

# PRELIMINARY ASSESSMENT OF SHARK BY-CATCH IN PELAGIC FISHERIES OF SOUTHEASTERN ADRIATIC (MONTENEGRO)

Ilija Četković<sup>1,2</sup>, Ana Pešić<sup>1</sup>, Stefan Ralević<sup>1,2</sup>, Marko Nikolić<sup>1</sup>, Jovana Tomanić<sup>1</sup>

<sup>1</sup>Institute of Marine Biology, Dobrota bb, 85330 Kotor, Montenegro

<sup>2</sup> Montenegrin Ecologists Society, Bulevar Sv. Petra Cetinjskog 73, 81000 Podgorica, Montenegro

## Introduction

Pelagic elasmobranchs are representing one component of marine megafauna and one of marine ecosystem's key elements. Nowadays, a lot of these species have become significantly threatened due to their vulnerability to fisheries. Chondrichthyans are more likely to be affected by intensive fishing more than most teleosts due to their K-selected life history strategies and high position in food webs. Species of this group could be good indicators of fishing pressure (Stevens *et al.*, 2000). Overfishing is the primary threat to pelagic sharks and rays and tens of millions are taken by longlines, purse seines and gillnets across the world oceans on annually basis (Camhi *et al.*, 2009). There is a lack of data on this conservation problem in the region of the Adriatic Sea. Montenegro has a lack of scientific data on shark by-catch in its pelagic fishery and it was not assessed before.



Picture 1. Herceg Novi, Montenegro. Blue shark caught with drifting longline. © Ilija Četković

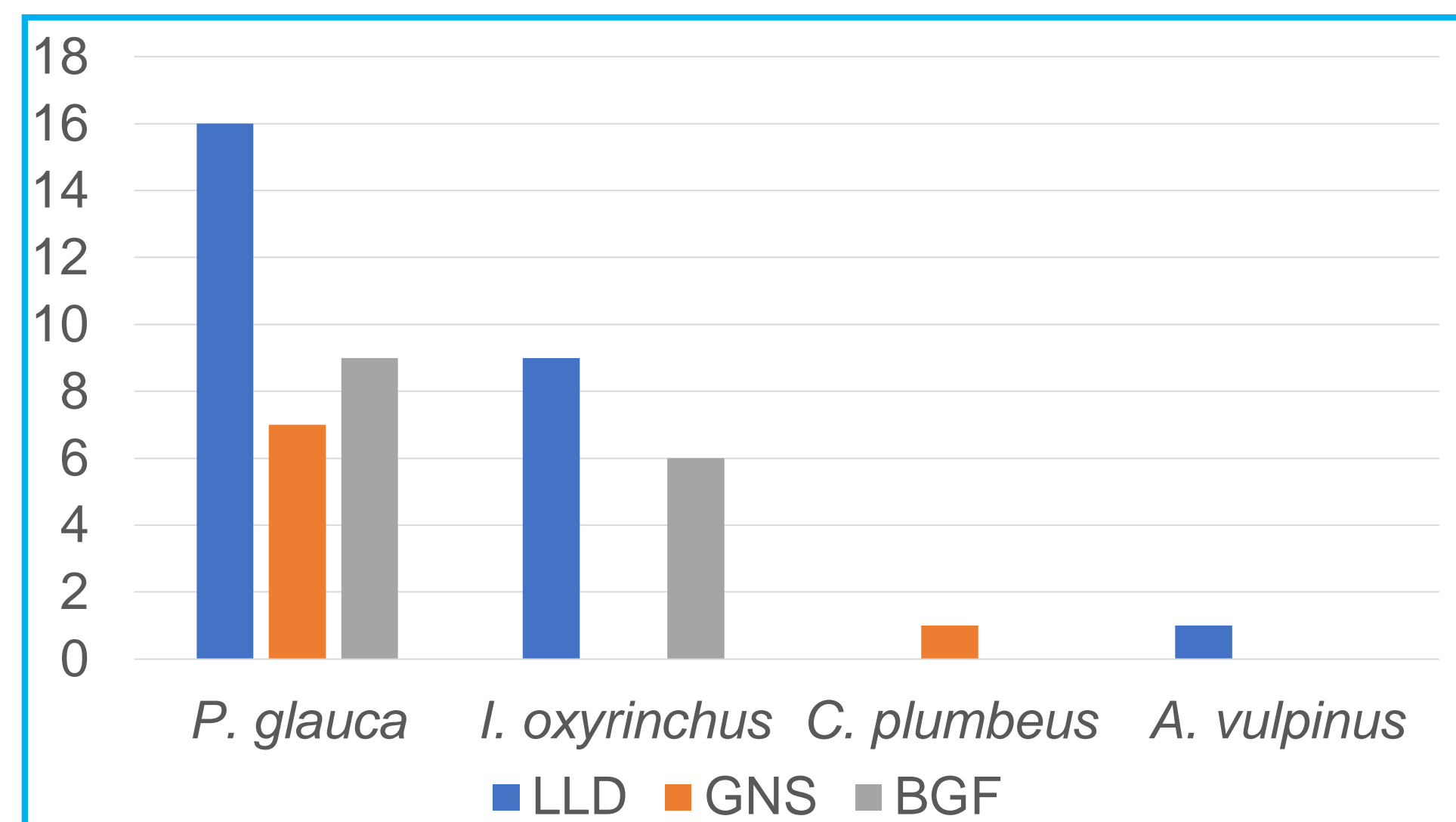


Figure 1. Number of individuals caught per fishing gear.

Table 1. Nominal CPUE per species for surveyed gears on the annual basis.

Species	LLD (No ind./100 hooks)	GNS (No ind./100 m of net)	BGF (No ind./10 days at sea)
<i>P. glauca</i>	1.14285714	0.15909091	0.3
<i>I. oxyrinchus</i>	0.642857143	-	0.2
<i>C. plumbeus</i>	-	0.02272727	-
<i>A. vulpinus</i>	0.071429	-	-
Total shark by-catch	1.857143	0.181818	0.5

## Materials and methods

Three types of fishing gears which are operating in pelagic and coastal-pelagic zone were sampled and monitored during the period from 1<sup>st</sup> of January 2016 until 31<sup>th</sup> of December 2017. Among commercial, those were pelagic longlines (LLD) and set gillnets (GNS). Furthermore, recreational tuna fishing was observed (big game fishing – BGF). On the beginning of the survey, Montenegrin commercial fleet was consisted of 135 fishing vessels operating with different types of gears (trawls, trammel nets, gillnets, longlines, seine nets etc.). By the data obtained from the Directorate for Fisheries, Montenegrin fleet had 2620 hooks of pelagic longline and 28400 length meters of gillnets registered as active in using. Gillnets that are being used in Boka Kotorska bay are not considered except those on its entrance (Herceg Novi), due to its position deep into the mainland and absence of pelagic sharks. Recreational tuna fishing is covered under the common recreational fishing licenses, so it was observed additionally with the help of 4 local BGF teams due to impossibility of counting their exact number. In total, 700 hooks of LLD were sampled, 2200 length meters of GNS and mentioned 4 BGF teams. After the data collection, nominal catch per unit of effort (CPUE) for sampled gears and species were calculated on annually basis: number of individuals/100 hooks of LLD, number of individuals/100 length meters of GNS and number of individuals/10 days at sea for BGF teams.

Table 2. Estimated nominal CPUE on the annual basis for total amount of surveyed gears registered in the Montenegrin commercial fleet.

Species	LLD	GNS
<i>P. glauca</i>	29.9428571	45.1818182
<i>I. oxyrinchus</i>	16.84285714	-
<i>C. plumbeus</i>	-	6.45454545
<i>A. vulpinus</i>	1.871429	-
Total per gear	48.65714	51.63636
Total estimated by-catch	100.2935	



Picture 2. Bar, Montenegro. Big game fishing. © Ilija Četković

## Results and discussion

During the two years of survey, 49 individuals of four pelagic species were recorded. The most abundant species in all surveyed gears was *Prionace glauca*. Number of individuals per species and gear is showed in Figure 1. Nominal CPUE was calculated for each gear and species (Table 1.). They were calculated from real data for the concrete amount of surveyed gears and raised up on total amount of observed gears registered in fleet (Table 2.). According to the official data, there are 2620 hooks of pelagic longlines and 28400 length meters of gillnets registered. Estimated nominal CPUE for big game fishing teams was not calculated due to a lack of official data for this kind of fishing activity. For it, only real data for 4 surveyed teams was calculated. Oliver *et al* (2015) showed that pelagic longline fisheries have the largest annual shark by-catch. As the results of this study showed, pelagic sharks are dominantly found in drifting longline fisheries in the Southeastern Adriatic. Among recorded species, blue shark is the most frequently occurred. Buencuerpo *et al.* (1998) showed similar results with blue shark and shortfin mako as the most common shark species in Spanish pelagic longline fishery that targets swordfish. For the same region, Mejuto *et al.* (2009) found that shark by-catch is consisted mainly of this species.

## Acknowledgements

We own appreciation to the fishermen community and colleagues from the Institute of Marine Biology in Kotor for help in data collecting. We thank to The Rufford Foundation for providing necessary funds for the research.

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