



Call for tenders 03/2016, Objective A

# TAGGING PROGRAMME 2016 - ICCAT/GBYP PHASE 06

# CALL FOR TENDERS 03/2016 - OBJECTIVE A

# ELECTRONIC TAGGING OF ADULT BLUEFIN TUNAS BY PURSE-SEINERS IN THE

# EASTERN MEDITERRANEAN

**Final Report** 

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#### Abstract

The scientific tagging campaign was carried out in the Eastern Mediterranean, in particular in the South-Eastern coast of Turkey, close to the Gazipaşa town (Alanya), by a partnership between *Unimar società cooperativa* from Italy and, from Turkey, *University of Istanbul, Faculty of Fishery* and the fishing company "*Kılıç Deniz Ürünleri A.Ş.* 

Tagging campaign was carried out using electronic tags in order to provide additional data to better understand the behaviour of Bluefin tuna.

#### Keywords

Bluefin tuna BFT, Thunnus thynnus, Eastern Mediterranean Sea, tagging, purse seine





#### 1. Background and objectives

The main objectives of the ICCAT Atlantic-Wide Bluefin Tuna Research Programme (GBYP) are to improve: (a) the understanding of key biological and ecological processes, (b) the current assessment methodology, (c) the management procedures, and (d) advice.

Key tasks are to reduce uncertainty in stock assessment and to provide strong management advice. This requires improved knowledge of key biological processes and parameters. However, currently almost all the data used in stock assessments are obtained from the fisheries-dependent data. It is therefore important to obtain data from alternative sources, such as tagging studies, in order to verify the assumptions made when conducting the assessments.

The specific objectives of the tagging activity in the medium term (according to the ICCAT/GBYP Tagging Design) are:

- validation of the current stock status definitions for populations of BFT in the Atlantic and Mediterranean Sea;
- b. estimation of biological parameters such as growth, natural mortality rates (M) of BFT populations by age or age-groups;
- c. estimation of tagging reporting rates for conventional tags, by major fishery and area, also using the observer programs currently deployed in the Mediterranean fisheries (ICCAT ROP-BFT);
- d. evaluation of habitat utilization and large-scale movement patterns (spatial-temporal) of both juveniles and spawners;
- e. estimation of the retention rate of various tag types, due to contrasting experiences in various oceans;
- f. estimation of the feasibility of tagging BFT in traps and purse-seiners by divers getting at the same time reliable size estimates.

The ICCAT GBYP Steering Committee in 2016 recommended to concentrate the efforts for Phase 6 toward electronic tagging in order to provide additional data to improve the understanding of Bluefin tuna behaviour.





#### 2. Methodological Terms of Reference

This report refers to the activities carried out in the Eastern Mediterranean Sea according to the ToRs of the Call for Tenders. The methodology provided for the electronic tagging of adult Bluefin tunas by purse-seiners in the Eastern Mediterranean Sea - included, among others, the following specific tasks:

- a. deployment of 20 miniPATs on adult Bluefin tunas;
- b. the time-frame for tagging shall be mid-May 2015 to mid-July 2015;
- c. purse-seiners shall be the type of vessel to be used for tagging; the total number of vessels by area shall be sufficient for reaching the final objective, with a minimum of one vessel;
- d. adult tunas shall be tagged by divers directly underwater, fish can be kept in the seine or moved into a cage; each fish shall be tagged by an expert diver, possibly following the same methodology reported in SCRS/2014/189. Tagging shall be recorded with underwater stereo-cameras, with the purposes of estimating the size of each individually tagged fish; sequence of tags, pictures and laser estimates shall be properly recorded for future uses and controls. Number of each tag and length estimates shall be recorded on the ICCAT form;
- e. carrying out biological sampling during the tagging activities; biological samples must be collected from the same fish school, as much as possible. Sampling shall be conducted according to the protocols adopted by the Contractor(s) in charge of the biological and genetic sampling and analyses; the samples shall be shipped to the laboratory in charge.
- f. the hiring of a Coordinator for tagging activities with specific experience in electronic tagging of tunas. The Coordinator shall be responsible for directly managing all the field activities and the scientific team;
- g. the hiring of a tagging team.

#### 3. Materials and methods

The team participating to the field activities was composed of a partnership between Turkish and Italian scientists. The Turkish scientific partner was the *Faculty of Fisheries - University of Istanbul*,





with the tagging coordinator (Prof. Saadet Karakulak) and a tagging team member (Taner Yıldız); the second Turkish partner was a fishing company (*Kılıç Deniz Ürünleri A.Ş.*), which was in charge of the necessary logistic support, namely the fishing boats, fishing crew, and the divers for supporting the field activities. The Italian partner was *Unimar società cooperativa* with the team that carried out the tagging in the South Tyrrhenian Sea in 2013 and 2015 (Adriano Mariani, Massimiliano Valastro and Simone Serra).

#### 3.1 Logistics and permits

Once the project was approved, the first step was to contact the Turkish Embassy/Consulate in Rome in order to immediately start the procedures for the necessary authorizations for carrying out the scientific work on the Turkish territory, having in mind that in the 2015 experience it took about one week. A first visit at the Turkish Embassy/Consulate in Rome was done on the 18th May, the day after the approval of the proposal, in order to collect information about the procedures to be done. All the forms and the documents were prepared according to the instructions from the Embassy/Consulate officers, including the application for the authorizations to obtain before requesting the visa and the new online registration for visa application, for each of the three Unimar persons involved. The visa could be requested (and its issue is not immediate) only once this authorization from the Turkish authorities would have been obtained. Once received the letter from the Turkish Ministry of Food, Agriculture and Livestock (May 24th) and from the Istanbul University (May 25th), the procedures were activated, with the strong aid of the colleagues from the Istanbul University: they continuously contacted and tried to speed up the bureaucratic mechanisms inside the different involved Ministries, including a further letter from the University addressed to the Gazipasa Airport aimed to inform them and try to avoid possible problems related to the electronic equipment. Further several visits (up to 8) and daily phone contacts with the Embassy/Consulate were done, in order to push for the shortening of the procedures, and more documents were later required: first, a letter from the Turkish Ministry of Foreign Affairs, then received on Friday June 3rd. After the submission of this letter, it was communicated that a further authorization from "another Ministry" (a not specified one, even after request) was necessary, not previously requested in 2015. It is presumable that in 2016 new security procedures have entered







into force. Because of this new procedures, it will be necessary for eventual future jobs that a minimum time of two months have to be taken into consideration to obtain the permits.

#### 3.2 Field activities

A technical and logistic meeting was organized in Bodrum on May 22, with the Italian and Turkish team and the Turkish fishing company. During this meeting, field organization was agreed: the tunas, caught at the very end of the fishing campaign, will be kept in a cage waiting for being tagged by the team, without feeding them: this option was considered the best in order to tag the tunas reducing the risk of mortality. A number of at least 80 large fishes sized 100 kg were agreed to be put at disposal of tagging and then released. The tagging campaign was planned to start from Gazipaşa (Alanya), South Eastern Turkey, depending on the fishers' indications.

The scientific team was set up and trained to be ready before the official beginning of the campaign and all the technical equipment was set up and integrated where necessary. Several briefing meetings were held among the scientific staff.

The 20 miniPAT tags were connected to Tag Agent and updated with the data uploaded by ICCAT. The finalization was set up into the Auto Start mode.

On the 17th June the Italian team moved to Turkey, as soon as fishermen told they were almost ready for putting the tuna at disposal. They also communicated a new meeting point, Taşucu, around 200 Km East of Gazipaşa. So, after one-night stop at Istanbul, the Italian and Turkish team met on the 18th June at the Istanbul airport and fly to Gazipaşa waiting for the call of the fishers when the tunas were ready in the cage. Fishermen in the meantime communicated a new change in the meeting point, indicating again Gazipaşa. After 4 stand-by days, the fishers called on the 21st in order to do the tagging on the 22nd. The team went back on the 23rd.





#### 3.3 Geographic area

The area of the scientific tagging campaign was the Eastern Mediterranean mainly the Eastern end of the Gulf of Antalya, where the cage with the fish was put at disposal by *Kılıç* company.

The *Kiliç* fleet was reported to fish in an area comprised between the Gulf of Antalya and Eastern Cyprus.

#### 3.4 Fishing activity in the area

About 20 purse seiners, whose length ranged between 32 and 62 m, are usually active in the North Levantine Sea during the fishing season. The fishing strategy generally observed the last year consisted in detecting the fish school mostly by sonars, surrounding it with the purse seine and closing the net with groups of 7-8 co-operating purse seiners to search the school and to catch it. It is presumable they used the same strategy in 2016, but no observation on the fishing operation was done this year because the work was land-based and the only day on board was on a supporting vessel, from the port to the cage, at the very end of the fishing season.

#### 3.1 Vessels

Name	LOA (m)	Power (hp)	GT	Role
"Kılıç 24"	41,50	2.200	240	Transfer to the cage
"Kılıç 16"	37,70	1.500	446	Support to tagging operations

#### **3.2 Tagging operations**

UNIMAR received the following technical equipment which was selected and used according to the best opportunities on field: 20 electronic miniPATs tags (Figure 10)

#### 3.3 Spearguns

The equipment used was an "arbalete" speargun (Figure 6), 127 cm long and equipped with a double rubber band. The shaft was long 144 cm and its head was properly milled to host the spring steel applicator pin.

Just before the beginning of the tagging campaign, several ballistic trials were carried out in order to test the speargun efficiency. With the best ballistic compound, a 2,5mm thick plastic bin, was





pierced by accurate shots even at a distance of 3m, with a spear shaft fully rigged with a fake miniPAT tag.

In order to guarantee the best hold of the dart and avoid to wound the fish too much, it was decided to stop the dart penetration 6 cm from the fish skin, using a rubber stop. In order to recover the tag from the only tuna died during the deployments because of its little dimensions (about 120 cm), the crew struggled hard with a knife to extract the dart from the fish back, confirming the good grip of the rig in its intramuscular insertion.

#### 3.4 Recording system

As in the 2013 and 2015 campaigns, videos of the shooting operations were recorded using a "GoPro 3 Hero Black edition" video camera (+ underwater case) installed under the speargun through a specific mounting bracket (Figure 7). The inclination of the camera was tested through several trials before the operations in order to guarantee the best framing. Total n. 4 videocameras, bought for the former campaigns, were ready for immediate change in case of low battery or full memory card. One was specifically used to film by hand the tagging operation and the release from an external view by another diver.

The video cameras were set up with the following parameters:

- video resolution: 1080p
- PAL system, 50 frames per second

#### 4. Results

#### 4.1 Tagging operations

The Italian and Turkish team embarked on the 22nd June at Gazipaşa port at 7:00 local time (4:00 GMT) on "Kılıç 24" vessel. At 7:30 the vessel sets sail towards the cage, placed about 12nm South East of Gazipaşa port, about 1nm off shore (N36.11520 E32.42315), where the boat arrived at 8:50. The depth under the cage was 144 m. Other two boats were in the area: "Kılıç 16" and a towing boat. The team was transferred to "Kılıç 16" from where the tagging operations were carried out. The tunas were kept in a half cage divided by a net from the rest of the cage, where other fishes for commercial purposes were kept. A first inspection diving in the cage was done at 9:10: about n. 5-7 100kg and about n. 50-70 20-40kg samples where in the half cage, so with a very different





composition compared to the agreed one. In any case, the team decided to start the tagging on the available samples, starting with the biggest ones. The cage depth was about 25 meters and so was asked to be lowered to 15 meters in order to facilitate the tagging operations. At 9h15 the first diving for placing the tags was performed. The operations went on tagging all the biggest ones. When a small individual (about 120 cm) died because of the shaft penetration right into the dorsal spine, it was decided to suspend the operations in order to avoid any further risk of mortality on the small-sized samples and new negotiations with the fishers were necessary: they agreed to open the dividing net and let the biggest tuna for commercial purposes enter into the tagging "room". Before this, the already tagged samples were released at 10:50. After about two hours, necessary to do this operation, the tagging started again at 12:45 on the new biggest tunas put at disposal of the team, about 200 kg each estimated. The tagging activities went on until 13:35, when the last tag was placed, and at 13:45 the tagged samples were released. At 14:30, "Kilic 16" left towards Gazipasa port. The cage with the commercial fishes was immediately towed towards İzmir once the tagging was concluded. We performed the tagging at the very end of fishing, with no possibilities given by the fishermen of further waiting, but during the day of the operations the fishing company representatives told us that other two companies were still fishing in the area.

19 tags were placed on the tunas. Unfortunately, at the very beginning of the deployment operations, due to a missed shot, a tag was lost in the deep trough the net meshes. Apparently, a fully rigged tag is not able to float if goes off below 5m deep. During the fish transfer between the two halves of the cage, 1 or 2 (different estimate of our tagger and Turkish fishermen) tagged samples were wrongly left to pass back in the "commercial" half of the cage by the fishers' divers. We recommended to take care to recover this one (or two) tags at the moment of collecting the fishes from the cage to the market.

#### 4.2 Trials of tuna size estimates method and video analysis

The trials done in 2015 on the dead fish were used for calibrate the size estimates methodology. The sample was hanged horizontally at 4 meters depth, and many videos were taken with the camera mounted on the speargun, simulating different shooting distance from the fish, using the spear shaft and its line as reference. Images were also taken rotating the speargun to get different angles in order to "mime" the different possible approaches to the fish during the tagging activity.





An estimate of tuna sizes was determined using the analysis of images coming from the videocamera mounted on the spearguns, using an algorithm that compares images of tunas with a series of images of a graduated pole, taken from a known distance (SCRS/2014/189). The videos were very useful to tune the calculation of size estimates, being known the length of the tuna sample; the same algorithm was improved using the size collected by the tuna sample. The Kinovea software was used to compare the frames.

For tentative purposes, a preliminary trial with 5 tags was done, colouring them with different patterns in order to associate the samples to the tag videos and have a further control on the size estimates (Figure 10). Using the tag length (12 cm) and comparing it with the fish length in the frame it was tried to have a further comparison about the fish size, using the different patterns associated to the tag numbers.

#### 4.3 Biological sampling

A total of 3 Bluefin tunas, died in the cage during the tagging operations, were sampled: one died for the shot and the other two were snagged in the net independently from the tagging operations. The biological sampling was performed by the University of Istanbul team. According to the ICCAT sampling protocol, muscle, otolith and first dorsal spine were sampled. The samples will be provided to the Consortium headed by AZTI.

#### 5. Conclusions and suggestions

At the end of the 2016 activities, some remarks can be underlined in order to provide elements useful to improve any future campaign.

The methodology adopted confirmed its ductility. Keeping always as the first reference the need of adopting a conservative approach, in order to avoid risks of mortality, it is confirmed that the best method is to keep the fish quiet not reducing too much the available space. The calm behaviour of the fish allows as well to operate in the proper way, which is essential above all when tagging with pop-up tags.





This need requires also having the availability of a number of fish, which shall be much higher than the number of tags, otherwise it will be increasingly difficult to have fish which cannot be approached by the diver.

After 3 field campaigns (South Tyrrhenian 2013, Eastern Mediterranean 2015 and Sardinia 2015) many different settings of the spearguns and shafts were tested, identifying, for each situation and also depending on the size of the samples, the best equipment.

According to the past experience, the use of different kinds of darts should be further studied and analysed. Unless the dart is deeply inserted by hand into and through the rays of the dorsal fin, some doubts remain about the holds of dart, once inserted into the flesh, also according to the different sizes of tunas. Once a detailed analysis of the data obtained from the tags which popped-off so far will be finished, it will be possible to better understand the reason for the surfacing, either fishing or premature detachment.

Final remarks should be about the available time for the preparation of the fishing campaign, which was very tight. When the time is so reduced, as it was this year, everything becomes increasingly difficult, and possible unpredictable problems can arise much easier thereby undermining the results. Having more available time means to have the chance to better prepare the field activities and to discuss about operational choices. Furthermore, a very high risk of losing the whole job was not so far this year, due to the very long delay in the achievement of the scientific permits from the Turkish authorities.

Finally, the decision to deploy the tags at the end of the fishing season was correct because in this way there are less possibilities to lose the tags because of catches and made. Furthermore, the logistic issues are easier. As well, the decision to keep the tuna in the cage made the operations easier, if the fishes stay in the cage for a limited time. Anyway, a wide uncertainty due to the fishers' needs exists: the scientific team cannot decide anything and the schedule of the operation is entirely conditioned by the fishers.





#### Table 1 - Tagging activity

Ν	date	Activity*	N° of fish	Size range (FL cm)	Tags n.	Died	Weather condition
1	22/06/2016	tagging	19	147 - 238	19	1	calm

#### Table 2 - List of the deployed tags

ID	Tag Code	PTT	Area	Date of deployment	FL (cm)	RWT (kg)	notes
1	15P1009	161679	Eastern Mediterranean	22/06/2016	158,1	70,42	
2	15P1011	161680	Eastern Mediterranean	22/06/2016	224,05	200,5	
3	15P1012	161681	Eastern Mediterranean	22/06/2016	213,29	173	
4	15P1013	161687	Eastern Mediterranean	22/06/2016	174,02	93,91	
6	15P1017	161704	Eastern Mediterranean	22/06/2016	215,88	179,3	
7	15P1018	161705	Eastern Mediterranean	22/06/2016	182,3	108	
8	15P1108	161678	Eastern Mediterranean	22/06/2016	211,9	169,6	
9	15P1122	161653	Eastern Mediterranean	22/06/2016	176,33	97,7	
10	15P1123	161654	Eastern Mediterranean	22/06/2016	222,06	195,2	
11	15P1157	161689	Eastern Mediterranean	22/06/2016	146,92	56,51	
12	15P1158	161655	Eastern Mediterranean	22/06/2016	197,06	136,4	
13	15P1159	161656	Eastern Mediterranean	22/06/2016	232,54	224,2	
14	15P1160	161690	Eastern Mediterranean	22/06/2016	224,84	202,6	
15	15P1161	161657	Eastern Mediterranean	22/06/2016	208,95	162,6	
16	15P1162	161691	Eastern Mediterranean	22/06/2016	-	-	*
17	15P1163	161658	Eastern Mediterranean	22/06/2016	158,6	71,08	
18	15P1164	161692	Eastern Mediterranean	22/06/2016	215,66	178,8	
19	15P1165	161693	Eastern Mediterranean	22/06/2016	226,06	205,9	
20	15P1167	161659	Eastern Mediterranean	22/06/2016	237,9	240	

\* video missing

## The following tag was not deployed because it was accidentally lost in the deep in the first shot:

	<u> </u>	/				
5	15P1014	161688	Eastern Mediterranean	22/06/2016		lost







Figure 1 - The vessel "Kılıç 24" at the Gazipaşa port







Figure 2 - Onboard the "Kılıç 16" vessel during the tagging operations







Figure 3 - The cage (while towed after the end of tagging operations)







Figure 4 - The tagging site





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Figure 5 - Tunas in the cage before the tagging operations







Figure 6 - The speargun used for tagging (wooden)



Figure 7 - Video camera with mounting bracket





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Figure 8 - The diver during the tag operations





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Figure 9 - Frame shots of tagging operations







Figure 10 - Some of the used tags (the five ones coloured for size control)



Figure 11 - Example of video estimation of sizes