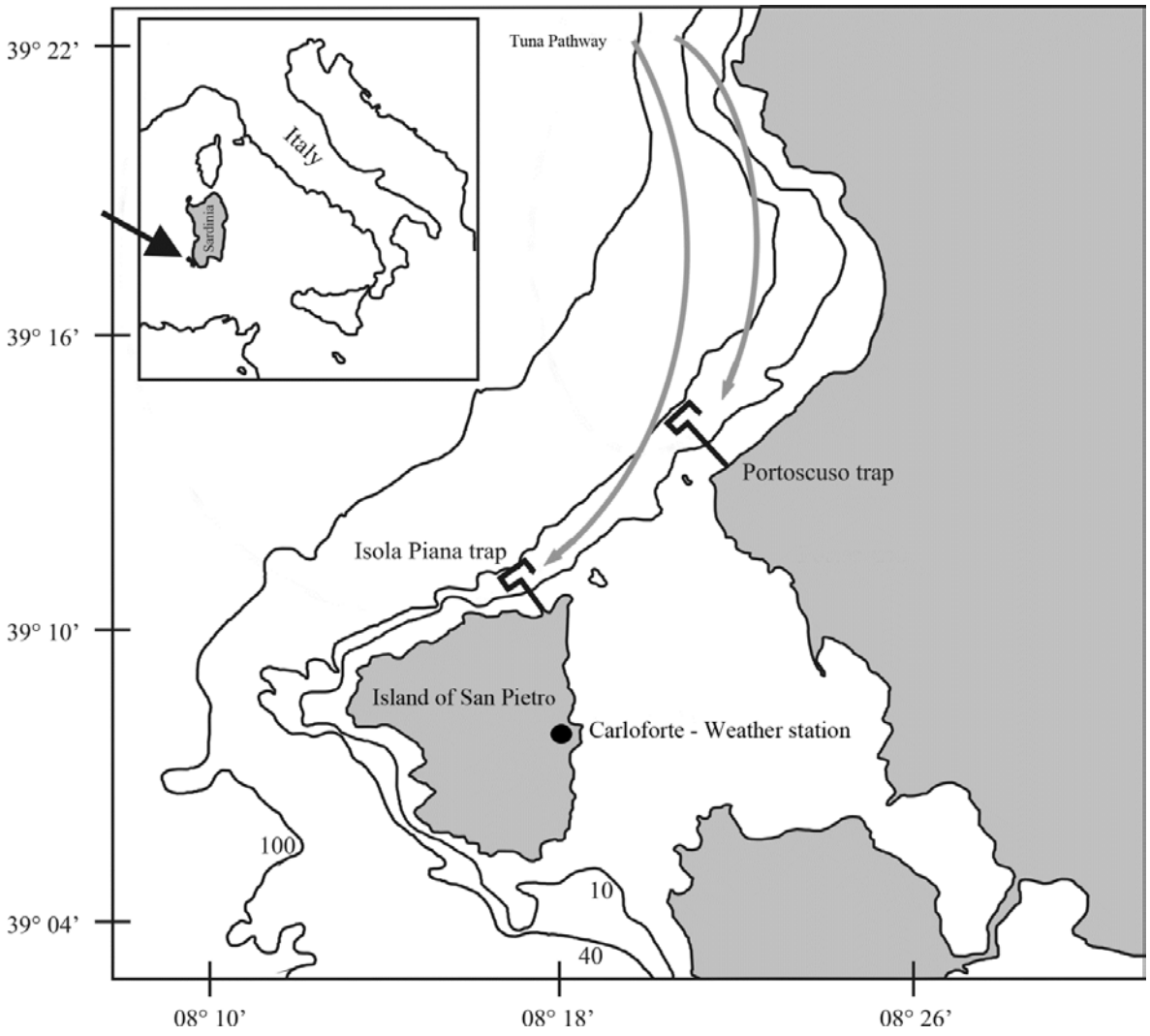
SARDINIAN TRAPS: general features

In Sardinia (W-Mediterranean) are settled three traditional traps (tonnara): Isola Piana, Capo Altano and Porto Paglia. The position of such gears is the same from the 17th century, where the occurrence and high abundance of reproductive bluefin tuna sustained three coastal villages. The traps used for the purposes of the tagging programme are the Isola Piana (located in the Island of San Pietro) and the Capo Altano trap (or Portoscuso trap) (see below the ICCAT list number). The third trap of Porto Paglia has not been used for tagging purposes because considering recent and historical data this location has low productivity of tuna, probably due to lower environmental suitability respect of the other locations.

The Capo Altano trap also known as the tonnara of Portoscuso is the oldest trap in Sardinia dated back to XVI century. It is deployed in Capo Altano at a depth of 35-38 m. Its main features are: five chambers, a long tail (1500m) which is necessary because of the slight slope of the bathymetries and the strong hydrodynamism. The Capo Altano trap is managed by the company Tonnare Su Pranu srl which form together with the other traps the company Compagnia Tonnare Sardegna. The trap crew is composed by 25 fishermen (tonnarotti).

The Isola Piana trap is deployed in the northern part of the island of San Pietro in the location known as Tacche bianche. It is the second oldest trap of Sardinia and nowadays the most productive one, it has a tail 1050 m long, five chambers settled at 42m depth. The trap of Isola Piana is manged by the Carloforte Tonnare PIAM srl which joint the Compagnia Tonnare Sardegna. The trap crew is composed by 25 fishermen (tonnarotti).

ICCAT List Number	Reporting Flag	Trap	Reg.Number	Owner	Address	Operator	Address
ATEU2ITA00009	EU.Italy	Tonnara Capo Altano	ITA04/FIS/2010	Soc. Tonnara Su Pranu Portoscuso srl	Pzza S. Maria D'Itria n.4, 09010 Portoscuso (CI)	Soc. Tonnara Su Pranu Portoscuso srl	Pzza S. Maria D'Itria n.4, 09010 Portoscuso (CI)
ATEU2ITA00003	EU.Italy	Tonnara Isola Piana	ITA02/FIS/2010	Soc. Carloforte Tonnare P.I.A.M. s.r.l.	Via Arezzo n.2, 09125 Cagliari (CA)	Soc. Carloforte Tonnare P.I.A.M. s.r.l.	Via Arezzo n.2, 09125 Cagliari (CA)
ATEU2ITA00006	EU.Italy	Tonnara di Porto Paglia	ITA05/FIS/2010	Tonnare Sulcitane srl	Via M. Polo n.1, 09010 Portoscuso (CA)	Tonnare Sulcitane srl	Via M. Polo n.1, 09010 Portoscuso (CA)



FISHING SEASON 2013

The fishing season 2013 of the Sardinian trap fishery started on early February. Each trap include around 120 anchors (~200Kgs each), kilometers of steel cables and chains, hundreds buoys and kilometers of nets of diverse mesh size. Each array needs at least 20 working days to be settled, considering favorable weather conditions.

In mid-late April the three traps ware fully operative and the first observation of entrapped bluefin tuna occurred on early May.

It must be pointed out that the fishing practice in Sardinian traps changed in 2011 from the traditional system of capture tunas by "mattanzas" on-site, to the capture and caged of bluefin tuna alive in transporting cages for a tuna farm in Malta (Mare Blu Tuna Farm - Ricardo Fuentes and Hijos). For these purposes two cages are positioned adjoined to the death chamber in each trap array. A specific waterway allows the transfer of tunas from the death chamber to the cage. Here counting and videotapes of bluefin tuna specimens are acquired to control the achievement of the Quota.

The Quota assigned to the trap fishery by the Italian Ministry for Agriculture Policy and Forestry in 2013 was 165 tons. Successively the trap companies acquired 56,99 tons reaching a total Quota of 221,99 tons.

The full Quota was completed on June 14 when a small mattanza of 5 tons occurred. At that date none tagging activities were carried out. On the basis of the plans agreed with the trap companies, tagging started afterwards June 14.

In the following graph is displayed the schedule for the tagging programme until the date of submission of the draft final report.

TAGGING PROTOCOL

The tagging protocol used for the present proposal responds to the Tagging Manual by the ICCAT/GBYP. Certainly some modifications have applied in order to accomplish the tagging procedure by diver using pneumatic spearguns. Adjustment in the tagging protocol are described below.

TRAINING COURSE FOR DIVERS AND SCIENTIFIC TEAMs

Operational activities were properly prepared before the tagging phase. Three technical meetings have been arranged on May 17, 22 and 31 at the trap company headquarters (in the villages of Carloforte for the Carloforte Tonnare, and Portoscuso for the Compagnia Tonnare Sardegna). It was defined and discussed on logistic and practical activities. During the first meeting the tagging coordinator has showed a PowerPoint presentation to introduce and discuss on the tagging protocol, methodologies and equipment to use for tagging. An explicative guidebook has been distributed to the trap managers and at the chiefs of fishermen (Rais).

Two testing days (on May 31 and June 06), were also useful to verify the effectiveness of part of the equipment components. Professional divers of the trap companies participated at these tests to evaluate the effectiveness of pneumatic spearguns, tag-applicators, laser pointers and videocameras. Few changes have been taken after the testing days.

Fig. 1 - The trap crew of Isola Piana preparing the death chamber for tagging.

TECHNICAL MODIFICATION OF THE TRAP CHAMBERS

The trap array used in Sardinia is classified as 'tonnara di corsa' (arrival trap) because bluefin tuna are captured along their pre-spawning migration route and with ripening gonads. The gear consists of nylon nets arranged in a tail and five chambers: the "Grande" (120 m x 45 m), the "Bordonaro" (45 m x 45 m), the "Bastardo" (45 m x 40 m), the "Camera di ponente" (45 m x 40 m) and the "Camera della morte" (the "death chamber") (45 m x 30 m). Only the death chamber has a moving mesh 'floor' (horizontal) used to pull up the bluefin tuna flocks and to carry out the "mattanza". Some differences in size of the tail and the chambers characterized the two traps according the diverse features of the sea bottom and the trap orientation.

Following the technical meetings hold on May 17 and 22, among the tagging coordinator, the trap Company managers (Mr Giuliano Greco, Mr Andrea Farris) and fishermen chiefs (Rais Luigi Biggio for Isola Piana and Rais Ettore Biggio for Capo Altano), was decided to proceed as follows:

A) to start tagging operation after the full transfer of the Quota into the cages (such procedure allowed to avoid possible transfer of tagged bluefin into the cages) and maintain the traps operative for fifteen days after the achieving the Quota;

B) to test the first tagging operation by diver and pneumatic spearguns in the chamber "Bastardo" and "Camera" (which are chambers without net-mesh floor);

C) to evaluate the possibility to carry out tagging by diver and spearguns into the "death chamber";

D) to evaluate the possibility to carry out tagging by handle-pole into the death chamber. This option, successively, has been excluded by the fishermen chiefs because there is a high risk for mortality caused of entangling individuals. In fact, to tag using a pole, the net-floor should go up at 2.5-3 meters from the sea surface causing possible high distress in medium-large individuals. Such procedure could cause a unintentional "mattanza" with a high rate of mortality.

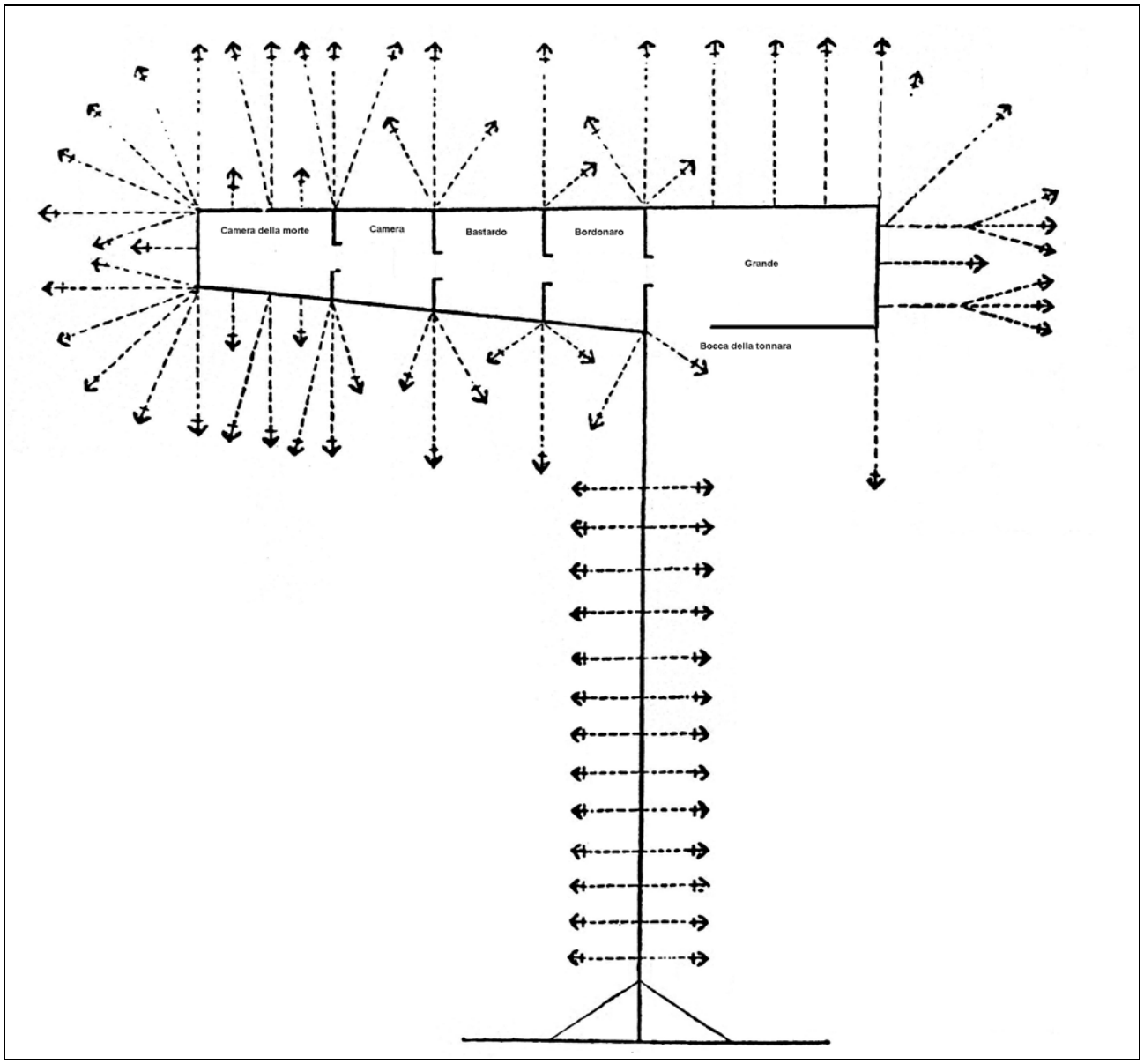


Fig. 2 Scheme of the traditional trap used in Sardinia

TAGGING EQUIPMENT

Description	*Source*
Single-barb spaghetti tag	1500 Spaghetti tags – FT1-94
Double-barb spaghetti tag - SMALL	TG02 (for the 350 Small billfish tags – FIM-96)
Double-barb spaghetti tag - LARGE	TG02 (for the 350 Large billfish tags – BFIM-96)
Tag applicators	60 for FT-94 - 40 for FIM-96 - 40 for BFIM-96
Speargun oleo pneumatic	MARES Cyrano 85-100-110 cm
Underwater camera	GoPro® HERO System BLACK
Software for image editing and analysis	TPSDig2; GoPro CineForm Studio
Underwater Laser pointer	Model RLP-LG05-B150 by APINEX
Flash memory card used for storing images	MicroSD 32GB
Backup Plus portable drive	Seagate 1T

APPLICATORS

Tag applicators and conventional tags have been provided by ICCAT. Tagging by pneumatic spearguns needed diverse modification, since applicators provided by ICCAT are prepared for pole tagging with bluefin specimens close the surface. Moreover in pole tagging the person appointed for tagging can measure out the force of insertion of the applicator into the tuna body. Using speargun such procedure is not under control the diver since a pneumatic speargun works generally at 20-24 bar.

In order to reduce a deep insertion of the applicator using a speargun (which can cause lethal injuries to the specimen), we initially applied a small steel plate (~3-5 cm in diameter) (see PowerPoint presentation for details) welded to the applicator to limit (to stop) at 4-5 cm the penetration into the tuna body. After an experimental test on some bluefin (entangled) this device has been refuse because such system had too much friction in the water causing a deceleration and deviation of the speargun-shaft.

Finally we decide to use the pneumatic spearguns at low operative pressure. The right pressure for tagging bluefin tuna specimens without lethal injuries was 12-13 bar in a small - medium size specimens (30-70 kgs).

Each diver worked alone using the "all-in-one" equipment, i.e. the speargun + camera + laser pointers.

Fig. 3 Applicator for single barb spaghetti modified for speargun (1st model)

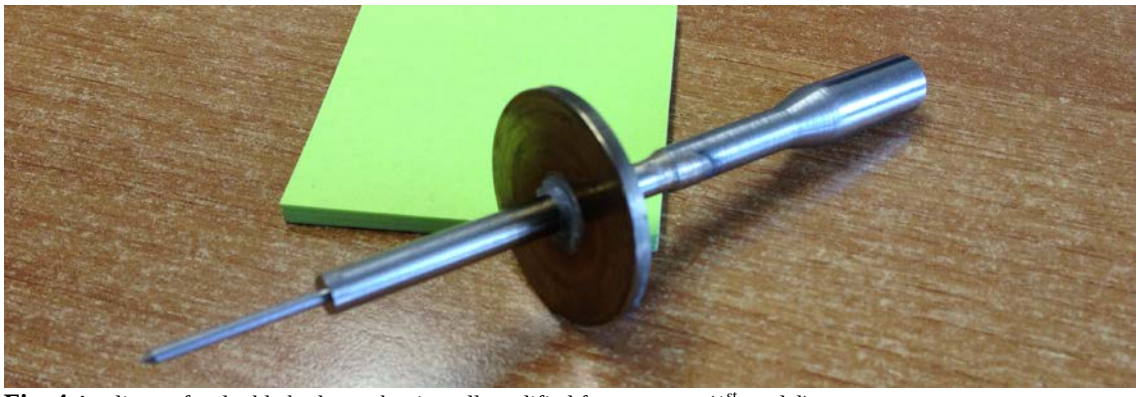


Fig. 4 Applicator for double barb spaghetti small modified for speargun (1st model)

Fig. 5 Applicator for double tagging with single barb and double barb spaghetti modified for speargun (1st model)

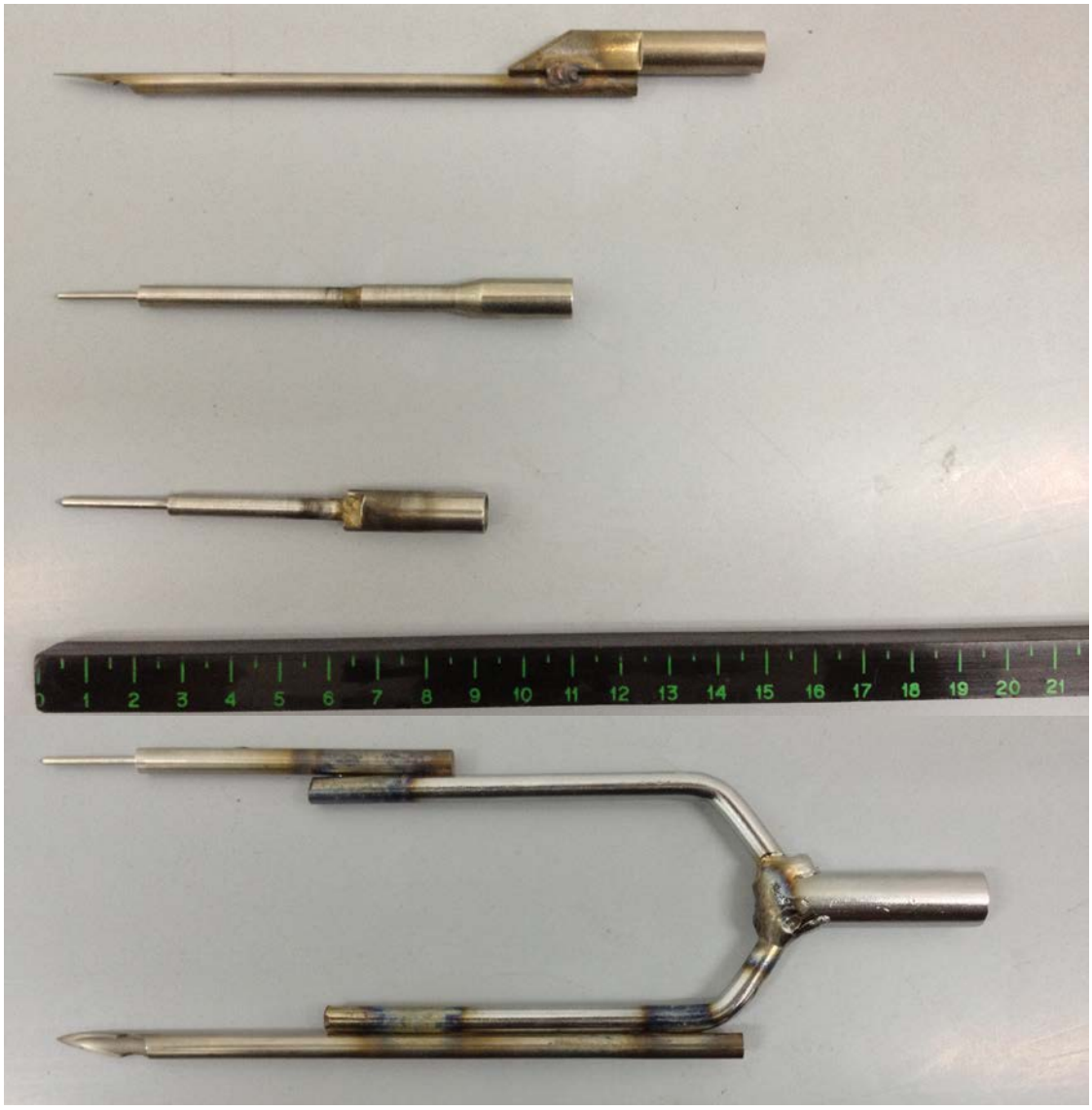


Fig. 6 Applicator for single and double barb spaghetti modified for speargun (2nd model)

Fig. 7 Applicators for double tagging (single and double barb spaghetti) modified for speargun (2nd model)

SPEARGUNS

For our purposes we adopted the Cyrano speargun (Mares). This speargun combines the power characteristics of a pneumatic gun with manageability and extreme shaft speed. It is equipped by highly sensitive release mechanism, ergonomic handle with a soft insert and with power adjusting system (WP). For tagging activities we used the 85, 97 and 110-cm sizes which are equipped with a 7-mm tahitian race shaft.

Fig. 8 Set of spearguns model Mares Cyrano adopted for tagging: only three sizes (85-97-110cm) were used for tagging operation

CAMERA TYPE

Our initial proposal for the 3D underwater camera by GoPro® 3D HERO System by GoPro®. Successively such system was replaced by GoPro Hero3 Black since the GoPro 3D system is only suitable for external videos but not for underwater. A correction lens with specific refractive index for sea water was not available from the Italian dealer of GoPro.

Fig. 9 The GoPro 3D system was initially proposed for furnish proofs of tagging

Fig. 10 Back of the GoPro 3D system initially used in the project

Fig. 11 The GoPro Hero3 Black edition was successively adopted for tagging

Fig. 12 Waterproof housing for the GoPro Hero3 Black edition

Fig. 13 Removable LCD touch screen for the GoPro Hero3 Black edition

Fig. 14 Kit useful for mounting the GoPro system on the spearguns

Key features

GoPro hero3 is a waterproof camera to 197' (60m), capable of capturing ultra-wide videos and 12MP photos at a rate of 30 photos per second. Optics are Ultra sharp *f*/2.8 6-element aspherical glass lens and Ultra wide angle / reduced distortion. Adopts a 1050mAh rechargeable lithium-ion battery chargeable via USB with an estimated time duration ranging from 1:05 – 1:20 depending from Resolution/fps using LCD screen.

Video Resolution	NTSC fps	PAL fps	STD Mode	Protune Mode	Field of View (FOV)	Screen Resolution/ Aspect Ratio
1080p	60, 48, 30, 24 fps	50, 48, 25, 24 fps	YES	YES	Ultra Wide, Medium, Narrow	1920x1080 16:9
720p	120, 60 fps	100, 50 fps	YES	YES	Ultra Wide, Narrow*	1280x720 16:9
1440p	48, 30, 24 fps	48, 25, 24 fps	YES	YES	Ultra Wide	1920x1440 4:3
4K	15 fps	12.5 fps	NO	ONLY in Protune	Ultra Wide	3840x2160 16:9
4K Cin	12 fps	12 fps	NO	ONLY in Protune	Ultra Wide	4096x2160 17:9
2.7K	30 fps	25 fps	YES*	YES	Ultra Wide	2704x1524 16:9
2.7K Cin	24 fps	24 fps	YES*	YES	Ultra Wide	2704x1440 17:9
960p	100, 48 fps	100, 48 fps	YES	YES	Ultra Wide	1280x960 4:3
WVGA	240 fps	240 fps	YES	NO	Ultra Wide	848x480 16:9

LASER POINTERS

We adopted a waterproof laser pointer by Apinex with features reported in the following table:

Laser Class:	IIIa
Output Power:	<5mW
Wavelength:	650nm
Batteries:	2 x AA (ncluded)
Body material:	Aluminium
Range :	>300 meters (outside the water)
Dimensions :	L:150mm x D:25mm
Waterproof to:	up to 300 feet

Fig. 15 The single red-laser pointer used in the tagging project

Fig. 16 Coupled laser used on the speargun for scaling length of bluefin tuna

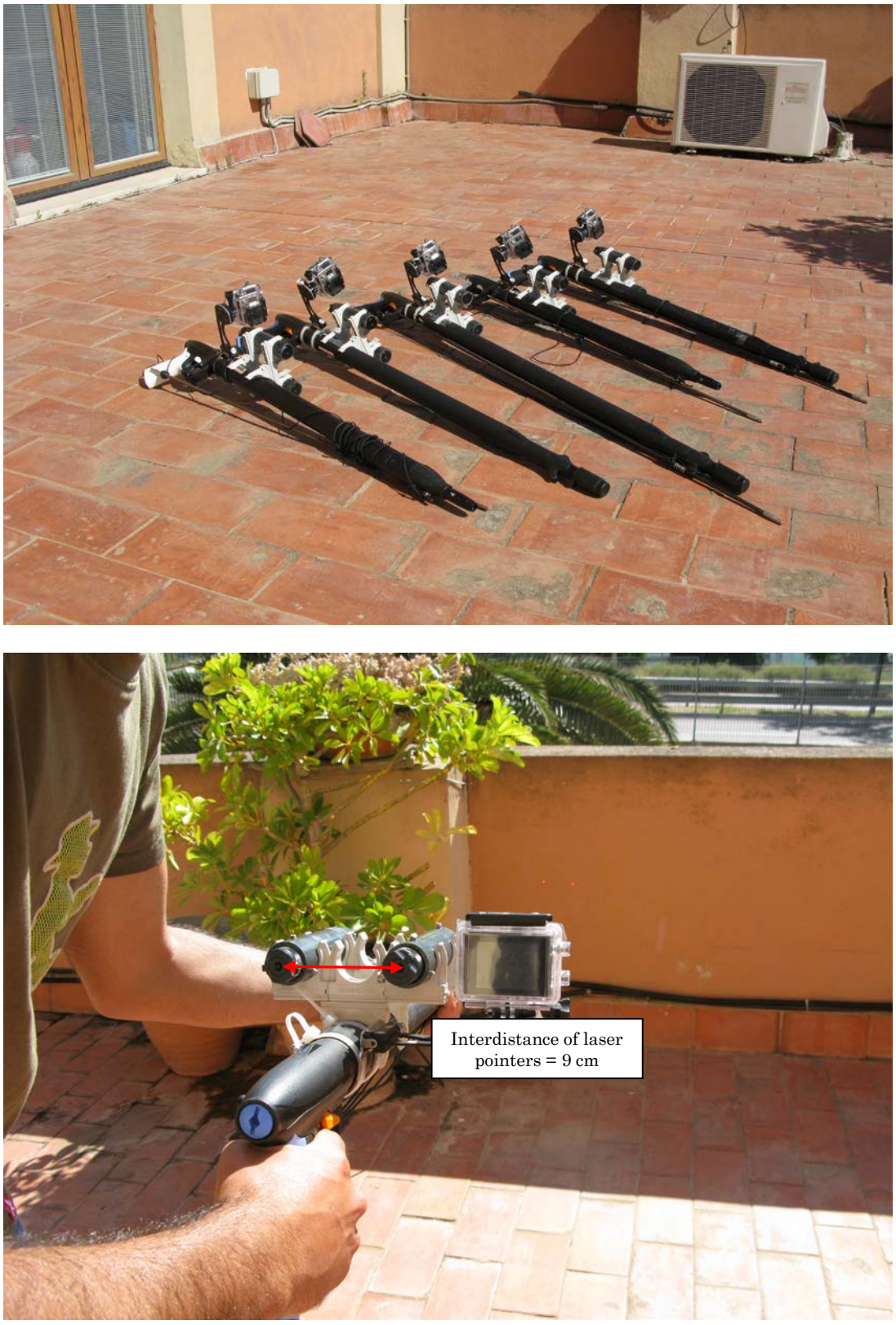


Fig. 17 Full suite of equipment used for tagging by spearguns

LENGTH ESTIMATION

Laser inter-distance validation

The inter-distance of the coupled lasers on each speargun (n=5) was established in 9 cm as length reference. Before the tagging activities the inter-distance of each coupled lasers for each speargun was measured at different distance (1m; 3 m; 5 m) casting lasers on a wall. Measurements (in mm) were collected by a ruler for each superguns at the three distances. One-way ANOVA was applied to test differences in measurements within spearguns. No-significant differences resulted in the test.

Length estimation

Fork length (FL) was estimated by photo referencing techniques (EFR). Photos were obtained from frames of the video recordings by the GoPro camera. A total of 164 high resolution pictures have been analyzed by the software Tpsdig2 (*Rohlf, F. J., 2009: TpsDig. Version 2.14*). The inter-distance lasers landmarks (interdistance 9,0 cm) on the body of specimens was the primary length reference. Frames analysis was conducted independently by 2 readers. After that, measures were compared; measures that not differ by 30% were considered acceptable. The 76% of measures were considered acceptable and the average was calculated.

In few cases laser points were not detectable for the following reasons: air bubble interferences, water turbidity, light overexposure. In such case the reference used for estimate body length was the yellow spaghetti tag detectable on the frame of each tagged tuna (7,5 cm in length). Tpsdig2 was used to measure fork length for the latter method.

If both references were not detectable, laser references at different distances were used. These references were recorded before the tagging activities on BFT entrapped in the death chamber where red points were detectable. The image readers (two) estimated the distance and the angle between the fish and the camera and choose the better reference.

Weight estimation

Weight estimation was conducted on each bluefin tuna by means of the length/weight relationship and visual estimation.

Length/weight relationship calculated for bft captured in Sardinian traps was:

$$W = FL^{2.8171} * 0.000044300$$

Parameters refers to 12,800 bluefin tuna captured in the period 1994-2007 (May-June).

The visual estimation of weight was carried out by the diver during tagging action . Each Diver communicated the data at the assistant on board during the recharging of speargun. Professional divers of the traps are skilled in such operation since this practice is used for biomass estimation for commercial purposes, mainly during transfer of bft from the death chamber to the transport cage.

Fig. 18 Example of picture used in the photo referencing techniques (landmarks by laser are detectable on bft).

Fig. 19 Frame showing the spaghetti tag BFIM used as reference for length valuation

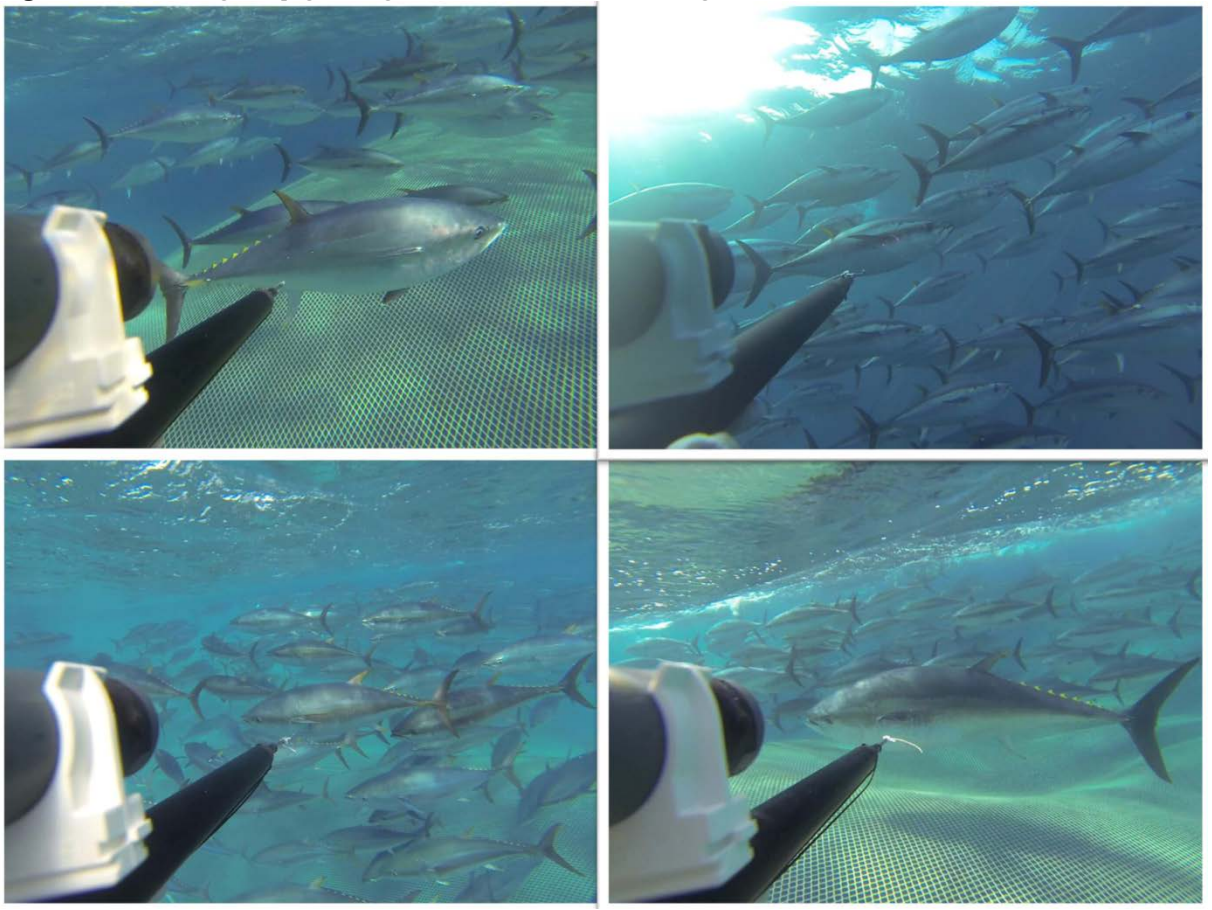


Fig. 20 Examples of some frames used for length reference.

LABELING PROCEDURE AND CODES

The serial number of each conventional tag provided by ICCAT has been registered by videocamera by the scientist on the boat before each tagging.

Fig. 21 Procedure before tagging: tag with PVC label for video recording (bottom); scientist during recording of the tag labels (top right); tag applicator armed for tagging (top left)

Fig. 22 Recording of the corresponding tag-code (top); speargun armed and ready for the tagging (bottom)

Fig. 23 Tagging action: before shot (top), and shot of a medium size bft (bottom). Other bft already tagged are visible

AUTHORIZATION

In order to inform the local authorities on the tagging activities, a formal communication was delivered to the Coast Guard of Portoscuso and Carloforte (prot. 44 of May 23, 2013).

A formal communication on tagging activities was also delivered by the trap company Carloforte Tonnare PIAM to the Italian Maritime Authority (beside the Ministry for Agriculture Policy and Forestry – Com. V. Giovannone).

DISSEMINATION ACTIVITIES

The aim of the ICCAT-GBYP tagging project and the reward posters for tags was presented during diverse local events:

- on May 31 at Carloforte at the bluefin tuna meeting at the international gourmet competition on bluefin "Girotonno";
- On June 14 at Portoscuso at the conference for trap fishery during the 43th edition of the Tuna festival;
- on July 13 at Stintino, during the awarding "King of the Sea" to celebrate the trap chiefs "Rais" from Sicily and Sardinia;
- Edited on the magazine Mondo Nautica (issue of August) and Mondo Pesca (issue of August).

Poster "Trova la marca" for reward tags have been distributed also in the following localities:

- Stintino, Coast Guard
- Alghero, Coast Guard
- Porto Torres, Coast Guard, Club Marina Cormorano
- Santa Maria Navarrese
- Arbatax
- Portoscuso
- Carloforte
- Teulada
- Buggerru
- Oristano
- Sant'Antioco
- Calasetta
- Cagliari
- Villasimius

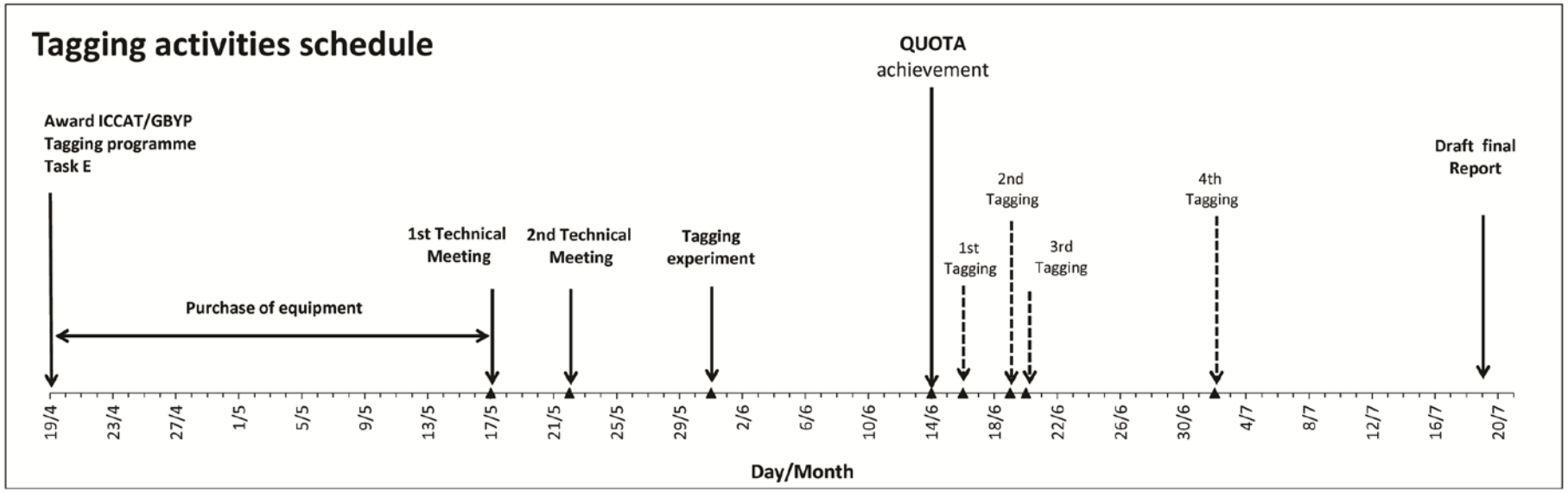
FILL TAGGING DATA FORM

Tagged bluefin tuna were properly recorded on the ICCAT forms and attached at the present report.

BIOLOGICAL SAMPLINGS

According to withdraw of the clause 7 of Annex 5a of the contract, biological sampling were omitted by the protocol. However, a total of 42 samples (muscle, and spines) were collected in the trap of Isola Piana. Samples were collected from specimens 1) entangled during a cage transfer on May 30; 2) during the mattanza carried out on June 14, and finally 3) on three entangled specimens on June 20.
Samples have been properly stored according to ICCAT/GBYP biological sampling protocol and recorded on ICCAT forms considering the progressive code of the ICCAT-GBYP Biological sampling protocol 2012. Samples were shipped to AZTI on July 22.

TIMING


Tagging activities schedule
QUOTA
achievement
Award ICCAT/GBYP
Tagging programme
Task E
1st Technical
Meeting
2nd Technical
Meeting
Tagging
experiment
2nd
Tagging
4th
Tagging
Draft final
Report
1st
Tagging
3rd
Tagging
Purchase of equipment
19/4
23/4
27/4
1/5
5/5
9/5
13/5
17/5
21/5
25/5
29/5
2/6
6/6
10/6
14/6
18/6
22/6
26/6
30/6
4/7
8/7
12/7
16/7
20/7
Day/Month

TAGGING ACCOMPLISHED

Size class		Tag type		
		FIM-96	BFIM-96	BFIM-96 + FIM-96
1	< 25 kg	2	46	0
2	> 25 kg	16	128	6
unknown		0	9	1
Total (208)		18	183	7

May 31

On May 31 was carried out the first experimental tagging to test and setting the equipment acquired few days before. Test regarded 1) the effectiveness of modified applicators and 2) the power adjusting system of spearguns (charge pressure tests). Few individuals have been likely tagged during this test, however definitely we assumed "not tagged" for the filling-in of ICCAT forms.

June 16 (first tagging)

On June 16 the first tagging operation by diver and pneumatic spearguns was carried out in the chamber "Bastardo" (45m x 40m) and the "Camera" (45m x 40m). These are chambers without moving net-floor, therefore bluefin tuna swim freely in a large water volume of 45m X 40m X ~40m in depth. This first test was partially satisfactory because the confined waters of such chambers were too large and bluefin tuna individuals were hardly approachable by divers to be shot.

Date 16/06/2013

Tagging informations				**RELEASE Information**		
N°	Species	Target	Tag type	Site	Time	Depth (m)
5	**BFT**	**YES**	**FIM-96**	**Capo Altano**	**15:00**	**38**
21	**BFT**	**YES**	**BFIM-96**	**Capo Altano**	**15:00**	**38**
total 26						

Summary of lost tags on June 16

Date 16/06/2013				
Tag code	Tag type	Site	Depth (m)	Notes
BYP 071754	**BFIM-96**	**Capo Altano**	**38**	**lost**
BYP 071755	**BFIM-96**	**Capo Altano**	**38**	**lost**
BYP 071759	**BFIM-96**	**Capo Altano**	**38**	**lost**
BYP 071773	**BFIM-96**	**Capo Altano**	**38**	**lost**
BYP 058927	**FIM-96**	**Capo Altano**	**38**	**lost**
BYP 020486	**FT-1-94**	**Capo Altano**	**38**	**lost**
BYP 020487	**FT-1-94**	**Capo Altano**	**38**	**lost**
total 7				

June 19 (second tagging)

During the second day of tagging was attempted the same operation of the previous tagging, i.e. using the chambers "Bastardo" and the "Camera". Also in this case, the adopted method has not proved sufficiently valid and 9 individuals were tagged.

Date 19/06/2013						
	Tagging informations			**RELEASE Information**		
N°	Species	Target	Tag type	Date	Time	Depth (m)
2	**BFT**	**YES**	**BFIM-96**	**Capo Altano**	**11:00**	**38**
7	**BFT**	**YES**	**BFIM-96**	**Isola Piana**	**15:00**	**40**
total 9						

Summary of lost tags on June 19

Date 19/06/2013				
Tag code	Tag type	Date	Depth (m)	Notes
BYP 071576	**BFIM-96**	**Capo Altano**	**38**	**lost**
BYP 071578	**BFIM-96**	**Capo Altano**	**38**	**lost**
BYP 071580	**BFIM-96**	**Capo Altano**	**38**	**lost**
BYP 071581	**BFIM-96**	**Capo Altano**	**38**	**lost**
BYP 071582	**BFIM-96**	**Capo Altano**	**38**	**lost**
BYP 071583	**BFIM-96**	**Capo Altano**	**38**	**lost**
BYP 071584	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071586	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071588	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071591	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071592	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071594	**BFIM-96**	**Isola Piana**	**40**	**lost**
total 12				

June 20 (third tagging)

The trap chiefs (Rais) and the tagging coordinator proposed to test the death chamber to confine a small flock of individuals (~120), to pull up the net-floor in order to narrow the space of water to tag easily tunas. This test resulted satisfactory since 40 bluefin tuna were tagged by divers using spearguns in a short time range (less 2 hours).

Date 20/06/2013						
	Tagging informations			**RELEASE Information**		
N°	Species	Target	Tag type	Date	Time	Depth (m)
40	**BFT**	**YES**	**BFIM-96**	**Isola Piana**	**16:00**	**40**
total 40						

Summary of lost tags on June 20

Date 20/06/2013				
Tag code	Tag type	Date	Depth (m)	Notes
BYP 071702	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071703	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071704	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071705	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071708	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071709	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071732	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071737	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071742	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071747	**BFIM-96**	**Isola Piana**	**40**	**lost**
total 10				

July 2 (fourth tagging)

Because of a storm, the activities of tagging have had a long forced interruption of 10 days. On July 2, the last operation took place using the previous methodology, i.e. entrapping the bluefin tuna flock into the death room. 133 individuals were successfully tagged.

Date 02/07/2013						
	Tagging informations			**RELEASE Information**		
N°	Species	Target	Tag type	Date	Time	Depth (m)
13	**BFT**	**YES**	**FIM-96**	**Isola Piana**	**19:00**	**40**
113	**BFT**	**YES**	**BFIM-96**	**Isola Piana**	**19:00**	**40**
7	**BFT**	**YES**	**Double**	**Isola Piana**	**19:00**	**40**
total 133						

Summary of lost tags on July 2

Date 02/07/2013				
Tag code	Tag type	Date	Depth (m)	Notes
BYP 071612	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071614	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071648	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071663	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071681	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071685	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071797	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 071812	**BFIM-96**	**Isola Piana**	**40**	**lost**
BYP 058804	**FIM-96**	**Isola Piana**	**40**	**lost**
BYP 020233	**FT-1-94**	**Isola Piana**	**40**	**lost**
total 10				

Recommendations

Tag and Applicators

- 1) The applicator for the single barb spaghetti FT was not appropriate for speargun tagging
- 2) The applicator cut the spaghetti tag FT when penetrate into the tuna body
- 3) The applicator tip for the double barb (FIM) breaks easily during shots
- 4) Large Billfish applicator (BFIM) and tag have been ideal for tagging by spearguns
- 5) Suggestion: improve the quality of stainless steel of the tip in small billfish applicator (FIM)
- 6) Double tagging by harpoon has been difficult when dissimilar tags were associated (i.e. FT + FIM and FIM + BFIM)
- 7) Suggestion: the double tagging is feasible when two BFIM are associated in the harpoon

Laser and length estimation

- 1) Red laser (650nm wavelength) has proven partially effective for length estimation
- 2) Cause: sun-light overexposure and back light may interfere red laser points
- 3) Suggestion: test one-beam green laser (532nm wavelength)
- 4) Suggestion: test Cross laser modules (the module generates two bright crossing lines).
- 5) Suggestion: test Line laser module with a fan angle of 60°

Video camera

- 1) The current GoPro 3D camera was not proper for underwater recordings
- 2) Cause: lack of an appropriate corrective lens to adjust sea water distortion
- 3) A new GoPro 3D system will be available soon
- 4) The GoPro Hero3 has been proper for recordings the sequence of tagging
- 5) The video and photo quality (resolution) is functional for length estimation
- 6) Batteries have limited duration

Spearguns

- 1) The pneumatic speargun is appropriate for tagging
- 2) The best fitting size is the 85cm or lower (three sizes were tested)
- 3) The level of operating pressure is important to avoid injuries on bft (10bar)

Weather conditions

- 1) Tagging by traps strictly needs good weather conditions (scale 3 in Beaufort)
- 2) Sea current can disturb tagging operations
- 3) Water transparency is needed for good quality video recordings

Mortality

- 1) Bluefin tuna needs to swim continuously and suffer shallow waters (net pulled up)
- 2) Hand-pole tagging would require to pull up the net-floor of the death chamber nearby the surface (~2m depth)
- 3) High mortality must be take in account with pole-hand tagging by traps
- 4) Such methods has been rejected by the fishermen chiefs
- 5) No-mortality has been caused by tagging with spearguns into the death chamber
- 6) The appropriate depth of the net into the death chamber was 5-7 meters

Tagging rate

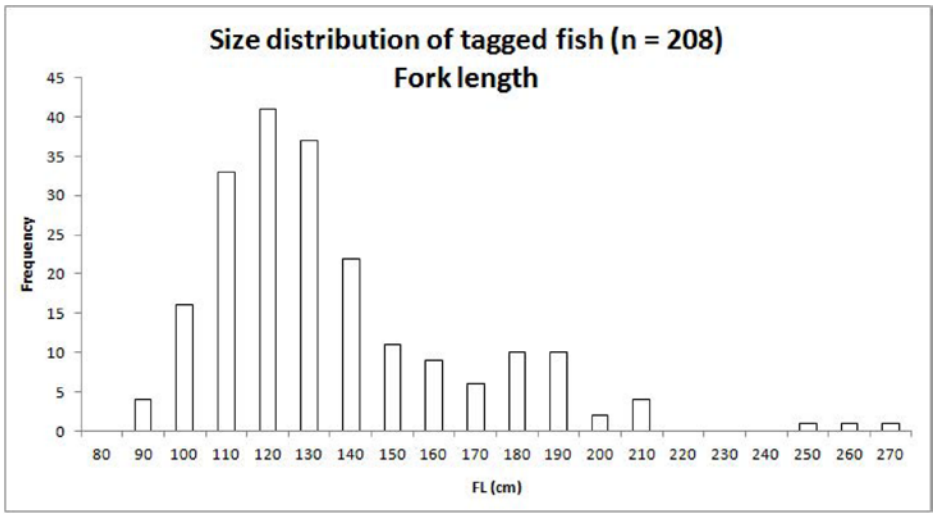
- 1) Average tagging rate has been 52tag/day (±55 sd)
- 2) Such overdispersion is cause by the experimental trainings in the first days
- 3) Once the methodology of entrapping fish has been set, number of bft tagged has been satisfying (133tag/day)

ANNEX 1: list of tagged fish

(file: Annex 1 List of Tagged Fish.xlsx)

ANNEX 2: size distribution of tagged fish

Length Class (cm)	*Frequency*
80	0
90	4
100	16
110	33
120	41
130	37
140	22
150	11
160	9
170	6
180	10
190	10
200	2
210	4
220	0
230	0
240	0
250	1
260	1
270	1
tot	**208**



Weigth Class(Kg)	*Frequency*
10	0
20	28
30	62
40	41
50	24
60	11
70	7
80	5
90	7
100	8
110	6
120	1
130	1
140	1
150	3
250	2
300	1
tot	**208**