BLUEFIN TUNA (*THUNNUS THYNNUS*) SIZE COMPOSITION IN THE WESTERN LIGURIAN SEA (WESTERN MEDITERRANEAN) FOR THE PERIOD 1990-2013

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SUMMARY

The Ligurian Sea has always been considered as a good feeding and growing area for young BFT. The bulk of catches recorded in the past (1990-2009) by surface swordfish long line, driftnet and purse seine have always been made by juveniles (mostly fish 0 to 4 years old). From 2010 there has been an increase in the mean size of captured individuals, due to the introduction of the new mesopelagic swordfish long line. The paper compares the BFT size composition of tuna caught in the Ligurian Sea in the past with various "surface" fishing gears with that of the current catches obtained as by-catch of the mesopelagic swordfish long line.

RÉSUMÉ

La mer de Ligure a toujours été considérée comme une bonne zone d'alimentation et de croissance des jeunes thons rouges. La majorité des prises consignées entre 1990 et 2009 et réalisées à la palangre de surface ciblant l'espadon, au filet dérivant et à la senne a toujours été composée par des juvéniles (principalement des poissons de 0 à 4 ans). À partir de 2010, la taille moyenne des spécimens capturés a augmenté, en raison de l'introduction de la palangre mésopélagique ciblant l'espadon. Le document compare la composition des tailles des thons rouges capturés dans la mer de Ligure par le passé au moyen de différents engins de pêche de « surface » avec celles des prises actuelles obtenues en tant que prise accessoire par la palangre mésopélagique ciblant l'espadon.

RESUMEN

El mar de Liguria se ha considerado siempre una buena zona de alimentación y crecimiento para los atunes rojos jóvenes. El grueso de las capturas consignadas en el pasado (1990-2009) por el palangre, las redes de enmalle a la deriva y el cerco dirigido al pez espada se componía siempre de juveniles (principalmente peces de 0 a 4 años). Desde 2010 se ha producido un aumento en la talla media de los ejemplares capturados, debido a la introducción del nuevo palangre mesopelágico dirigido al pez espada. Este documento compara la composición por tallas del atún rojo capturado en el mar de Liguria en el pasado con diversos artes pesqueros de "superficie" con la de las capturas actuales obtenidas como captura fortuita del palangre mesopelágico dirigido al pez espada.

KEYWORDS

Bluefin, Size distribution, Ligurian Sea

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1. Introduction

Since 1990 large pelagic fishery in the Ligurian Sea have been monitored by the Genoa University within the framework of national (MiPAAF, MIUR) and international (EU, ICCAT) programs; in the last years research have been mainly sustained by regional funds and, specifically for bluefin, by the GBYP program. Several studies are being conducted on fishery trends and exploitation of pelagic resources, by-catch, possible interactions with protected and endangered species, but also on many aspects of the biology of bluefin tuna, *Thunnus thynus*, such as growth, feeding and tagging (Orsi Relini *et al.*, 1995, 1997, 1999, 2010; Relini *et al.*, 1995). In the Ligurian Sea the tuna catches can derive from professional and recreational fishery using several different gears. The fishing season generally takes place from June to November, depending both on the weather conditions and the abundance of the targeted fish. Aim of this note is to describe changes that occurred in the fishing activities over the long period, since 1990 up to date, with the introduction in the most recent years of a different long line, which affected the size structure of the bluefin tuna catches in the area, exploiting a fraction of the population unsuspected so far.

2. Material and methods

The fishing activities addressed to large pelagic fish have been monitored in the same way descirbed in previous studies, in order to continue the historical series obtained till now. The main harbours where landing controls were carried out were Sanremo and Imperia, which produce about 80% of the landings of the Ligurian coast, ad in the last few years Loano was also introduced as a new sampling location. During each day of observation at landings, information about total catches and effort were recorded and all the catches were measured and when possible, weighted. Activities were also carried out directly onboard the fishing vessels for the collection of biological samples. Throughout the entire period (1990-2013) we recorded size data for 8,754 BFT, 4,204 of which from purse seine (PS), 2,036 from drift net (DN), 1,152 from albacore long line (ALB LL), 703 from surface swordfish long line (SWOLL), 533 from MesoSWOLL and 126 from recreational fishery (SPORT). Data were used to create size frequency distributions and the average size of the BFT caught for the different gears.

3. Results

Historically, in the Ligurian Sea the activity of the professional pelagic fishery extended from May to December, depending both on the weather conditions and the abundance/availability of pelagic resources: for BFT the period is slightly reduced, from late May to September, even if in a few years some activities, especially with PS could be present. As well as for swordfish, the main bluefin tuna fishing ground is located in the Central-Western part of the basin, where several different gears were used by the professional fishery throughout the entire period covered by the research. This area was also shared in the past by French vessels exploiting BFT by PS and DN (the so called "Thonaille"). The size-frequency distributions of all BFT measured by gear over the first 19 years of observations, from 1990 until 2009, is presented in **Figure 1**. It can be easily seen that the Ligurian Sea population was mainly composed of individuals between 1+ and 4+ years old, while larger fish were only occasionally caught. The differences in the size composition of the catches are really low among gears and strictly related to their technical characteristics and selectivity. The great majority of measures obviously derive from the gears targeting directly BFT (PS, DN and what we called ALB LL). This latter is a gear very similar to the longline used in Southern Italy targeting albacore, considering that the average size of the BFT population in the Ligurian Sea is very close to albacore. It was used in the past by a small part of the swordfish longline fleet, mainly during the summer full-moon phases, on July and August, which are favorable for BFT catches. For the SWOLL obviously BFT catches are only a by-catch: up to 2009, the main gear was the traditional drifting SWOLL, displaced strictly at surface (max depth 15m) during the afternoon and hauled during the night. The gear maintained the same characteristics in its general scheme (hook size, bait, average number of hooks per boat and depth of set) throughout the period of observation, since 1990; in this way comparison among different years was more reliable. Starting in 2010, all boats introduced a new gear, borrowed from some vessels that have come to fish from southern Italian areas, which we defined as Mesopelagic SWO LL (MesoSWOLL), since most of the hooks are displaced in mesopelagic waters. This gear is very similar to the long line described by Barcelona-Garcia et al. (2010), and called Semipelagic longline (SPLL), which was introduced by Spanish fishermen since 2006. A more detailed description of the gear and its "behaviour" are reported in Garibaldi (2014). As well as happened for swordfish, also BFT caught by this gear are significantly larger than the others caught with other "surface" gear. The comparison of the two different size frequency distributions is shown in Figure 2. The same is even more evident if we consider the average BFT size by gear (Table 1) and the trend of average size by year of BFT caught by SWOLL (both surface and mesopelagic ones), reported in Figure 3.

4. Discussion

The tuna fishery in the Ligurian Sea has always been carried out mainly at artisanal level. Over the entire studied period, the only "industrial" fleet, composed by less than 10 PS boats in the '80, faced a sharp decline since the beginning of the '90s, due to the raising of costs and the reduction of the resource. After that only exogenous PS came to exploit the Ligurian population at the end of the season (August to October). Finally, the introduction of the new management measures (Driftnet ban, minimum catch size, TAC quotas, etc.) over the last 20 years has significantly reduced the fishing capacity; at this moment the only possible catches occur in the SWO long line fishery, as a by-catch. The Ligurian Sea is not a spawning area for BFT, but is a well-known feeding ground for the juveniles BFT, for the abundance of small pelagic fish or krill as an alternative food. Until 2009, in spite of the use of different gears, the sizes structure of the fished population has always been mostly composed of individuals between 1+ and 4 + years of age, as pointed out by studies carried out in the past in the area (Di Natale et al., 1995; Orsi Relini et al., 2010). The same situation was common in adjacent areas, such as the Gulf of Lions (Liorzou, 2001; Fromentin, 2002); we can also recall the fishing activity carried out up to 5 years ago with the small mesh DN called "thonaille" along the French coast, that had similar catches (Imbert et al., 2007). However, the introduction of the MESOSWOLL completely changed this scenario, raising some questions: is the increase in size due to the different selectivity of the gear? Or is the presence of these larger fish a positive effect of the management measures adopted by ICCAT? Or even, was this fraction of the population present also in the past, but not exploited, due to a different, "deeper" behavior? Analyzing Figure 3, it appears a slight increase in the average BFT size also in the last years of use of surface SWOLL, but we unfortunately are not able to make direct comparisons with the MESO SWOLL, because no more "surface" fishing activities are still present in the area. Sightings of large schools of tuna at surface, made of young individuals, are reported with increasing frequency, but a stronger monitoring effort, using also fishery independent methods, should be needed in order to obtain more reliable data.

References

- Di Natale A., A. Mangano, A. Maurizi, L. Montaldo, E. Navarra, S. Pinca, G. Schimmenti, G. Torchia and M. Valastro (1995) A review of driftnet catches by the Italian fleet: species composition, observers data and distribution along the net. Collect. Vol. Sci. Pap. ICCAT, 44(1): 236-241.
- Fromentin, JM. 2004. The 2002 size composition of Bluefin tuna catches of the French purse seine compared to those of the early 1990s and 2001. Coll. Vol. Sci. Pap. ICCAT, 56(3): 1182-1188.
- García-Barcelona, S., Ortiz De Urbina, J. M., De La Serna, J. M., Alot, E. and Macías, D. 2010. Seabird by-catch in Spanish Mediterranean large pelagic logline fisheries, 1998-2008. Aquatic Living Resources.
- Garibaldi, F. 2014. Effects of the introduction of the mesopelagic long line on catches and size structure of swordfish in the Ligurian Sea (Western Mediterranean). Col. Vol. Sci. Pap. ICCAT, 71. *In this Volume*.
- Imbert, G., Laubier, L., Malan, A., Gaertner, J.-C., Dekeyser, I., 2007. La thonaille ou courantille volante. Rapport final to the Council of the « Région Provence-Alpes-Côte d'Azur". Centre d'Océanologie de Marseille, Ed. Méditerranée 2000, Cannes, 402 pp.
- Liorzou, B. 2001. Final report of the EU project BFTMED (97/029).
- Orsi Relini, L., F. Garibaldi, C. Cima and G. Palandri. 1995. Feeding of the swordfish, the bluefin and other pelagic nekton in the Western Ligurian Sea. Coll. Vol. Sci. Pap. ICCAT 44 (1): 283-286.
- Orsi Relini L., Palandri G., Garibaldi F., Relini M., Cima C., Torchia G. 1997 Seasonal growth in young bluefin tuna of the Ligurian Sea. ICCAT, Coll. Vol. Sci. Pap., 46 (2): 122-128.

Orsi Relini, I., G. Palandri, F. Garibaldi and C. Cima. 1999. Longline swordfish fishery in the Ligurian Sea: eight years of observations on target and by-catch species. Coll. Vol. Sci. Pap. ICCAT, 49 (1): 146-150.

- Orsi Relini L., G. Palandri, F. Garibaldi, M. Relini, C. Cima and L. Lanteri. 2010. Large pelagic fish, swordfish, bluefin and small tunas, in the Ligurian Sea: biological characteristics and fishery trends. Chemistry and Ecology, 26(1, Suppl. 1): 341 357.
- Relini, M., Palandri, G., Torchia, G. 1995. Tagging of *Thunnus thynnus* juveniles in the Ligurian Sea, Autumn 1994. Coll. Vol. Sci. Pap. ICCAT, 44 (1): 378.



Table 1. Average size by gear of the BFT caught in the Ligurian Sea (1990-2013)

Figure 1. BFT size/frequency distributions of the different gears used.



Figure 2. Size/frequency distributions of BFT caught by MESO SWOLL (2010-2013) and all other surface gears combined (1990 – 2009).



Figure 3. Mean weight of bluefin tuna caught by the two types of swordfish long lines in the Ligurian Sea.