UPDATED FISHING CAPACITY ESTIMATES FOR BLUEFIN TUNA IN THE EASTERN ATLANTIC AND MEDITERRANEAN SEA

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SUMMARY

Changing dynamics for bluefin tuna in the eastern Atlantic Ocean and Mediterranean Sea necessitate an update of capacity estimates for the fishery. Catch rates sanctioned by the SCRS over the past decade were combined with the number of CPCs' vessels over the past decade (2008-2018) as recorded in their 2018 fishing plans to calculate a range of capacity estimates. The wide range of results suggests that the SCRS should revisit its best estimates of fishing capacity by gear class to ensure they reflect current population and fishery trends. Alternatively, a new methodology should be developed to estimate capacity in the fishery.

RÉSUMÉ

Compte tenu de l'évolution de la dynamique du thon rouge dans l'océan Atlantique et en mer Méditerranée, il convient de procéder à une mise à jour des estimations de la capacité de la pêcherie. Les taux de capture approuvés par le SCRS au cours de la dernière décennie ont été combinés au nombre de navires des CPC au cours de la dernière décennie (2008-2018), indiqués dans leur plan de pêche de 2018, afin de calculer une fourchette d'estimations de capacité. Le large éventail de résultats suggère que le SCRS devrait revoir ses meilleures estimations de la capacité de pêche par classe d'engins afin de s'assurer qu'elles reflètent les tendances actuelles en matière de population et de pêche. Une nouvelle méthodologie devrait être développée pour estimer la capacité de la pêcherie.

RESUMEN

La dinámica cambiante para el atún rojo en el Atlántico este y el Mediterráneo requiere una actualización de las estimaciones de capacidad de la pesquería. Las tasas de captura sancionadas por el SCRS durante la década pasada se combinaron con el número de buques de las CPC durante la pasada década (2008-2018) tal y como aparecían consignados en sus planes de pesca de 2018 para calcular un rango de estimaciones de capacidad. El amplio rango de resultados sugiere que el SCRS debería reexaminar sus mejores estimaciones de capacidad pesquera por tipo de arte para asegurarse de que reflejan las tendencias actuales de la población y de la pesquería. De manera alternativa, debería desarrollarse una nueva metodología para estimar la capacidad en la pesquería.

KEYWORDS

Fishing capacity; Eastern Atlantic and Mediterranean Sea bluefin tuna; Catch rates

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1. Introduction

The capacity level of the bluefin tuna fishery in the eastern Atlantic and Mediterranean Sea has been a very important aspect for the dynamics of the stock and its history in the past 30 years. Even though the enforcement of strict regulations such as TAC, minimum size and fishing seasons constrain the catches, tracking the evolution of fleet capacity is important to ensure that the potential catch is commensurate with the allowable catch, as well as to prevent a trend towards overcapacity as existed in the past (Fromentin *et al.* 2014).

To date, mean catch rates for each fleet segment have been used to estimate fishing capacity of bluefin tuna in the eastern Atlantic and Mediterranean Sea (EBFT). This was done first in 2008. In the following years, these catch rates were revised based on the 2008 and 2009 catch, whereas other scientists proposed alternative values (Tudela and Quílez 2011). In the annual EBFT fishing plans, such as those included in the 2018 report of the Panel 2 intersessional meeting (ICCAT 2018), other estimates are used.

Here we reviewed the different catch rates that have been used to assess EBFT fishing capacity over the past decade. Using these values and the number of boats for each CPC since 2008 extracted from the 2018 Panel 2 intersessional report, the present manuscript investigates how the fishing capacity evolved and how it changes depending on the different catch rates used.

2. Materials and methods

We analyzed 6 different catch rates that have been considered by the SCRS over the past decade. Catch rates were obtained from a) the "best catch rates defined by the SCRS" used in EBFT annual fishing plans (ICCAT 2018); catch rates developed by the SCRS in 2008 for the b) Mediterranean Sea and c) Atlantic; catch rates considered by the SCRS in 2010 based on a d) 2008 reference year and e) 2009 reference year; and f) catch rates determined by Tudela and Quílez (2011) (**Table 1**). The number of boats in each fleet segment for each year since 2008 were extracted from the 2018 report of the Panel 2 intersessional meeting (ICCAT 2018). Since these vessel lists were not differentiated between the Mediterranean and Atlantic, the 2008 catch rates used in (b) and (c) were combined to create a minimum and maximum catch rate for the entire eastern area, as shown in **Table 2**. We then multiplied the different catch rates by the number of boats to calculate the fishery's total fishing capacity and compared it to the agreed EBFT total allowable catch (TAC) through 2020.

3. Results

The results showed a clear decrease in boat number for some CPCs over the whole time period, whereas other CPCs displayed a decrease followed by an increase starting in 2012 (**Figure 1**). The overall number of purse seine vessels (PS) decreased over the whole period, with the large PS displaying an increase starting in 2012 (**Figure 2**). The number of small and medium longline vessels (LL) generally decreased, whereas large ones decreased and re-increased around 2012 (**Figure 2**). The number of traps and trawlers generally decreased over the period, whereas the number of boats in the "Other artisanal" category increased sharply since 2012, reaching substantially higher numbers than in 2008 (**Figure 2**).

The capacity computed for each CPC using the different catch rates displayed very large differences, sometimes reaching several orders of magnitude (**Figure 3**). This variability also affected the trend observed for some CPCs (e.g., the EU), from decreasing to increasing (**Figure 3)**. This also translated into differences in the contribution to the total fishing capacity (**Figure 4**). For instance, EU had a smaller contribution to the total fishing capacity when using the catch rates currently used in the annual fishing plans, than when using the catch rates from SCRS 2010 based upon a 2008 reference year. The contribution of each fleet segment to the total capacity also varied depending on the catch

rates (**Figure 5**). For instance, the contribution of the "other artisanal" segment was much smaller using the current annual fishing plan catch rates, than the catch rates from SCRS 2010 or Tudela and Quilez (2011). Finally, comparing the total fishing capacity for the different catch rates to the TAC generally showed a similar trend, i.e., decrease followed by increase in 2012 (**Figure 6**). However, while the catch rates currently used by Panel 2 for the annual fishing plans produce a total capacity below the 2020 TAC of 36,000 t, all of the other catch rates produce a capacity well above the TAC (**Table 2, Figure 6**).

4. Discussion

The fishing capacity derived from our study ranges from 20.180 tonnes to above 47.330 tonnes for 2018 (**Table 2**). The catch rates currently used in the annual fishing plans based on the "best catch rates defined by the SCRS" provide the smallest fishing capacity compared to the other catch rates. The results also show that the different catch rates used do not all result in a similar trend regarding the evolution of capacity over time. This is an important aspect for the bluefin tuna fisheries as rapid development of overcapacity was a primary cause attributed to past overexploitation (Fromentin *et al.*, 2014, ICCAT 2009). In the context of the acceptable TAC increase advised in 2017 by the SCRS, accurately following the evolution of fishing capacity is therefore of particular importance. This document suggests that the SCRS should clarify or re-compute catch rates so that any changes in fishing capacity are evaluated accurately.

References

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Table 1. Different catch rates (in tons/vessel/year) used to estimate the fishing capacity since 2008.

Fleet segment	*Panel 2, 2018*	*2008 Mediterranean*	*2008 Atlantic*	*SCRS 2010, reference 2008*	*SCRS 2010, reference 2009*	*Tudela and Quílez (2011)*
PS large (>= 40 m)	70.7	300	NA	66	61	116.52
PS medium (> 24 m & < 40 m)	49.78	150	50	54	45	75.16
PS small (<= 24 m)	33.68	40	25	5	5	5
LL large (>= 40 m)	25	50	50	24	53	73.29
LL medium (> 24 m & < 40 m)	5.68	20	20	14	10	11.61
LL small (<= 24 m)	5	10	10	6	5	5
Baitboat	19.8	NA	40	20	12	22.56
Handline	5	3	5	5	3	5
Trawler	10	2	15	6	6	6
Trap	130	40	245	130	130	130
Other artisanal	5	4	3	36	18	18

Table 2. Total capacity (in tons) per year computed for the different catch rates.

Year	*Panel 2, 2018*	*2008 min*	*2008 max*	*SCRS 2010, reference 2008*	*SCRS 2010, reference 2009*	*Tudela and Quílez (2011)*
2008	32132	49514	80762	36443	30204	43024
2009	23549	38184	61458	34896	26590	36478
2010	17641	25242	42709	29040	21031	27514
2011	14046	21869	35063	20873	15962	21439
2012	12220	16855	30016	17035	13414	18216
2013	12552	17652	31070	16743	13515	18410
2014	12851	15726	30522	20727	15482	20204
2015	14601	21242	35566	26933	19297	24625
2016	15818	24463	38973	25538	19114	25304
2017	16453	23305	39265	30682	21756	28093
2018	20180	30497	47330	42220	28896	36581

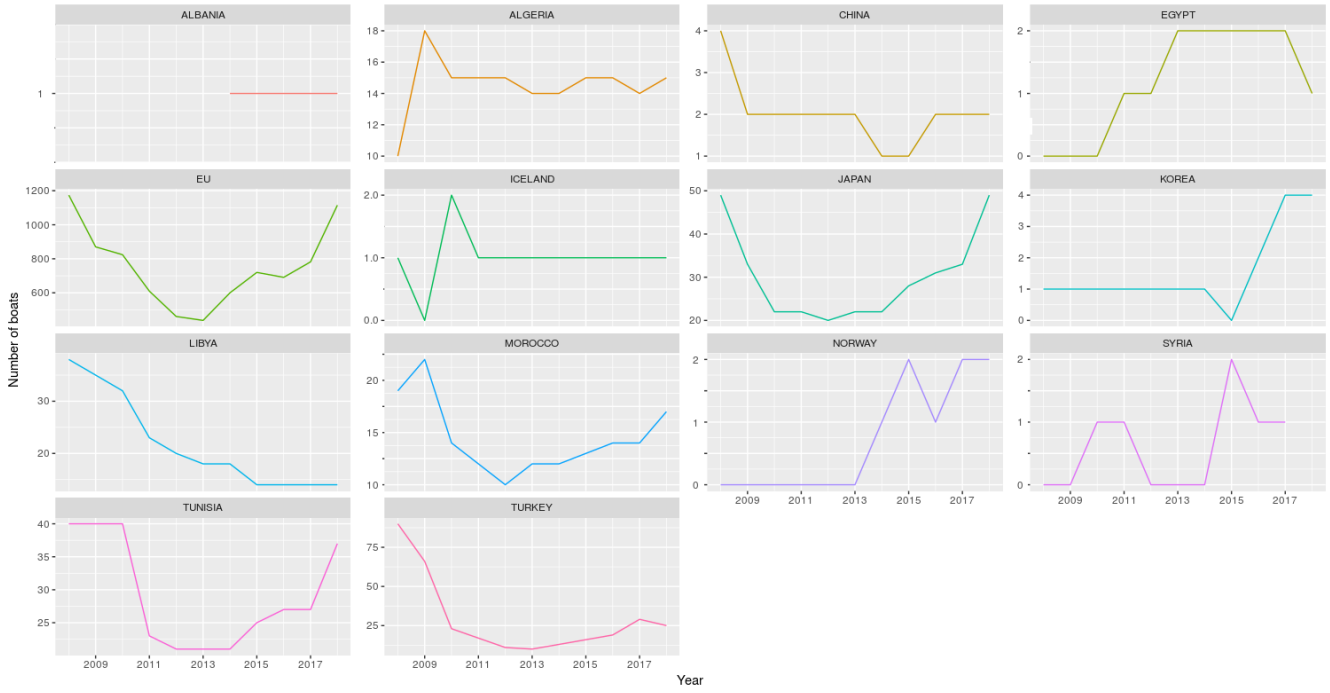

Figure 1. Evolution of boat number by CPC.

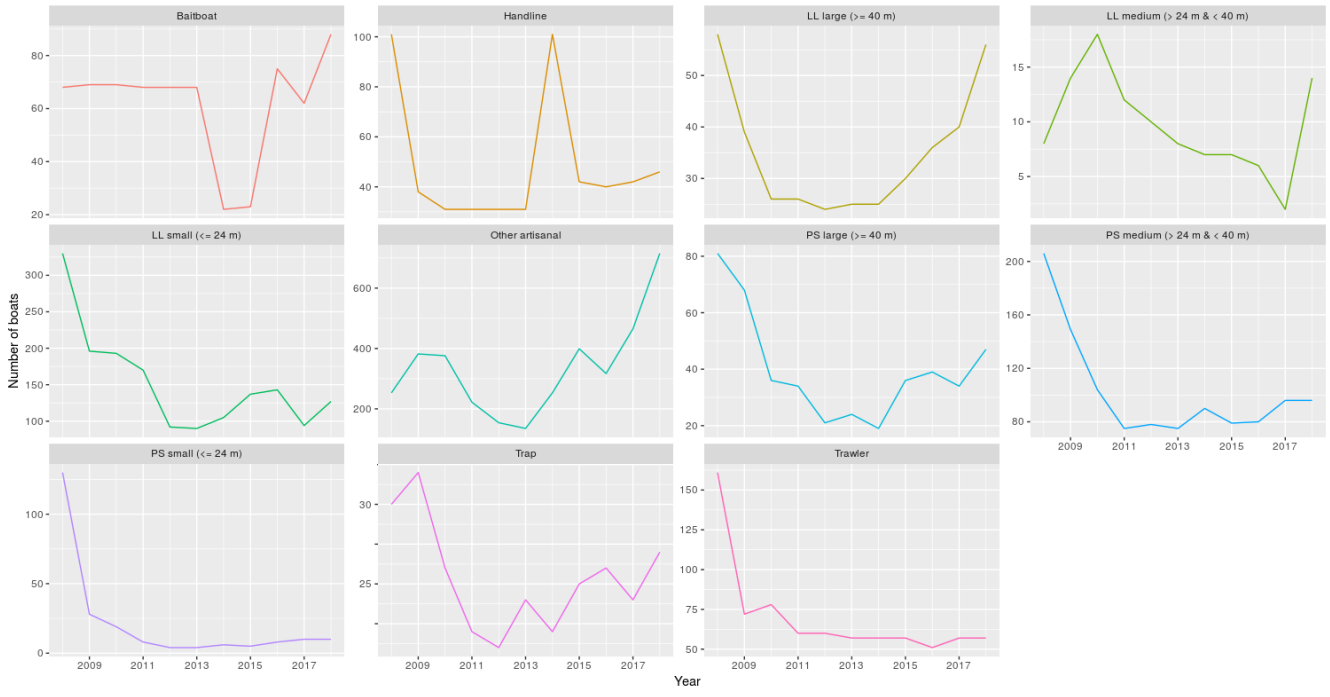

Figure 2. Number of boats by gear type.

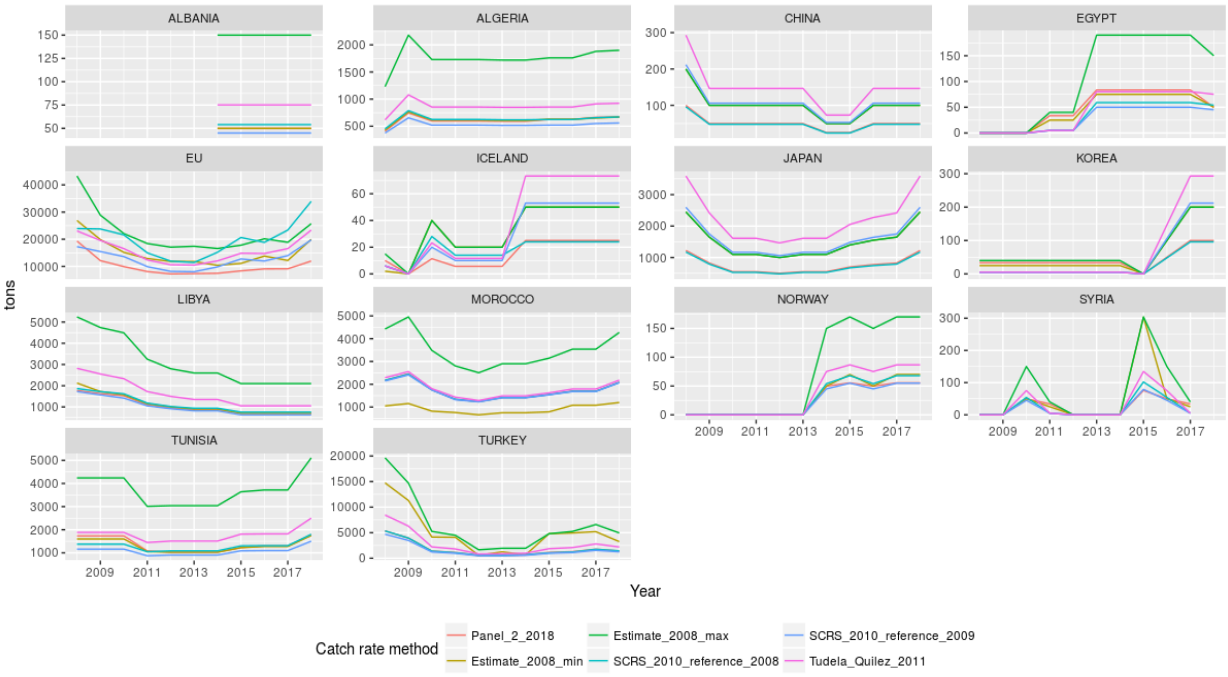

Figure 3. Capacity time series for each CPC computed from the different catch rate methods.

Figure 4. Contribution of each CPC to the total capacity for the different catch rate methods.

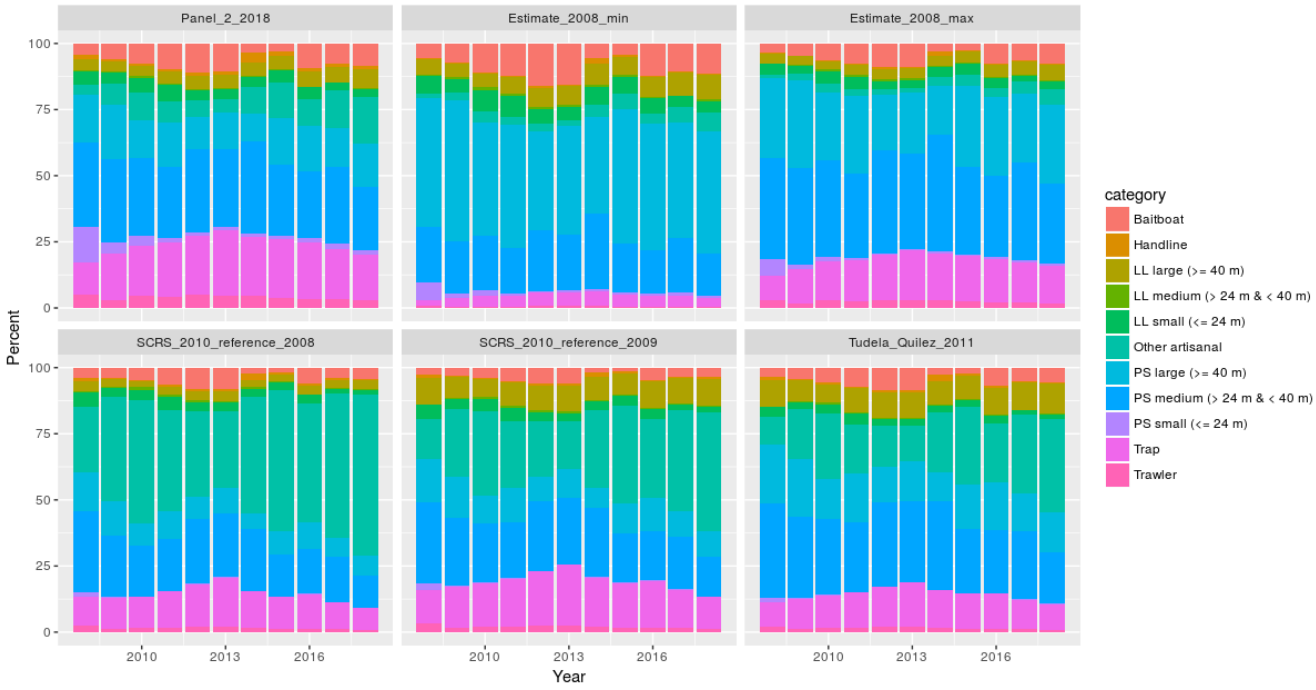

Figure 5. Contribution of each fleet segment to the total capacity for the different catch rate methods.

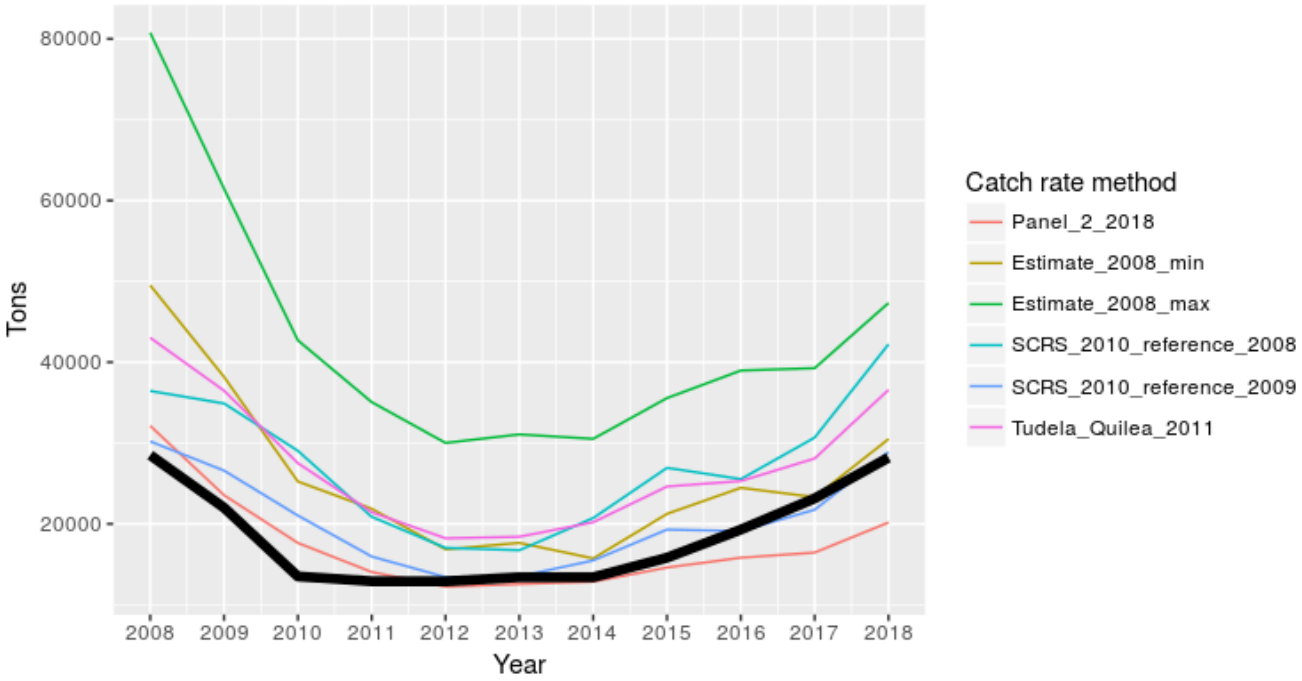

Figure 6. Evolution of fishing capacity for the different catch rates (coloured lines) compared to the TAC (thick black line).