Some clues for correcting the tagging database of tropical tunas

Daniel Gaertner, P. Kebe, C. Palma

SOME CLUES FOR CORRECTING THE TAGGING DATABASE OF TROPICAL TUNAS

Daniel Gaertner[1], Papa Kebe[2] and Carlos Palma[2]

SUMMARY

Conventional "spaghetti" tags have been used for a long time in Tropical Atlantic Ocean and have been collected by ICCAT secretary with the collaboration of scientists and fishermen. Despite, careful examination of the information provided at release and at recapture some errors may persist into the ICCAT tagging data base. The aim of this short note is to highlight some types of errors existing in the tagging data bases for tropical tunas and to suggest potential clues for corrections.

RÉSUMÉ

Les marques conventionnelles "spaghetti" sont utilisées depuis longtemps dans l'Océan Atlantique tropical et elles sont collectées par le Secrétariat de l'ICCAT en collaboration avec les scientifiques et les pêcheurs. Malgré l'examen minutieux de l'information transmise par le marquage-recapture, il est possible que certaines erreurs persistent dans la base de données de marquage de l'ICCAT. L'objectif de cette brève note vise à mettre en évidence certains types d'erreurs existant dans les bases de données de marquage des thonidés tropicaux et à suggérer de potentielles solutions pour les corriger.

RESUMEN

En el Atlántico tropical se han usado durante mucho tiempo marcas convencionales tipo "espagueti" que la Secretaría de ICCAT ha recopilado con la colaboración de científicos y pescadores. A pesar de realizar un examen exhaustivo de la información proporcionada en la liberación y la recaptura, puede seguir habiendo algunos errores en la base de datos de marcado de ICCAT. El objetivo de esta breve nota es destacar alguno de los tipos de errores que existen en las bases de datos de marcado de túnidos tropicales y sugerir posibles orientaciones para su corrección.

KEYWORDS

Tagging data, tropical tunas

1. Introduction

In spite of the increasing use of electronic tags in the recent years, traditional tags (mainly external spaghetti tags, McFarlane et al., 1990; Prince et al., 2002) remain an indispensable tool for stock assessment studies (Jones, 1976). Electronic tagging studies the behaviour of tunas at the level of the individuals with the difficultly to extrapolate this behaviour to the whole group or population. In contrast, the weak amount of information embedded into an individual traditional tag is counter-balanced by its low cost, allowing one to perform massive tagging operations. As a consequence, large recoveries may be expected and combining insights obtained from both types of tags can lead to improved harvesting and management strategies (Holland et al. 2001; Bach et al., 2001).

[1]Institut de Recherche pour le Développement (IRD), UR 109, Centre de Recherche Halieutique Méditerranéenne et Tropicale, BP 171, 34203 – Sète Cedex, France.
[2]ICCAT, Corazon de Maria, 28001 Madrid Spain.

Tag-recovery studies facilitate the collection of a variety of types of information on the species under study such as stock structure, growth rate, gear selectivity, migrations, survival/mortality, etc. For fisheries agency, such methods are useful to increase the biological understanding of spatially structured populations and to gauge the effects of fishing activities on these populations. Furthermore, the information contained in these files is of primary interest, specifically in the framework of the multi-species approach that we attempt to develop within the ICCAT Tropical Working Group (e.g., Gaertner et al. 2006), etc.

After omitting duplicated tags (i.e., when 2 records share the same tag identification :"strTag"), the tagging data base provided by the ICCAT secretary during the recent Inter-sessional Meeting of the Tropical Species Working Group hold on April 24-28, 2006, in Séte (France) contains 17804 records for yellowfin (*Thunnus albacares*), 11167 for bigeye (*Thunnus obesus*) and 35965 for skipjack (*Katsuwonus pelamis*). Screening these Excel files by eye is a complicated and time consuming task and it is obvious that ICCAT Secretary cannot correct all the data files without some help provided by the scientists involved in the Tropical Working Group. For situations, where it is not possible to validate the information with the source (i.e. scientist in charge of the tag experiment), the ICCAT secretary must decide itself if a correction can be proposed. The purpose of this paper is to suggest some simple error checking rules and to open a discussion about how to build accurate ordered substitution rules, not only for the historic data base, but also for data coming from future tagging experiments.

2. Examples of errors and suggestions for correction

2.1 Species identification

This aspect concerns records for which the species is identified differently at release and at recapture (i.e., in columns rSpeciesID and cSpeciesID, respectively). Among the possible criterion which could be used for the correction of this case, one can argue that identification at recapture is more plausible than at release due to the quick handling time during the tagging operation. Other possible simple criterion could be the choice of the most abundant species during the tagging operation conducted at same date and location (i.e., simple in the sense that ecological criterion, such as temperature or dissolved oxygen preferences, which are more effective to predict the presence/absence of a given species might be difficult to implement). For instance, based on the occurrence of the different species at tagging, tag "AT001931" released as yellowfin but recaptured as bigeye (Fig. 1) could be classified as yellowfin (10 yellowfin and 0 bigeye were tagged at the same place on 15/08/1986). Other criterion could be based on valid length/weight ranges and growth rates, to delimit possible errors in Species identification. For instance, the difference between the length of the fish for which species identification is suspicious, and between the average length of each of the species present at release the same day and place could be used to propose the most likely correct species identification (even if more sophisticated distances could be envisaged to transform these guesses in term of probability), etc. Obviously all these aspects, whose only some of them are presented in **Figure 1**, should be discussed by fishery experts before to drawn definitive recommendations, but it makes sense to propose some simple checking rules and procedures to improve the integrity of data base.

2.2 Date at release

A certain number of records have no date at release clearly identified (and in this case commonly reported by US scientists as: 01/01/1940). In such a situation the correction procedure can consist in sorting the tag identification column (strTags), then assuming that tags are released by lots (excepted may be for sport fishery), attempting to locate the surrounding tags in term of identification number. Using such procedure one may assume that tag "C-023697" was approximately released between end of May 1964 and end of October 1964 **(Figure 2)**; even if the existing information is not helpful enough for obtaining a more precise date at released. However, using a "multispecies" approach (seeking for similar identification among the tags used for bigeye or for skipjack by the same country allow one to reduce the possible time period from July 1964 to end of October 1964. Obviously, other situations are more complex, e.g. case of tag "E-056003" (released 29/03/1993 or 01/04/1994 ?). In addition, for the numerous US tags for which date at release is lacking and for which the gear was coded as unclassified (rGearID = 13), the column rGearID should be corrected by 12 or 22 (sport fishery RR); depending on the opinion of U.S. scientists.

2.3 Location at release

Based on the same date at release (rDatOp), when a record depicts a different rLonY (or conversely a different rLatY) compared with surrounding strTags (once again assuming that for the major fishing gears, tags are released by lots) it seems reasonable to suspect some mistakes, and likely to propose some accurate corrections. Consequently, sorting the tagging data base by longitude or by latitude at release can be helpful for detecting potential errors. For instance based on tags belonging to the same lots and released the same day it appears likely that for tag "H-036475", rLonx should be -79.833 instead of -99.833 **(Figure 3)**. Using the same procedure: rLonX for tags "H-005523", "H-005524", "H-005525" should be -74 instead of -24.

2.4 Tag identification missing

Based on tags released the same day and place by the same gear/country, tags recorded with a partial identification could be reconstituted. For instance, tags released the 17/09/1977, and recorded as –00XXXX (X being a number) were likely part of the serie IS000191 **(Figure 4)**. In the same way, some tags released in 1971 and partially identified as –00XXXX were likely part of the T-00XXXX serie.

2.5 Others

The cases analyzed previously concern mainly errors at release. Errors at recapture (e.g., date, location, length, etc) are difficult to detect. However, in some circumstances some tests should be done : unrealistic growth rate, unrealistic displacement rate (in such case a simple map can help for detecting the error), recapture in a strata for which no fishing effort was reported in the ICCAT task II data base for the corresponding gear/country, etc. In addition, the ICCAT secretary could publish simple tables summarising releases and recoveries reported by year/country/gear to facilitate a systematic control of the data base integrity. All these aspects should be discussed by scientists involved in ICCAT stock assessment in order to list the type of tests which can be helpful for correcting the tagging data base (not only for the current tagging data, but also for data coming from future tagging experiments).

3. References

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Specimen	strTags	RCStage	rFleetID	rGearID	rDateOp	rLonX	rLatY	rSpeciesID	rLiCM	rWi	cFleetID	cGearID	cDateOp	cLonX	cLatY	cSpeciesID	cLiCM
314571	AT001235	RC1	050CI00	16	29/06/1986	-3,533	4,517	8	47		027GH00	16	15/08/1986	-999,000	-999,000	3	
No fish with the same species identification for this date and location; may be SKJ due to the overall lack of precision at recapture																	
205148	AT001931	RC1	050CI00	16	15/08/1986	-17,667	14,600	3	57		021ES00	5	16/09/1986	-21,000	9,250	5	86
Likely YFT (10 YFT vs 0 BET released at same date and location)																	
400773	PE008623	RC1	008FR00	17	29/07/1994	-17,283	19,383	8	57		008FR00	13	08/08/1994	-18,000	20,033	3	58
80341	PE008667	RC1	008FR00	17	29/07/1994	-17,283	19,383	5	50		999--99	13		0,000	0,000	3	56,5
May be YFT (but 5 YFT vs 4 SKJ and 1 BET and released at same date and location)																	
366290	PE009036	RC1	008FR00	17	27/08/1996	-17,800	20,000	3	60		021ES00	13	15/11/1996	-18,000	20,367	5	
307745	PE009050	RC1	008FR00	17	27/08/1996	-17,800	20,000	8	50		008FR00	13	15/09/1996	-18,000	20,333	3	53,5
May be BET for the first (due to the size at release) and YFT for the second (13 YFT vs 12 SKJ and may be 1 BET released at same date and location)																	
162460	PE009305	RC1	008FR00	17	05/09/1996	-18,017	20,117	3	64		008FR00	13	30/09/1996	-18,000	20,000	8	63,5
Owing to the size at release, likely YFT (but 13 YFT vs 31 SKJ released at same date and location)																	
270735	SJ007694	RC1	008FR00	17	05/09/1997	-18,600	19,767	3	43		008FR00	13	18/10/1997	-18,000	18,800	5	52
Assuming a better identification at recapture, may be BET (3 YFT vs 3 BET released at same date same location)																	

Figure 1. Example of discrepancy in species identification.

Tags with no date of release with the closest strTags for the same species

Specimen	strTags	RCStage	rFleetID	rGearID	rDateOp	rLonX	rLatY	rSpeciesI	rLiCM	rWiKG	cFleetID	cGearID	cDateOp	cLonX	cLatY	cSpecies
265528	C-021436	R-1	025US00	6	27/05/1964			3		31,75						
196506	C-021437	R-1	025US00	6	27/05/1964			3		36,29						
16459	C-021438	R-1	025US00	6	27/05/1964			3		29,48						
160614	C-023697	R-1		0	01/01/1940			3								
272427	C-025941	R-1	025US00	6	28/10/1964			3		45,36						
415760	C-025944	R-1	025US00	6	29/10/1964			3		45,36						
54170	C-025945	R-1	025US00	6	29/10/1964			3		45,36						
Likely released after 13/07/1964; see tag C-023616 for a SKJ in Misc)																
393158	R-112810	R-1	043VI00	22	13/12/1994	-74,48	36,82	3	81,28	11,34						
384796	R-112811	R-1	043VI00	22	13/12/1994	-74,48	36,82	3	81,28	11,34						
333873	R-112812	R-1	025US00	22	01/01/1940	-74,48	36,82	3	45,72	9,07						
247356	R-112813	R-1	025US00	22	11/12/1994	-74,50	36,48	3	40,64	9,07						
Likely released between 11-13/12/1994 same rlonX and rLatY than adjacent strTags																
96177	E-056000	R-1	025US00	22	02/10/1993	-75,50	35,17	3		3,63						
344392	E-056001	RC1	025US00	1	01/04/1994	-75,50	35,17	3	55,88	5,90	025US00	22	20/09/1994	-73	40,17	3
186995	E-056002	R-1	025US00	1	01/04/1994	-75,50	35,17	3	55,88	5,90						
168449	E-056003	R-1	025US00	1	01/04/1940	-75,50	35,17	3	55,88	5,90						
69743	E-056005	R-1	025US00	22	29/09/1993	-75,50	35,17	3	35,56	2,27						
286897	E-056006	R-1	025US00	22	29/09/1993	-75,50	35,17	3	35,56	2,27						
417485	E-056007	R-1	025US00	22	29/09/1993	-75,50	35,17	3	35,56	2,27						
May be a mistake in the year (1994 and not 1940)																
90128	Z-000000	R-1		0	01/01/1940			3								
No tag identification but all tags with an identification beginning by a Z were released by Japan at the end of 2000 (see Misc)																

Figure 2. Date at release not reported.

SpecimenI	strTags	RCSta	rFleetID	rGearID	rDateOp	rLonX	rLatY	rSpeciesID	rLiCM	rWiKG	cFleetID	cGearID	cDateOp	cLonX	cLatY	cSpeciesID	cLiCM	cWiKG
27204	D-005566	R-1	025US00	13	04/09/1962	-39,50	72,17	8	35,56									
According to all other SKJ released at same date rLonx must be -72.166 and rLatY must be 39.5																		
110618	H-005525	R-1	025US00	6	14/07/1966	-24,00	38,00	8	58,42									
212951	H-005524	R-1	025US00	6	14/07/1966	-24,00	38,00	8	58,42									
294453	H-005523	R-1	025US00	6	14/07/1966	-24,00	38,00	8	58,42									
According to all other SKJ released at same date rLonx must be -74																		
112607	H-036475	R-1	025US00	22	05/12/1972	-99,83	26,17	8		2,268								
According to all other SKJ released at same date rLonx must be -79.833																		
31606	A-003743	R-1	012JP00	13	03/09/1980	0,90	3,08	8	46									
According to all other SKJ released at same date rLatY must be 3.0333																		
100779	LD003967	RC1	021ES00	17	08/10/1981	-16,93	28,35	8	56		021ES00	17	22/10/1981	-17	28,02	8		
Based on the tags released the same day, I suspect that the rGearID should be 7 and that rLonX should be -17.933																		
182292	LD005925	R-2	021ES00	17	31/08/1982	-24,00	28,20	8										
Likely rLonY = -14																		
285446	PE002807	RC1	006CU00	17	06/06/1983	-82,07	21,45	8	34		006CU00	17	08/06/1983	-83	21,93	8	49	
Likely rLonY = -83.066																		
177209	PE009077	R-1	008FR00	17	29/08/1996	-17,67	49,88	8	45									
rLatY should be 19.8833																		
404423	PE007713	RC1	008FR00	17	18/08/1997	-18,45	18,67	8	47		021ES00	13	15/10/1997	-999	-999,00	8		
rLatY should be 18.0666																		
214526	SJ007426	R-2	008FR00	16	28/08/1997	-18,00	19,27	8	51									
rLatY likely 19.0666																		
269692	AT005490	R-2	008FR00	6	15/08/1999	-18,00	20,52	8	50,5									
50857	AT004806	R-2	008FR00	6	15/08/1999	-18,00	20,67	8	55									
rLatY likely 20.6166																		

Figure 3. Potential mistakes in location at release.

SpecimenI	strTags	RCStage	rFleetID	rGearID	rDateOp	rLonX	rLatY	rSpeciesID	rLiCM	rWiKG	cFleetID	cGearID	cDateOp	cLonX	cLatY	cSpeciesID	cLiCM
316400	--000191	RC1	008FR00	9	17/09/1977	26,07	33,70	5	52		019PT00	13	21/06/1978	28	38,33	5	
78653	--000901	RC1	008FR00	9	17/09/1977	26,07	33,70	5	50		019PT00	13	29/07/1978	16	33,67	5	63
37935	--006401	RC1	008FR00	9	17/09/1977	26,07	33,70	5	77		021ES00	13	19/06/1978	24	38,00	5	
159791	--006433	RC1	008FR00	9	17/09/1977	26,07	33,70	5			021ES00	13	27/02/1978	-999	-999,00	5	80
6898	--006463	RC1	008FR00	9	17/09/1977	26,07	33,70	5	77		021ES00	13	19/06/1978	24	38,00	5	80
296465	--006493	RC1	008FR00	9	17/09/1977	26,07	33,70	5	104		019PT00	13	10/05/1978	17	32,50	5	
147705	--006499	RC1	008FR00	9	17/09/1977	26,07	33,70	5	104		019PT00	13	10/05/1978	17	32,50	5	
188929	--006508	RC1	008FR00	9	17/09/1977	26,07	33,70	5	85		021ES00	13		25	38,00	5	
354609	--006511	RC1	008FR00	9	17/09/1977	26,07	33,70	5	85		021ES00	13		25	38,00	5	
379197	--006524	RC1	008FR00	9	17/09/1977	26,07	33,70	5	82		021ES00	13	19/07/1978	24	38,00	5	
Likeky strTags=IS000191 (and so on), and rLonX=-26.0666																	
183584	--001378	RC1	008FR00	17	22/09/1971	9,00	-3,00	5	40		999--99	13	21/05/1972	1	2,00	5	55
216801	--001428	RC1	008FR00	17	22/09/1971	0,00	-3,00	5	40		008FR00	13	28/01/1972	8	-3,00	5	48
159456	--000074	RC1	008FR00	17	16/07/1971	8,00	0,00	5	72		999--99	13	17/07/1972	7	-1,00	5	135
Likeky strTags=T-001378 (and so on)																	

Figure 4. Partial lost in tag identification.