TAGGING PROGRAMME 2016 - ICCAT/GBYP PHASE 6

CALL FOR TENDERS 08/2016

AREA A) ELECTRONIC TAGGING OF ADULT BLUEFIN TUNAS BY HANDLINE IN THE STRAIT OF MESSINA (CENTRAL MEDITERRANEAN SEA)

FINAL REPORT

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The scientific team

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Summary

The scientific tagging campaign was carried out by Unimar in the Strait of Messina, Italy, through the involvement of recreational fishers usually operating in the area.

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

The field campaign was carried out from September 25th to November 30th, 2016. A total of 15 tunas were tagged. N. 15 miniPATs satellite tags and 8 Conventional "spaghetti" tags (double tagging) were applied.

Keywords

Bluefin tuna BFT, *Thunnus thynnus*, Southern Tyrrhenian Sea, Strait of Messina electronic tagging, conventional tagging.

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:

a. 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 (spatiotemporal) 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 concerns the activities carried out in the Area A) "Strait of Messina" (Italy, Southern Tyrrhenian Sea). According to the Call for Tenders, the methodology for the deployment of the electronic tags on adult Bluefin tunas strictly followed the following specific ToRs:

a) A minimum of 20 miniPATs should be implanted in the Strait of Messina (Central Mediterranean Sea) on adult bluefin tunas, which remained in the Mediterranean after the spawning season; these electronic pop-up tags will be set for the longest possible time frame; the applicators and the miniPATs will be provided by the ICCAT GBYP, along with precise instructions.

b) The time-frame for tagging shall be set from the beginning of September and up to the end of November, after the end of the usual spawning season and when fishing activities should be over, with no changes admitted regarding the tagging period;

c) Hand line shall be the fishing gear to be used for catching the bluefin tunas, while a boat should be used for moving the tagging team within the area of the Strait; the total number of boats shall be sufficient for reaching the final objective. Any in-kind boat time provided should be clearly mentioned in the offer. The final invoice shall cover the costs that was necessary for deploying all tags.

d) Adult tunas shall be tagged along the side of the boat by expert taggers, possibly removing the hook which was used for fishing them. Tagging operations shall be carried out following the methodology reported in the ICCAT GBYP Tagging Manual. The sequence of tags, pictures and size measures shall be properly recorded for future uses and controls, while the number of each tag and the total straight fork length measure shall be properly recorded on the ICCAT forms.

e) A conventional tag shall be implanted on the dorsal part of each fish tagged with electronic tags; conventional tags will be provided by ICCAT GBYP.

f) Carry out biological sampling during the tagging activities; biological samples must be collected from the same tagged fish. Sampling shall be conducted according to the protocols adopted by the contractor(s) in charge of the biological studies; the samples shall be shipped to the laboratory in charge.

g) A Coordinator for tagging activities who has specific experience in electronic tagging on tunas; this tagging Coordinator could be hired under a short-term contract. The Tagging Coordinator, who would work in close, constant contact with the ICCAT GBYP Coordination team, shall be responsible for directly managing all field activities, the scientific teams on board, and their training and monitoring.

h) A tagging team; The team should possibly include at least an electronic tagging specialist with demonstrated experience any additional scientific staff.

i) All necessary permits for accessing and operating in the waters under the jurisdiction of each CPC concerned.

2.1 Physical characteristics of the Strait

The strait is a very peculiar site, well known and studied because of its peculiarities. We are reporting here, therefore, only some very basic information. The Strait links the Ionian and the Tyrrhenian Sea, separating Sicily from Calabria. In its narrowest part (the North part, that is the area of the fishing campaign) it is around 3.2 Km large and 80-120 m deep.

The area is very well known since ancient times because of the extraordinary currents, both horizontal and vertical, maximized in the North end (see Figure 1 and Figure 2 showing horizontal and vertical turbulence). The tagging area is a large area comprised between Messina port and the village of Ganzirri (see Figure 3, showing two maps representing the tagging site and area).

Figure 1 - Evidence of currents in the Strait

Figure 2 - Evidence of currents in the Strait

Figure 3 - The tagging site and area

2.2 Fishing methods in the Strait

The most characterizing professional fishing method is the swordfish fishing through harpoons by the well-known traditional boats named "*feluche*", specialized vessels equipped with a long bow footbridge and a sighting tower. Traditionally, this fishing is carried out during the swordfish spawning period (second part of springtime - summer).

Bluefin tuna fishing is also a very ancient tradition, and it is still carried out mostly with hand lines (see Figure 4). This fishing is carried out with dead bait and chum, drifting the boat along the current and periodically moving to get back to the previous position (Figure 5). Even if very simple in terms of technical equipment, the experience of the fishermen allows to manage fishes up to 200 kg.

Fishing is also carried out through live bait and trolling lines. In this case, the very first part of the day (starting from the last part of the night) is dedicated to catch the live bait.

Fishing is strongly conditioned by the currents and the moon phases: typically, fishing activity is concentrated during the hours of moderate tide currents and the last quarter of the moon, with particular emphasis on some periods of the year. Normally, fishing is stopped during the top phases of currents and tide phases because it is impossible to manage the correct trend of the line and of the boat.

Figure 4 - Traditional hand line fishing

Figure 5 - Fishing with dead bait and three lines

2.3 Methodology adopted

The methodology followed what foreseen by the TOR's of the project, eventually adapting it according to local conditions. Therefore:

- the tagging was planned during the period September-November 2016, in the Sicilian coast of the Strait north of Messina city;
- the tags were mini pop-up type: we received 21 Wildlife Computers® miniPAT pop-up tags (see Figure 6), and two "Geyser" type additional tags, plus some spaghetti-type tags.
- a number of fishermen, to be calibrated according to the best available choices and budget, had to be appointed for fishing;
- the tunas had to be adult samples;
- tagging operations had to be carried out following the methodology reported in the ICCAT-GBYP Tagging Manual, and biological sampling had to carried out, as well;
- a tagging coordinator had to be selected, as well as a tagging specialist and an additional scientific staff with experience in the specific field;
- all the necessary permits had to be issued.

Figure 6 - MiniPAT electronic tag and applicator

3. Results

The tagging team was composed by:

- Adriano Mariani, tagging coordinator
- Gemma Quilez-Badia, tagging specialist
- Andrea Potoschi, local expert with experience in tagging
- Simone Serra, reporting and data support

3.1 Logistics and permits.

Between July and August the permits were requested to the competent Authorities. While no problems were issued by the National Authority (Ministry of the Agricultural, Alimentary and Forestry Policies), some problems were raised from the Coast Guard of Messina, since it was at first mentioned the preference for professional fishermen to carry out tagging instead of recreational ones. Anyway, finally, the permit was issued, prior to the daily communication about the start and finish hours, in addition to the name of fishermen and scientific team. In order to prepare permits and discuss with the local Coast Guard, a mission was carried out in Messina in July 21-22.

With the help of the local expert, 5 fishermen, chosen among the most experienced, available and affordable ones, were selected and appointed. Additional fishermen were also contacted, to be involved in case of temporary non-availability of some of the first ones.

The local expert made available a rubber boat to be used as support boat. According to our planning, the support boat had to stay in the same area of fishermen, and connected with them, to be ready to rapidly moving to a fishing boat in case of a catch.

3.2 Tagging operations.

Once a fisherman caught a fish, he had to call the support boat to let two (or three) components of the team pass onto the fisherman boat.

Tuna was hooked in the best possible way, by the lower jaw, and taken on board, to be put on a smooth mat. In the second part of the campaign, a basket specifically modified was prepared and successfully tested, to avoid even the injury of hooking.

The hook was removed only if it wouldn’t bring damages to the fish: otherwise the line was cut.

Pop-up tags were applied with the applicator, previously sterilized with a disinfectant and/or an antibiotic.

In case of double tagging, the spaghetti-type tag was deployed behind the pop-up tag, in the way described later in the report (see Figure 8).

Small pieces of caudal fin for biological analysis, when taken, were cut and put into an "Eppendorf" tube with alcohol.

Once tagged, tuna was measured with a measuring tape (CFL) and put back into the water, observing its behaviour after releasing. All the specimens quickly disappeared vertically into the deep, with the typical behaviour of a good conditions tuna.

All the necessary data (coordinates etc.) were registered.

3.3 Field activities

The field activities were organized identifying three periods within the overall period selected, chosen with the aim of covering the whole period and during the periods traditionally known by the fishermen as the best ones, mostly corresponding to the moon phase of "*luna calante*" (waning moon). The details of the weather conditions, as much as it was possible to record, are reported in an Excel file among the Annexes. Figure 11 to Figure 16 show some relevant moments of the tagging operations. Table 1 to Table 3 show the details of the tagging activities and tags deployed. Table 4 shows the details of the biological sampling.

Table 1 - Days on duty

25/09/2016	22/10/2016	16/11/2016	25/11/2016
26/09/2016	23/10/2016	17/11/2016	26/11/2016
27/09/2016	24/10/2016	18/11/2016	27/11/2016
28/09/2016	25/10/2016	19/11/2016	28/11/2016
29/09/2016	26/10/2016	20/11/2016	29/11/2016
30/09/2016	27/10/2016	21/11/2016	30/11/2016
01/10/2016	03/11/2016	22/11/2016	
	04/11/2016	23/11/2016	
		24/11/2016	

Table 2 - Tagging activity

#	date	N° of fish	miniPATs tags n.	Conventional tags n.
1	25/9/2016	1	1	
2	28/9/2016	1	1	
3	29/9/2016	3	3	
4	30/9/2016	1	1	
5	1/10/2016	1	1	
6	3/11/2016	1	1	1
7	21/11/2016	1	1	1
8	22/11/2016	2	2	2
9	23/11/2016	1	1	1
10	28/11/2016	3	3	3

Table 3 - List of the deployed tags and fish size

ID	Date of deployment	Hour (GMT)	miniPAT code	miniPAT PTT	Spaghetti code	CFL (cm)	RWT (kg)
1	25/09/2016	10:45	16P0829	162977		136	45
2	28/09/2016	13:26	16P0832	162978		130	40
3	29/09/2016	07:05	16P0850	162979		141	50
4	29/09/2016	07:50	16P0855	162980		130	40
5	29/09/2016	13:40	16P0858	162981		130	40
6	30/09/2016	15:21	16P0861	162982		145	55
7	01/10/2016	07:35	16P0864	162983		154	65
8	03/11/2016	16:30	16P0869	162984	BYP059514	125	35
9	21/11/2016	08:50	16P0883	162988	BYP059509	141	50
10	22/11/2016	06:55	16P0870	162985	BYP059511	125	35
11	22/11/2016	08:05	16P1060	162990	BYP059505	136	45
12	23/11/2016	09:00	16P0871	162986	BYP059521	150	60
13	28/11/2016	13:15	16P0522	162946	BYP059508	131	40
14	28/11/2016	16:36	16P0523	162947	BYP059518	157	70
15	28/11/2016	13:45	16P0595	162949	BYP059515	141	50

Table 4 - Biological samples

Date	Sample #	CFL	Weight
27/09/2016	1	151	61,5
20/11/2016	2	127	36,6
21/11/2016	3	133	42,0

Figure 7 - Positions of the tagging events

1st Period: 22/09 - 2/10

September 23th and 24th were dedicated to meetings with fishermen to contract them, plan the work and train them on the way to carry out fishing and eventually tagging, not to stress or injury too much the fishes.

From 25/09 to 1/10, fishing for tagging was carried out at sea. N. 7 tunas were successfully tagged: see the annexed Excel files and the map with the position of all the deployed tags (see Figure 7). One more tuna was judged not suitable for tagging because too stressed during the catching: therefore a small piece of fin was taken for biological sampling and it was released into the water.

Remarks: after the first campaign it started to become clear that catching was extremely unpredictable, with rare moments in which tuna activity was concentrated (possibly because of the passage of tunas in "waves", and at the same depth of the bait fish) and many others of no activity.

2nd Period: 22/10 - 27/10

Due to the news of premature detachments of the previous tags, it was decided to adopt further precautions to eliminate as much as possible any other possible "tagging-dependent" causes of the

premature detachment. A second spaghetti-type tag was arranged in a way to form a loop around the pop-up tag (Figure 8) and limit the possible movements of the pop-up around the tether and the possible progressive enlargement of the wound; the spaghetti-type has therefore to be put just after the pop-up. A specially modified basket was also prepared to avoid the injury due to hooking, and successfully tested in some of the later tagging operations.

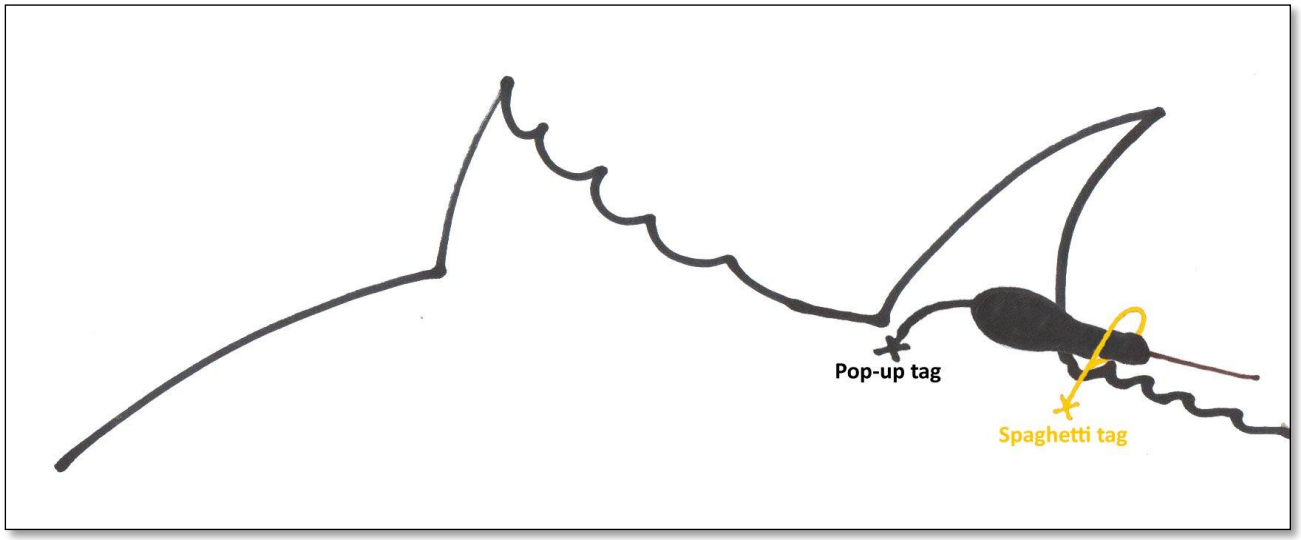

Figure 8 - The tags placement

This period, corresponding to the traditionally best situation of the year (last "*luna calante*" of October) was unfortunately completely without catches, confirming the high unpredictability of the catches, also due to the still summer conditions. Weather conditions were also highly variables, with sudden changes of wind and waves, very locally delimited.

To try to take the more advantage of the remaining tagging days it was also planned to add to the tagging with the full team some more days of "opportunistic" tagging, done only with the local expert and only when environmental/fishing conditions seemed to be more favorable.

3rd Period: 18/11 - 22/11

Tagging at sea was performed from Nov. 18 to Nov 22. N. 3 tunas were tagged and two were sampled for the genetic analyses. As for the previous sample, biological sampling was carried out only in tunas estimated not suitable for tagging, trying to avoid additional damages to the tunas tagged.

Opportunistic tagging

As previously described, 12 more days of tagging were performed by the local expert alone, to maximize the possibilities of tagging in the framework of the available budget. Field campaigns were performed in the days 3-4 Nov, 16-17 Nov, and from Nov 23 to the 30. N. 5 more tags were deployed, for a final total of 15 tags deployed.

Notes

Besides our main activity, a spaghetti type was shown us coming from a tuna most probably illegally fished (Figure 9). It was possible to make a picture with the registration code but not to obtain the tag. All the characteristics of tuna and of the tag were already transmitted to ICCAT-GBYP.

One tuna was also fished by other fishermen, showing a tether of a pop up tag still in place (Figure 10). Even in this case, ICCAT-GBYP is already informed about it. In this case we succeeded to have the piece and we are going to send it to ICCAT.

Figure 9

Figure 10

4. Final remarks and suggestions

After this campaign some remarks can be done. As foreseen, but much more of what it could be expected, it is confirmed that the particular characteristics of the area affect the predictability of the fishing, both in terms of presence of fishes and/or their availability to fishing, as well as in terms of extreme variability of environmental conditions, mostly currents and winds. The fact is confirmed by the results, going from a whole week without a single tag to three tunas tagged in one day. A high number of fishing days, therefore, must be foreseen in the activity planning.

Further difficulties of the area are even linked to the relationships with the fishermen; it was very difficult to “manage” them, above all because of their general strong "suspiciousness", with respect to the researchers as well as to the other fishermen (and to the Authorities). It seems that at the end we succeeded to establish good relationships with the ones we contracted, and to tune a good standardized methodology.

As a final suggestion, we strongly recommend (unless already done) to make a very careful check of the structural part of the pop up tag as well as of the software, in order to absolute exclude the possibility of premature detachments due to causes other than fishing.

We also suggest to put the code of the pop-up tag in the tether as well; in the case above cited, for example, it would have been very useful to have it in the tether.

Appendix: images showing the tagging operations

Figure 11

Figure 12

Figure 13

Figure 14

Figure 15

Figure 16