

**TAGGING OF BLUEFIN TUNAS (*THUNNUS THYNNUS*) IN THE
MOROCCAN ATLANTIC TRAP « ESSAHEL » DURING 2013:
METHODOLY AND PRELIMINARY RESULTS**

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SUMMARY

After the successful tagging activities carried out in 2011 and 2012 in the Moroccan trap "Essahel". The conventional and the electronic tagging continued in 2013 in the same trap. In total, 265 adult bluefin tunas were tagged, of which 129 received at least one conventional tag (Spaghetti). The double conventional tagging reached 47% of the total tagged fish. Fourteen pop-up MiniPAT and eight other acoustic tags were deployed during this campaign. No incidental bluefin tuna mortality was recorded during the tagging operations due to the high experience and the skillfulness of the tagging team. All the tagged fish were adult with sizes ranging from 202 to 255 cm FL (150-295kg). The preliminary results of the electronic tagging were consistent with those from 2011-2012, showing that not all fishes tagged in the trap entering into the Mediterranean Sea for spawning, as expected.

RÉSUMÉ

Après les activités de marquage couronnées de succès en 2011 et 2012 dans la madrague marocaine "Esahel", le marquage conventionnel et électronique s'est poursuivi en 2013 dans la même madrague. Au total, 265 thons rouges adultes ont été marqués, dont 129 ont reçu au moins une marque conventionnelle (de type spaghetti). Le double marquage conventionnel a atteint 47% du total des poissons marqués. Quatorze miniPAT reliés par satellite et huit autres marques acoustiques ont été déployées pendant cette campagne. Aucune mortalité accidentelle de thon rouge n'a été enregistrée pendant les opérations de marquage grâce à la vaste expérience et à la compétence de l'équipe de marquage. Tous les poissons marqués étaient adultes avec des tailles allant de 202 à 255 cm FL (150-295kg). Les résultats préliminaires du marquage électronique étaient conformes à ceux de 2011-2012, indiquant que les poissons marqués dans la madrague n'entrent pas tous en Méditerranée à des fins de reproduction, comme prévu.

RESUMEN

Tras las exitosas actividades de marcado realizadas en 2011 y 2012 en la almadraba marroquí "Eshahel", las actividades de marcado convencional y electrónico prosiguieron en 2013 en la misma almadraba. En total, se marcaron 265 atunes rojos adultos, de los cuales 129 se marcaron con al menos una marca convencional (espagueti). El 47% del total de los peces marcados fueron marcados con marcas dobles convencionales. Durante esta campaña se colocaron catorce marcas MiniPAT pop-up por satélite y ocho marcas acústicas. No se registró mortalidad incidental de atún rojo durante las operaciones de marcado debido a la amplia experiencia y capacidad del equipo de marcado. Todos los peces marcados eran adultos con tallas que oscilaban entre 202 y 255 cm FL (150-295 kg). Los resultados preliminares del marcado electrónico eran coherentes con los resultados de 2011-2012, y mostraban que no todos los peces marcados en la almadraba entraron en el mar Mediterráneo para reproducirse, como se esperaba.

KEYWORDS

Moroccan Atlantic traps, Adult bluefin tunas, Conventional & electronic tagging

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1. Introduction

During 2013, in the frame work of ICCAT/GBYP, the National Institute for Fisheries research of Morocco (INRH) has conducted electronic and conventional tagging for the third consecutive year in the Moroccan Atlantic trap «Essahel». These tagging activities were conducted in collaboration with the trap company MAROMADRABA and the World Wide Fund (WWF).

The electronic tagging operations conducted in 2011 and 2012 were a great success, because of the interesting and startling information transmitted by the pop-up tags about the behavior of bluefin tuna spawners tagged in the trap (Quílez-Badia *et al.*, 2012). According to these results not all fishes tagged in the trap entered into the Mediterranean for spawning as expected.

2. Material and methods

2.1 Conventional tagging

During 2013, the conventional tagging activities of adult BFT were carried out in the Moroccan Atlantic trap “Essahel”. The tagging operations took place into water (3-4 m depth) (**Figure 1**).

In general, the tagging was conducted according to the protocols adopted by the ICCAT/GBYP project. The weight of each tagged fish was estimated by skilled and experienced divers (taggers) with a maximal error of 10kg (5% of the individual average weight). The estimated individual weights were then converted into their corresponding fork length, using the length/weight relationship adopted by the SCRS for the East Atlantic BFT (Rey and Cort, unpublished).

The conventional tags were implanted manually at the base of the second dorsal fin, using applicators attached to wooden or metallic handles made locally (**Figure 2**). To deploy at the same time both the single and the double barb conventional tags (**Figure 3**), two applicators attached to the same handle were used (**Figures 4 and 5**).

At the end of each tagging operation, the fishes tagged into water were released in group, using a heavy weight handled by a crane to bring down the nets (**Figure 6**).

2.2 Electronic tagging

Following the methodology from 2012, two different systems were used to tag half and half of the tunas: i) using a small crane and a stretcher (**Figure 7**) to pull the tunas out of the water and deploy the tags on board one of the tuna trap vessels (**Figure 8**); and ii) in the water by means of a long pole (**Figure 9**).

From the 15 tunas, 8 were tagged on-board and 7 in the water. From the 8 tagged on board, one had an acoustic and a conventional tag deployed, while the other 7 had a pop-up (with a double anchor point), an acoustic and a conventional tag deployed between the 1st and 2nd dorsal fin (**Table 1**, Nos. 1-8). Due to the impossibility of deploying more than one tag at the same time, the 7 tunas tagged in the water, had only one pop-up – with a single anchor point - deployed at the base of the 2nd dorsal fin (**Table 1**, Nos. 9-15).

Tuna brought on board, immediately had a soft cloth soaked in fish slime replacement placed over their eyes, while a seawater hose oxygenated their gills. The curved fork length (CFL) was measured to the nearest 1 cm. CFL was transformed to straight fork length (Parrack and Phares 1979) and then to round weight using the formula adopted by ICCAT for East Atlantic stock (Rey and Cort *unpublished*). For those tuna tagged in the water a conservative estimation of the live weight was made by the tagging team.

Tunas tagged on board were safely released at sea within 3 minutes after having been pulled out of the water, by means of the crane and stretcher (**Figure 10**). Tunas tagged in the water, on the other hand, were released by means of a heavy weight carried by a crane that was used to lower the trap nets so that all the tagged tunas could leave together once the tagging had finished.

3. Preliminary Results

In total, 265 adult BFT were tagged during 2013. The number of fish tagged per day ranged from 7 to 59, with an average of 29 fish (**Table 1**).

121 fish were tagged with two conventional tags (one single barb and one small or large double barb tag), which represent 47% of the total number of tagged fish (**Table 1**).

The size of tagged fish ranged from 202 to 259cm FL, with an average size of 234cm FL. The majority of fish have size comprised between 220 and 245cm (**Figure 11**). Their estimated live weight (RW) varied between 150kg and 295kg, with an average of 224kg.

From the 14 pop-up tags deployed in the trap “Essahel”, 6 have been released (**Table 2**), and their pop-off positions are shown in **Figure 12**. Two of these tags (i.e. ID # 11P0445 and 12P0136) have been at liberty for over 30 days.

References

Quílez-Badia, G., P. Cermeño, S. Sainz-Trápaga, S. Tudela, A. Di Natale, M. Idrissi and N. Abid, 2012. ICCAT-GBYP pop-up tagging activity in 2012 in Larache (Morocco). SCRS/2012/143.

Rey, J. C. and J. L. Cort. (*unpublished*). "Length-weight relationships adopted by the SCRS for major species." From <http://iccat.int/Documents/SCRS/Manual/Appendices/Appendix%204%20III%20Length-weight.pdf>.

Table 1. Number of fish tagged by day and by types of tags.

Date	MiniPAT	Mini PAT& Spaghetti & acoustic	Spaghetti	Spaghetti & Large billfish	Spaghetti & small billfish	Spaghetti & acoustic	Total
20/05/2013		7				1	8
21/05/2013	7						7
22/05/2013			20	2			22
23/05/2013			50				50
24/05/2013			59				59
25/05/2013				30			30
26/05/2013				25			25
27/05/2013				18	16		34
31/05/2013					30		30
Total	7	7	129	75	46	1	265

Table 2. Summary of 2013 BFT tagging in the Moroccan tuna trap “Essahel” (35°18'10"N 06°11'40"W).

Deployment	Date	Pop-up ID	Acoustic	Conventional	Dart	GMT	Notes	DNA	CFL (cm)	Weight (kg)	Day programmed	Days at liberty	Days left	Pop-off Date	Pop-off position
1	5/20/2013	11P0028	94	BYPO21451	Umbrella + Titanium	9:30	on board	1	245	248.8	360	56	304		
2	5/20/2013	12P0126	93	BYPO21452	Umbrella + Titanium	9:36	on board	2	237	226.0	360	5	-	5/25/2013	35°58'23"N 6°41'54"W
3	5/20/2013	12P0130	87	BYPO21453	Umbrella + Titanium	9:40	on board	3	232	212.5	360	13	-	6/2/2013	36°13'44"N 7°14'44"W
4	5/20/2013	12P0133	90	BYPO21454	Umbrella + Titanium	9:45	on board	4	240	234.4	360	56	304		
5	5/20/2013	12P0134	83	BYPO21455	Umbrella + Titanium	9:48	on board	5	235	220.5	360	56	304		
6	5/20/2013	12P0136	85	BYPO21456	Umbrella + Titanium	9:50	on board	6	227	199.5	360	42	-	7/1/2013	38°54'58"N 10°15'36"W
7	5/20/2013	12P0137	89	BYPO21457	Umbrella + Titanium	9:54	on board	7	250	263.8	360	8	-	5/28/2013	36°05'57"N 7°28'42"W
8	5/20/2013	-	92	BYPO21458	-	9:55	on board	8	215	170.4	-	-	-		
9	5/21/2013	12P0139	-	-	Umbrella	9:15	in water	-	240	234.4	360	55	305		
10	5/21/2013	12P0140	-	-	Umbrella	9:18	in water	-	212	163.6	360	55	305		
11	5/21/2013	12P0141	-	-	Umbrella	9:19	in water	-	220	182.1	360	11	-	6/1/2013	35°13'51"N 2°40'05"W
12	5/21/2013	11P0474	-	-	Titanium	9:19	in water	-	230	207.2	360	55	305		
13	5/21/2013	11P0467	-	-	Titanium	9:20	in water	-	242	240.1	360	55	305		
14	5/21/2013	11P0445	-	-	Titanium	9:25	in water	-	246	251.8	360	39	-	6/29/2013	35°40'28"N 14°51'34"W
15	5/21/2013	11P0446	-	-	Titanium	9:29	in water	-	260	295.6	360	55	305		

Note: Rows in darker blue show the tags that have been released and how long they lasted attached to the fish. Rows in lighter blue are those tags still attached (as for 7/15/2013*).

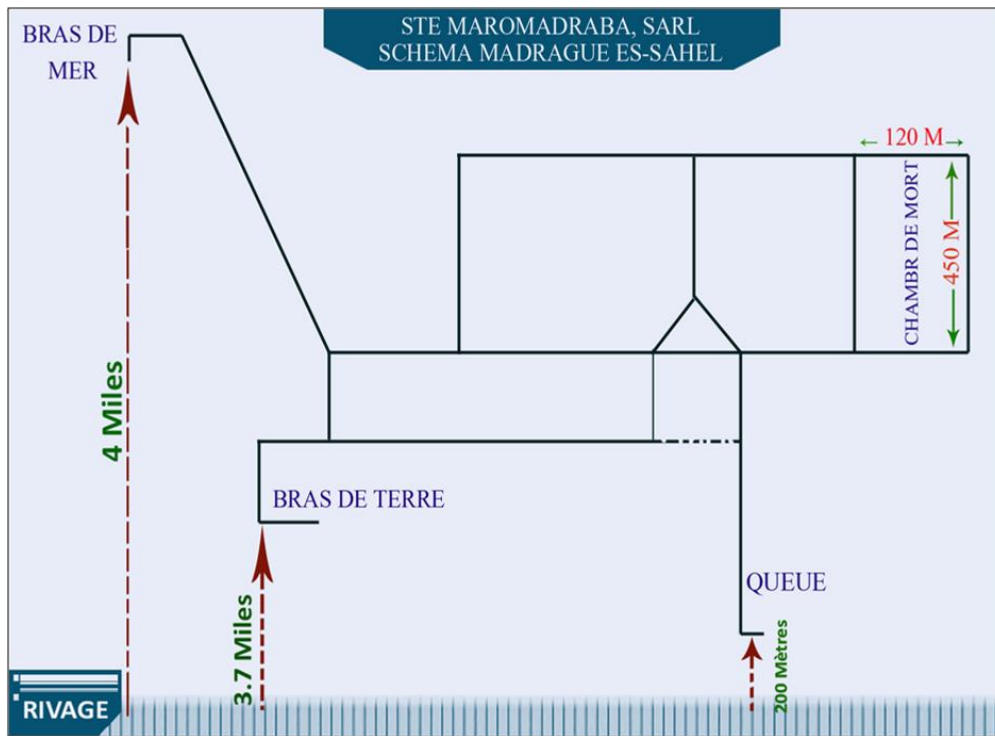


Figure 1. Designs of the Moroccan trap « Essahel ».



Figure 2. Different types of handles used for conventional tagging

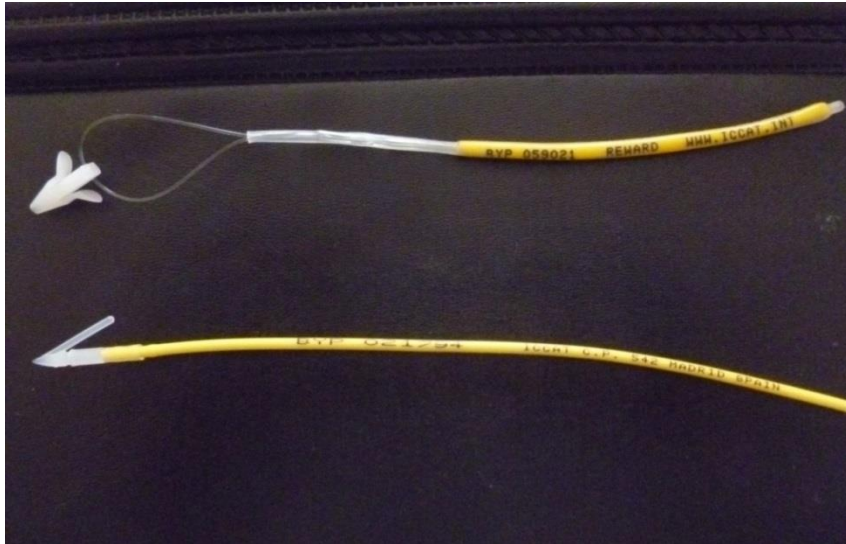


Figure 3. Types conventional tags used: single barb (bottom) and double barb (top)



Figure 4. Wooden handles (50 cm length) with two applicators used for double conventional tagging.



Figure 5. Two conventional tags (single and double barb) with their applicators attached to a wooden handle



Figure 6. Release operation in group of BFT tagged with one single conventional tag (top) and with two conventional tags (bottom). The arrow indicate the location of the tags.



Figure 7. Bluefin tuna tagging using the crane and stretcher (image: WWF).



Figure 8. Bluefin tuna tagging on board a tuna trap vessel (image: WWF).



Figure 9. Bluefin tuna tagging in the water (image: WWF).



Figure 10. Bluefin tuna being released at sea (image: George Shillinger).

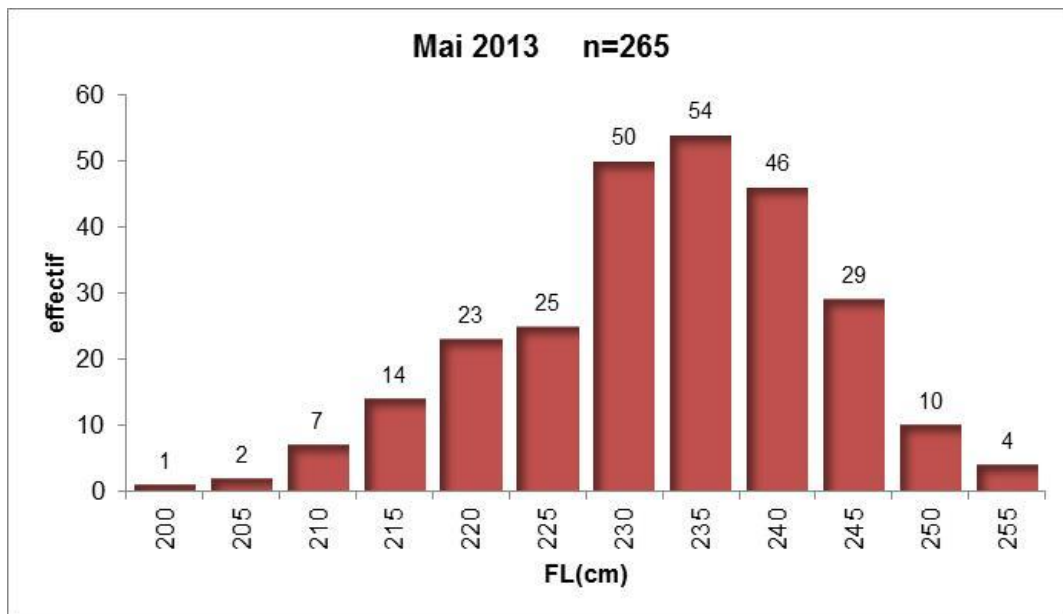


Figure 11. Size frequencies of BFT tagged in 2013 in the Moroccan trap "Essahel"

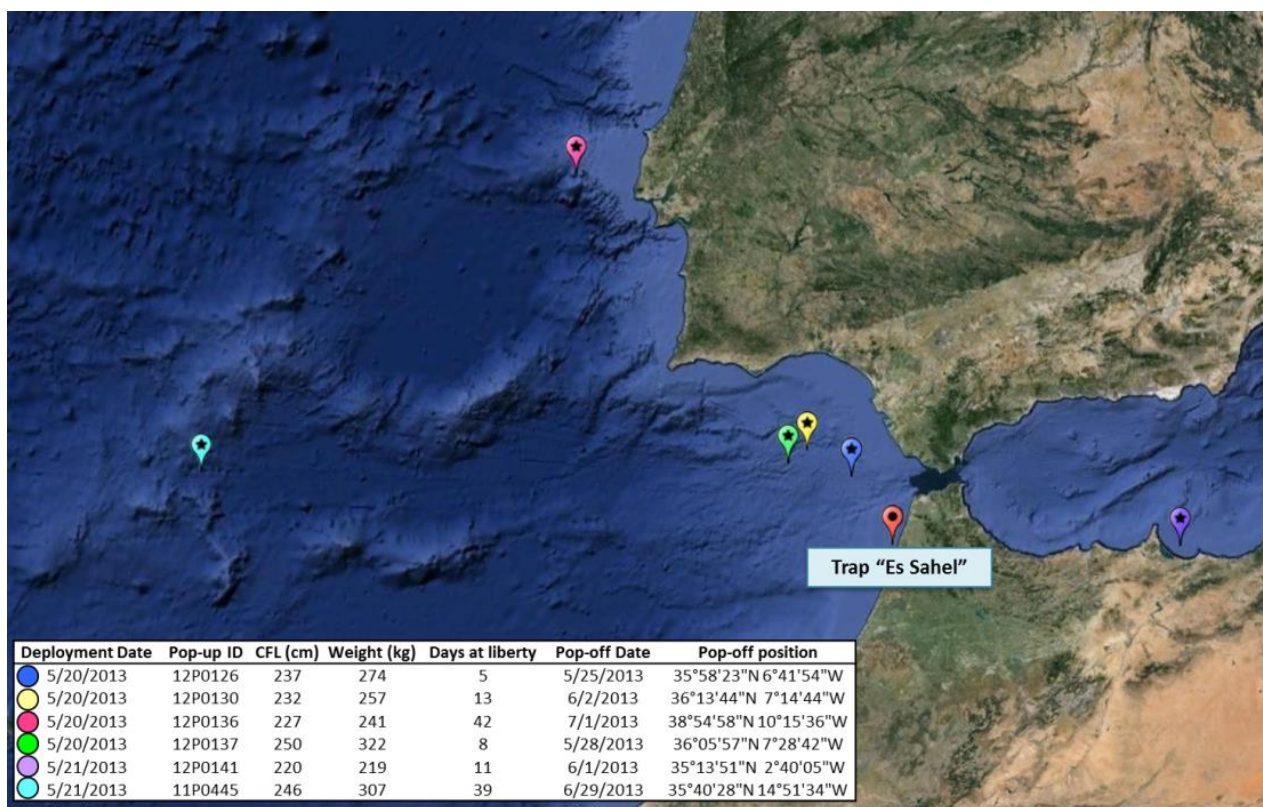


Figure 12. Pop-off positions of the six tags released (as for 15th July 2013).