

**NOTE ON THE OBSERVATION OF RECRUITS OF BLUE SHARK,
PRIONACE GLAUCA, IN NEAR COASTAL AREAS OF GALICIA
(NW SPAIN) DURING THE SUMMER OF 2013**

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SUMMARY

This note presents a summary of several observations reported during the summer of 2013 regarding the presence of blue shark recruits in near coastal surface waters of NW Galicia, Spain. Although these observations may be considered incidental, they do, however, serve to change the general perception that this oceanic species does not reach littoral zones. Appearances of this species may be sporadic, taking place during particular years or life stages or at very specific times of the year. On the other hand, the presence of recruits in the coastal waters of Galicia during the summer –a sporadic occurrence well known by professional fishers- and the very near coastal observations reported in 2013 suggest that these areas might be a part of the nursery-recruitment grounds of blue shark in the NE Atlantic. This has been observed in other zones of the NE Atlantic where recruits or juvenile have been known to actively seek feeding grounds in areas of upwelling and high productivity during the summer period.

RÉSUMÉ

La présente note fournit un résumé de plusieurs observations signalées au cours de l'été 2013 en ce qui concerne la présence de recrues de requin peau bleue dans les eaux superficielles côtières du Nord-Ouest de la Galicie (Espagne). Même si ces observations peuvent être considérées comme accidentelles, elles servent néanmoins à modifier la perception générale selon laquelle cette espèce n'atteint pas les zones littorales. Les apparitions de cette espèce peuvent être sporadiques, ayant lieu au cours d'années ou de cycles vitaux particuliers ou à des moments de l'année très spécifiques. D'autre part, la présence de recrues dans les eaux côtières de la Galicie pendant l'été - apparition sporadique bien connue des pêcheurs professionnels - et leur présence observée tout près des côtes en 2013 suggèrent que ces zones pourraient faire partie des zones de nourricerie-recrutement du requin peau bleue dans l'Atlantique Nord-Est. Ce phénomène a été observé dans d'autres zones de l'Atlantique Nord-Est où l'on sait que les recrues ou les juvéniles recherchent activement des zones trophiques dans des régions d'affleurement et de forte productivité pendant la période estivale.

RESUMEN

Esta nota resume algunas observaciones reportadas durante el verano 2013 sobre la presencia de reclutas de tiburón azul (tintorera) en aguas superficiales extremadamente costeras del NW de Galicia-España. Aunque estas observaciones podrían ser consideradas como anecdóticas, sin embargo contribuyen a modificar la percepción general de que esta especie oceánica no alcanza zonas litorales, aunque sea esporádicamente en algunos años o durante algunas fases vitales o en periodos temporales muy concretos. Por otra parte, la presencia de algunos reclutas en aguas costeras de Galicia durante el verano, conocida por los pescadores profesionales, junto con las observaciones litorales documentadas durante el año 2013, sugiere que estas áreas podrían formar parte del conjunto de regiones de "cría-reclutamiento" del tiburón azul del Atlántico nordeste, tal y como ha sido también observado en otras zonas del Atlántico NE con presencia de reclutas y juveniles durante el periodo estival para alimentarse activamente en zonas de afloramiento muy productivas.

KEYWORDS

Blue shark, Nursery grounds, Coastal areas, Galicia

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1. Introduction

The blue shark (*Prionace glauca*) is a highly migratory epipelagic shark species covering a wide-range of oceanic and fringe-littoral areas, most frequently between 60°N and 50°S latitude. Most of the reported observations and commercial catches have been offshore, but some sporadic inshore ventures have also been reported especially at night, in areas with a narrow continental shelf or off oceanic islands (Compagno 1984, Nakano and Stevens 2008). Some artisanal and recreational fisheries take advantage of the availability of blue shark in coastal or littoral areas to carry out seasonal fishing activities and/or tagging studies in some countries (i.e. Stevens 1976, Kohler *et al.* 1998, 2008).

Blue shark is a viviparous shark with a yolk-sac placenta. The mean litter size was estimated at 37.1 pups for all sizes and oceans combined (Mejuto and García-Cortés 2005). But the number of embryos observed may largely surpass 60 individuals per litter and may even reach 108 pups in some large females. The size at birth was estimated by the latter authors to be around 45-50 cm fork length FL -equivalent to 56-62 cm total length TL (Castro and Mejuto 1995)- after a gestation period of around 10-11 months. Other authors indicate a birth size between 35-50 cm total length after a period of 9-12 months of gestation (Nakano and Stevens 2008). Oceanic size-sex segregation of blue shark individuals has been described in several studies covering the broadest geographical views and literature revisions (i.e. Mejuto and García-Cortés 2005, Aires-Silva 2008, Nakano and Stevens 2008). Most of the available information on the distribution of this species belongs to observations obtained offshore in commercial oceanic fisheries. However, little information is available about the presence of recruits of this species or from coastal areas.

The purpose of this note is to report on the observation of recruits of blue shark sighted in some near coastal waters of Galicia (NW Spain) during the summer of 2013 in order to expand our knowledge on the behavior of this species during its early stages of life and recruitment periods.

2. Material and Methods

The sightings were recorded from information provided voluntarily by recreational and professional fishers who target other species (teleosts, squid, etc.). Sightings were also reported by other observers. Some of the data were provided by recreational or professional fishers who had caught and released most of the blue shark recruits as bycatch and/or had sighted them. A piece published in a regional newspaper was what set off a flurry of reported sightings, in some cases supported by unmistakable documentary evidence such as photograph and video recording. The geographic positions of these observations were not reported in detail (lat-lon). Therefore, an approximate position was given based on the local names or other details provided. One individual caught was used for biological studies.

3. Results and discussion

Table 1 presents a summary of the reports of the respective observations. All of the blue shark specimens were seen in a very restricted and the near coastal areas. Some of them were even sighted in marinas. The first sighting reported was obtained in the harbor-marina of A Coruña by a person with a background in biology who was fishing horse mackerel with a rod (Obs.#3). He reported this observation to the IEO and included several photographs and other data. Initially it was taken as an unprecedented incidental occurrence and therefore not deemed to be a widespread phenomenon. Although the sporadic presence of this recruit due to natural causes was feasible, we did not initially rule out other possibilities such as this specimen could have come from a bycatch released from a vessel operating near the coast. However a press release in the newspaper (Abuin 2013^a) caused a flurry of similar reports on the capture and sighting of similar-sized specimens in relatively nearby areas around the same time (Abuin 2013^b) in addition to other observations reported directly to the IEO. Practically all of the reports pertained to recruits roughly 60 cm in length and coincided with information, backed by supporting documentation, provided by professional fishers on the sporadic presence of these recruits in a littoral zone of Galicia in the summer season and specifically during August-September 2013 (i.e. Obs.#9 and #10). The reported sizes of these recruits suggest that they would be just weeks or months old. Many of the near coastal observers called it an “unprecedented” occurrence, “based on their many years of experience”. Only one adult specimen was reported verbally as bycatch (Obs. #8).

Figure 1 presents a summary of the approximate positions of the specimens reported. Most of the observations were of individual specimens or small groups. There was only one sighting (Obs.#6) that reported a school made up of numerous recruits of blue sharks, the size equivalent to one or two litters.

Observation #10, corresponding to a male recruit of 46.5 cm FL, was supplied by a fisherman for analysis (**Table 2**). Biometric study of this recruit was performed using as reference some of the biometric variables described by Compagno (1984). Additionally, it was observed the stomach content. A juvenile of mackerel *Scomber scombrus* of approximately 14 cm in length and 38 g in weight was identified which practically occupied all the stomach volume of the this blue shark recruit (**Table 3**).

The total number of observations is very limited and very restricted in geographic terms. Therefore it is not possible to draw generalized conclusions. Reports from professional fishers pointed out the regular sporadic presence of blue shark recruits near some areas of the Galician coast in the summer months observed during their fishing activities targeting teleost species. But the presence was considered much higher in 2013, up to 6 observations in one single fishing day in some cases. On the continental shelf of some relatively near-coastal areas, but still quite a few miles from the Galician coast, the presence of juvenile blue sharks had already been reported. Sporadic activities of recreational fishing, game fishing and artisanal fishing were carried out in some of the coastal waters years ago. Some scientific tagging surveys had also been performed on this species in the past. Although the observations of juveniles in relatively coastal areas fit the previous description of this species (Compagno 1984, Nakano and Stevens 2008), the presence of recruits in these very near coastal areas, and even within harbor and marina zones, is a novelty considering that this behavior was previously assumed to be unlikely in this species.

Given the short time period of these observations, it is not possible to determine whether the sightings reported so close to the coast in summer 2013 could be a sporadic, isolated occurrence during this particular year, or if they could be part of a broader, periodically recurring phenomenon that has never been described before. However reports of professional fishermen indicate a higher presence than usual during the summer of 2013. It is true that in recent years changes in sea temperatures have been suggested on the coast of Galicia. The increased presence or local abundance of some species rarely seen in these latitudes-areas such as the high amount of *Auxis* spp. or the unusual presence of *Mola* spp. during the second half of year 2012, would lend credibility to the hypothesis of the presence of oceanographic “anomalies” in these areas, at least in recent months, -a theory that must be verified-. On the other hand, the very large quantities of juveniles of horse mackerel and mackerel found in August and September 2013, respectively, in some Galician coastal waters could initially justify the unusual presence of blue shark recruits for feeding in the littoral areas described above. However, it is not uncommon to encounter juvenile of horse mackerel, mackerel, squids or other potential prey of blue shark in the near coastal waters of Galicia during most regular summers. An interaction between several factors should not be ruled out as the cause of the unusual number of observations of recruits of blue shark reported in very near coastal areas during August-September 2013.

Despite the limited reports available, the presence of recruits in these coastal areas fit onto the general hypothesis of the population structure of the blue shark of the North Atlantic, specifically in the NE Atlantic, suggested by several authors. Mejuto and García-Cortés (2005) obtained that parturitions take place during the first and second quarter of the year in the so-called North Atlantic region. Recruits observed in summer 2013 could be a part of these events. Nakano and Stevens (2008) summarize some available literature and propose that individuals born in spring could concentrate in “nursery zones” of the NE Atlantic during the summer, for example “off Portugal, near the Azores and extending as far North as the Bay of Biscay”. These authors include in their graphs the coastal areas near NW Galicia as being part of the suggested “summer nursery”. However, owing to the huge abundance of blue shark in the oceanic regions, they would probably need to avail themselves of much broader nursery zones than the areas suggested to date. It is likely that similar events to the one described here in summer 2013 may occur in many other coastal regions of the North Atlantic, particularly in habitats that favor a greater chance for survival of the recruits, with suitable temperature ranges and/or high productivity that allow blue shark recruits easy access to food so they can increase their body biomass in the shortest time possible. In this sense, the mean size of the embryos observed in pregnant females was significantly increasing from the warm-oceanic areas toward more productive colder-upwelled waters in coastal areas of the Gulf of Guinea (Castro and Mejuto 1995). If the annual occurrence of blue shark recruits in near coastal areas of Galicia can be confirmed in this area of the Atlantic and/or other areas in the future, it would further our understanding of the behaviour of this species during the first few months of its life before it enters the oceanic epipelagic system where it spends most of its existence. This species is believed to access into the oceanic epipelagic system after specimens reach a size of 105 cm FL-130 cm TL (Nakano and Stevens 2008).

Although the observations reported in this paper might be considered incidental, the bottom line is that the media was an extremely useful tool for encouraging the general public to collaborate on broadening the biological knowledge of these species, based merely on a simple observation that was initially assumed to be a casual encounter.

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⁴http://www.lavozdeg Galicia.es/noticia/galicia/2013/09/09/galicia-petada-tiburones/0003_201309G9P22991.htm

Table 1. Details of the observations reported during August-September 2013.

Obs.#	Date	Location	Approx. Position (N / W)	Legit	N° of fish	Size cm	Level	Notes
1	16-Aug-13	Santa Comba-Ferrol Beach	43° 33' 46.49" / 8° 17' 13.61"	Recre.Fisherman	1	Approx. 60	N/A	Caught & released
2	25-Aug-13	Doniños Beach	43° 30' 12.42" / 8° 19' 53.53"	Recre.Fisherman	6 or 7	Approx. 60	surface swimming	1 Caught with line & released
3	26-Aug-13	Port-Marina of A Coruña	43° 22' 6.93" / 8° 23' 46.38"	Recre.Fisherman	1	Approx. 60	surface	Caught pole-line & released
4	30-Aug-13	Barrañan Beach	43° 18' 58.21" / 8° 32' 56.02"	Recre.Fisherman	1	Approx. 60	surface swimming	Caught & released
5	31-Aug-13	Port-Marina of Ares	43° 25' 18.97" / 8° 14' 20.56"	Recre.Fisherman	1	Approx. 60	surface swimming	Visual observation
6	mid-Aug-13	Sabón-Barrañan Beach	43° 19' 9.35" / 8° 32' 12.15"	Kitesurfer report	60 or 70	Approx. 60	surface swimming	Visual observation
7	xx-Aug-13	Gandario Beach	43° 20' 44.46" / 8° 14' 16.25"	Kitesurfer report	2	Approx. 60	surface swimming	Visual observation
8	xx-Aug-13	Gandario Beach	43° 20' 44.46" / 8° 14' 16.25"	Kitesurfer report	1	Approx. 200	surface swimming	Visual observation
9	mid-Aug-13	O Carpancho	43° 26' / 8° 26'	Prof. fisherman	1 to 6	Approx. 60	surface	Incidental bycatch with net & released
10	20 Sept. -13	4 miles NE O Carpancho	Aprox. 43° 26' / 8° 26'	Prof. fisherman	1	46.5 (FL)	surface	Incidental bycatch with net & sci. observ.

Table 2. General details and biometric data of the observation #10 provided for scientific analysis by a fisherman. Codes used for biometric data are taken from Compagno (1984).

Obs.# 10

Species: **Prionace glauca**
 Sex: Male
 Legit: N/A
 Date: 20-Sep-13
 Gear: Incidental catch provided for scientific observation
 Geo. Position: O Carpancho around 4 miles NE of Obs.#9

FL cm: 46.5
 RW gr: 680

Biometric Data

Body lengths

Type-code	length (mm)
TOT	592
FOR	465
PRC	428
PD2	362
PD1	220
HDL	130
PGI	110
PSP	N/A
POB	46
IDS	90
DCS	45
EYL	11
ING	18

Clasper

Type-code	length (mm)
CLO	13
CLI	21

Caudal fin

Type-code	length (mm)
CDM	150
CPL	30
CPV	60

Dorsal fin

Type-code	length (mm)
DIA	48
DIP	28
DIB	35
DIL	50
DII	15

Perimeter

Type-code	length (mm)
GIR	17

Table 3. Data of the prey analyzed in observation #10.

Stomach contain observed:	<i>Scomber scombrus</i>
Weight of stomach with prey (gr):	56.40
Weight stomach without prey (gr):	13.93
Estimated weight of the prey + rest (gr):	42.47
Weight of the prey only (gr):	38.00
Size aprox. of the prey (cm):	14.00
Weight of intestines with rest of prey (gr):	29.69
Weight intestines without rest of prey (gr):	19.61
Weight of rest of prey remaining in intestines (gr):	10.08



Figure 1. Location of the observations (Obs.) reported during August-September 2013. See **Table 1** for details.



Figure 2. Release of a blue shark recruit incidentally caught during artisanal gillnet fishery targeting other species in August 2013 (Obs.#9). Photo reproduced from a video recording provided by Xosé Iglesias. <https://www.facebook.com/photo.php?v=618740188166577&set=vb.100000918049079&type=2&theater>



Figure 3. Incidental capture of a blue shark recruit released in A Coruña harbor on August 26 2013 (Obs.#3). The specimen was photographed and released alive. (Photo: Tomas Leandro Anllo).



Figure 4. Incidental capture of a blue shark recruit during a recreational fishing activity (Obs.#2). The specimen was photographed and released alive. (Photo: Aresio Gómez).



Figure 5. Incidental capture of a blue shark recruit during an artisanal fishing activity (Obs.#10). The specimen was provided for scientific analyses (see Tables 1, 2 and 3 for details).