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Characterization of the Artisanal Fishery of Elasmobranchs in Puerto Casma, Ancash, Peru: 2010-2015

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Abstract

The purpose of the research was to characterize the artisanal fishery of elasmobranchs from the Port of Casma, Ancash, Peru, 2010-2015. The population and sample was comprised by the fishing records of elasmobranchs landed and reported in the various geographical points of the jurisdiction of the Port of Casma. This information is comprised in the period 2010-2015. The values were processed through graphs, and then their behavior was analyzed, in addition to relating the total annual landings over time using the regression model. The most important landings were recorded in 2011 and 2015 with 2543 kg and 2305 kg respectively, presenting 4 target species being the "eagle ray", "guitar", "common dogfish", "hammerhead shark", the main vessel used for the artisanal fishery of elasmobranchs was the boat and the fishing gear used was the curtain. The main fishing ports that contributed to the landings in the Port of Casma were Islote La Viuda, Isla Blanca, El Buey, Hogadero, Cajero, Batan/Perez, and the regression model that described the total annual landings and time relationship was the polynomial regression model with an r2 of 0.158.

Keywords: Artisanal fishery; Elasmobranch fishery; Puerto Casma.

Introduction

Chondrichthyans constitute one of the oldest lineages of vertebrates, appearing approximately 410 million years ago, during the Silurian, and diversifying during the Devonian (Inoue et al., 2010). Current species inhabit all marine environments, from coral reefs in the tropics to temperate waters, from the great depths in the oceanic trenches to the epipelagic part of all oceans; in addition, there are species adapted to live in estuarine and freshwater zones (Compagno et al., 2005).

One of the fishery resources of greatest concern today are elasmobranchs, since several species have been overfished worldwide, which has led to a decrease in their populations (Bonfil, 1994; Camhi, 1998; Galván-Magaña, 2009). One of the reasons why elasmobranch fisheries have declined is because these organisms have slow growth rates and low reproductive rates (Walker, 1998).

According to FAO (2017), since 1959 the catch of elasmobranchs worldwide has tripled, reaching an all-time high of 888,000 t in 2000. However, since then, there has been a negative trend, with an 11% decrease in catches (790,000 t) in 2014.

In the Peruvian sea there are 30 families of elasmobranchs, with 123 species, which occupy

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the continental shelf from the coastal strip to the oceanic waters of the open sea, as well as the lower regions of the slope and possibly the abyssal plains, being the main commercial species: Prionace glauca "blue shark", Isurusoxyrinchus "diamond shark", Sphyrnazygaena "hammerhead shark", Musteluswitneyi "dogfish", Myliobatisperuvianus "eagle ray", Squatinacalifornica "angelshark", Alopiasvulpinus "thresher shark" and Carcharhinusbranchyurus "brown shark" (PRODUCE, 2014).

The elasmobranch fishery in Peruvian coasts is important, being so that it is mentioned within the 20 nations that carry out the largest trade of elasmobranchs, being the most important in the Southeast Pacific (Mundy-Taylor & Crook 2013), it is also mentioned within the 12 nations that carry out the largest exports of shark fins to the Hong Kong market (Cheung & Chang 2011). However, failure to manage properly can have ecological consequences on the structure and stability of food webs (Navia, 2013).

Gonzales et al. (2016) state that Peru is one of the top countries in terms of historical cumulative landings of sharks in the Pacific Ocean, but little is known about the group of rays. In this sense, García (2008) points out that due to the attraction that these hydrobiological resources represent worldwide, the elasmobranch fishery has been increasing over time. Therefore, the purpose of this research was to characterize the artisanal fishery of elasmobranchs from Puerto Casma (Ancash-Peru), 2010-2015.

Materials and Methods

The research is non-experimental, presented a cross-sectional and descriptive design. The population and sample consisted of the fishing records of elasmobranchs landed and reported in the various geographical points of the jurisdiction of the Port of Casma, under the direction of the Regional Management of Production of Ancash (based in Chimbote), this information is included in the period 2010-2015.

The quantitative values were processed through graphs, and then their behavior was analyzed, in addition to relating the total annual landings over time, using regression models.

Results and Discussion

Elasmobranch landings for each year, recorded significant values of 2543 kg and 2305 kg in 2011 and 2015 respectively and an insignificant value of 676 kg in 2013, for the study period (Table1).

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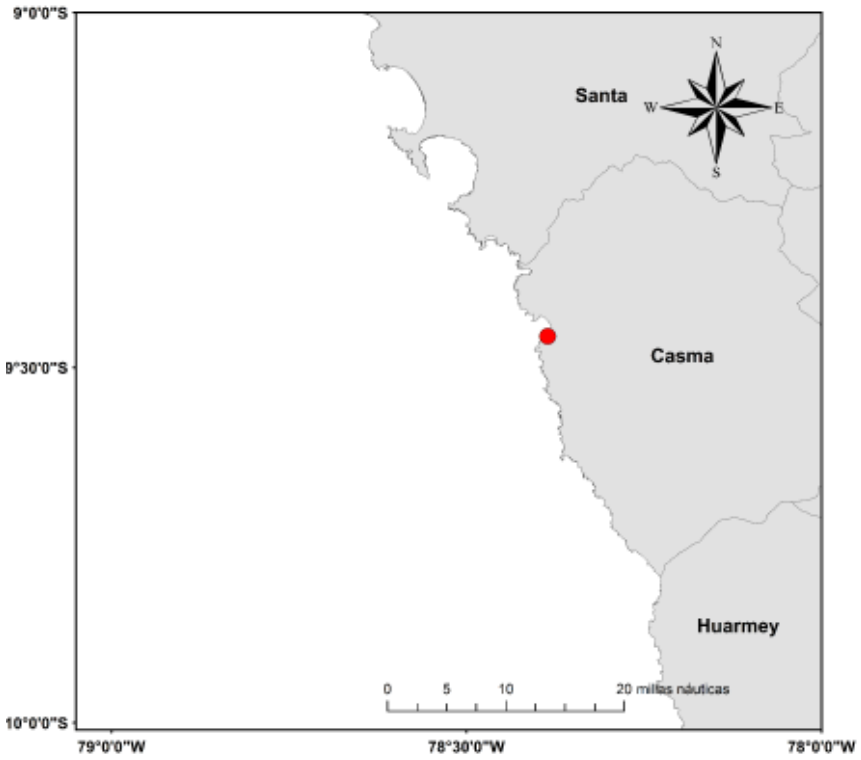

Figure 1. Location of the study area, Port of Casma, Ancash, Peru: 2010-2015.

Table 1.
Total annual landings of the Port of Casma, Ancash, Peru: 2010-2015.

TIME (years)	TOTAL LANDINGS (kg)	AVERAGE ANNUAL LANDINGS (kg)
2010	1306	14.51
2011	2543	30.27
2012	1468	17.27
2013	676	16.09
2014	1874	39.87
2015	2305	50.11
TOTAL	**10172**	**28.02**

The main species of elasmobranchs were "eagle ray" (62.15%), "guitar" (16.35%), "common dogfish" (9.67%), "hammerhead shark" (4.28%), in the category others were grouped species with minimal or insignificant landings from the Port of Casma. On the other hand, it should be noted that in Venezuela there is a great diversity of elasmobranchs, to date 115 species have been observed (66 sharks and 49 rays), according to Tavares (2019). In this sense, Mexico is among the top 5 countries in the world that exploit sharks and rays, and in 2017, elasmobranch landings in Mexico totaled 50,751 t, and Pacific coast fisheries accounted for 78.5% of these landings (CONAPESCA 2017).

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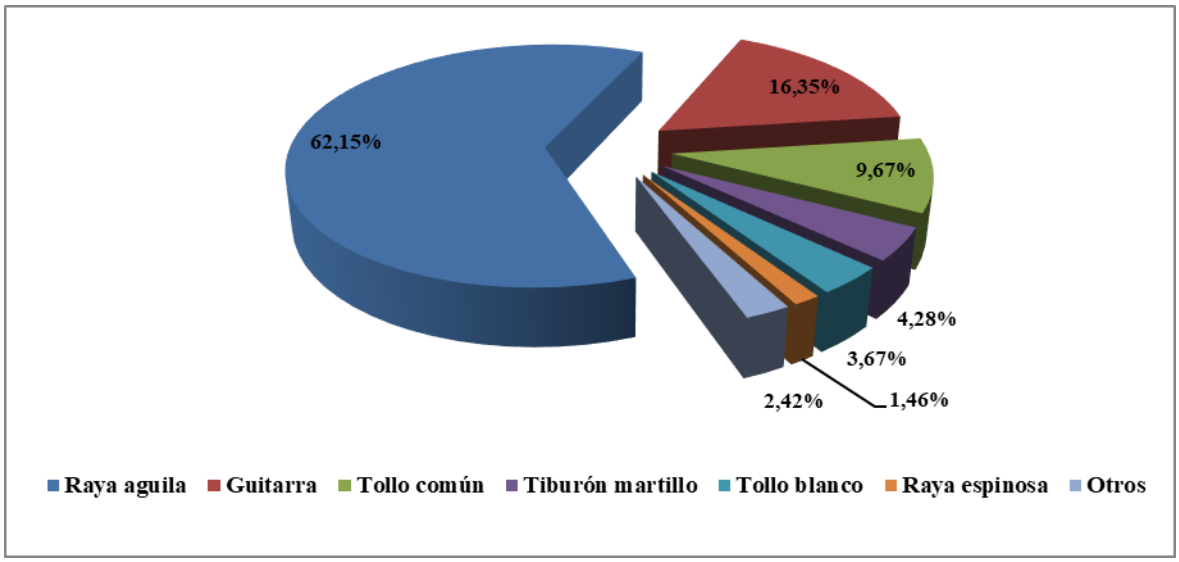

Figure 2. Main elasmosbranchs landed at the Port of Casma, Ancash, Peru: 2010-2015.

The vessels that were present during the research period were "eagle ray", "guitarfish", "common dogfish", while "hammerhead shark" and "white dogfish" contributed less landings in 2013, being this the year in which significantly decreased the landings of elasmobranchs in the Port of Casma for the study period (Figure 3), just this phenomenon has much similarity with what is indicated by Tavares (2019) who points out that in terms of fisheries data (1950-2018), the trend of landings is characterized by two stages: one of increase (1950-1997) and another of sustained decrease (1998-2018), such decrease is attributed to the political model and processes applied by governmental institutions since 1998.

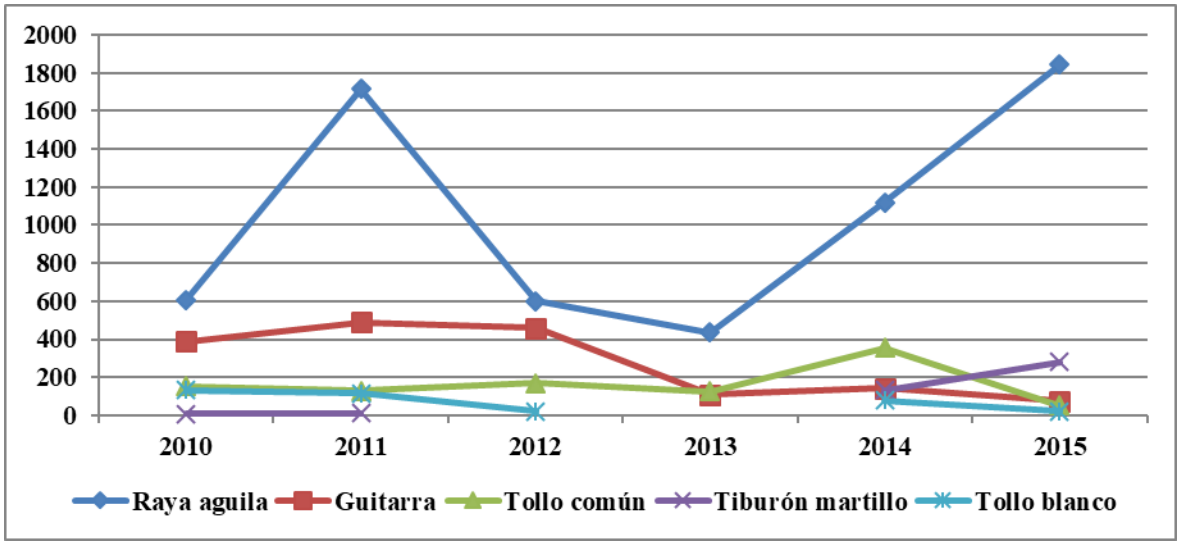

Figure 3. Annual landings of the main elasmosbranchs from the Port of Casma, Ancash, Peru: 2010-2015.

The vast majority of elasmobranch landings were made using the boat (94.93%), followed by the barge which had a minimal contribution of 5% and the motorboat contributed 0.07% of the landings recorded during 2010 to 2015 (Figure 4). It should be noted that all small-scale fisheries are necessary to ensure food security and the livelihoods of many people in low-income coastal communities, given that these fisheries employ approximately 90% of

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fishermen worldwide (Finkbeiner and Basurto 2015, Pita et al., 2019).

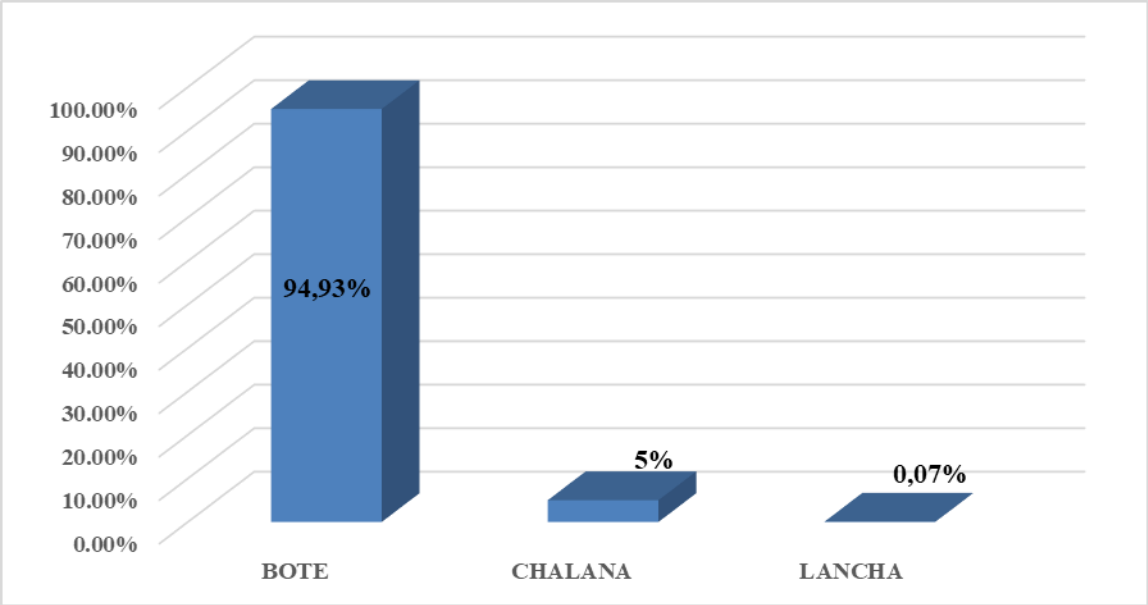

Figure 4. Annual landings of the main elasmobranchs in the Port of Casma, Ancash, Peru: 2010-2015, according to type of vessel.

The most used gear type was the curtain (99.63%) and incidentally it is usually caught by purse seine or spinner (Figure 5), coinciding with Gilman et al. (2008) and Doherty et al. (2014) who argue that the fishing gear used are the spinner and curtain, the latter being the most used. The use is differentiated according to the target species and the fishing area, and the socio-economic importance of the resources lies in the commercialization of their meat and fins.

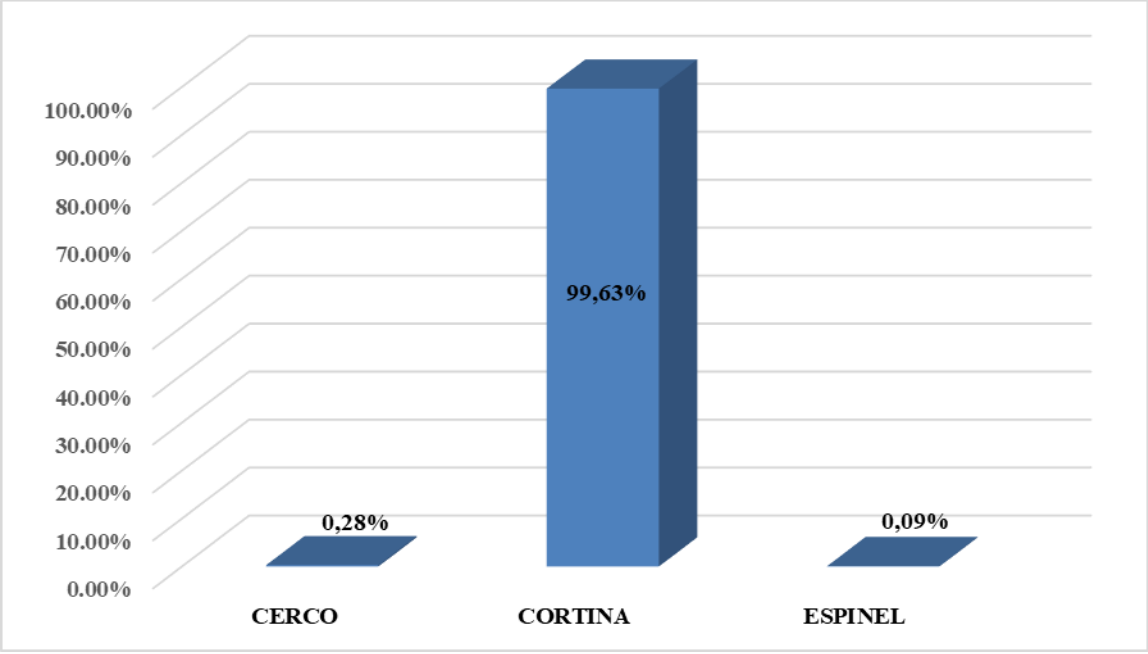

Figure 5. Annual landings of the main elasmosbranchs from the Port of Casma, Ancash, Peru: 2010-2015, according to gear and/or gear type..

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The main fishing points that contributed to the landings of the Port of Casma are: Islote La Viuda, Isla Blanca, El Buey, Hogadero, Cajero, Batan/Perez, which presented the highest amount of landings in the period 2010-2015 (Table 2), the main areas that contribute significant landings is associated with the conditions to inhabit (availability of food, physical, chemical and biological conditions for their life cycle). It should be noted that the specific composition of elasmobranchs and their spatiotemporal variability in a marine region can often be characterized by sampling the landings of the local fishery, which can have implications for their management (Santana-Morales et al., 2020).

Table2.

Total annual landings of the Port of Casma, Ancash, Peru: 2010-2015, according to fishing points.

FISHING AREA	TOTAL LANDED(kg)	FISHING AREA	TOTAL LANDED (kg)
IsloteLa Viuda	3295	La Pampa (Casma)	195
Is. Blanca	885	El Arco / Gramita / Punta Cruz (Casma)	176
El Buey	775	El Faro (Casma)	117
Hogadero	763	Punta Infiernillo (Casma)	112
Cajero	571	Punta Mongoncillo (Casma)	94
Campanario	422	Salitre (Casma)	92
Batan / Perez	395	Caballo Blanco (Casma)	73
Mongon	327	Rincon Piños (Casma)	71
Batea (Casma)	277	Punta Piños (Casma)	63
Los Chivatos	263	Palo Parado (Casma)	39
La Lobera / Loberia (Casma)	254	Bernardino (Casma)	28
EscaleriaFte (Casma)	221	Otros	47
La Fortuna (Casma)	212		
El Frio (Casma)	203		
Isla Tortugas	202		

The models that presented the highest coefficient of determination between the variables total annual landings and time (2010-2015) were the polynomial, linear and exponential regression models for elasmobranchs landed in the Port of Casma (Figure 6). It should be noted that in Mancora, Salaverry and San Jose, fishing is mainly directed towards sharks, with San Jose

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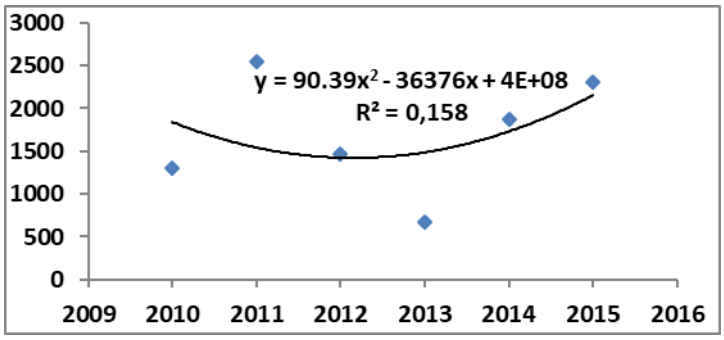
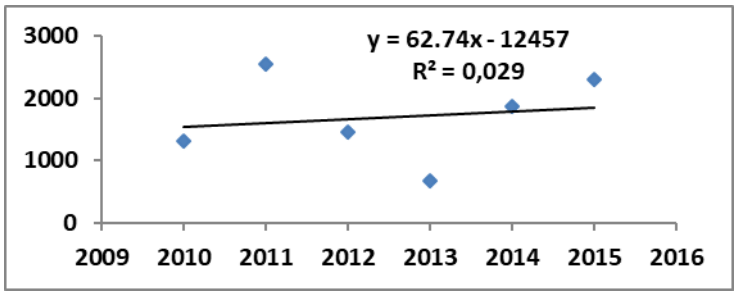
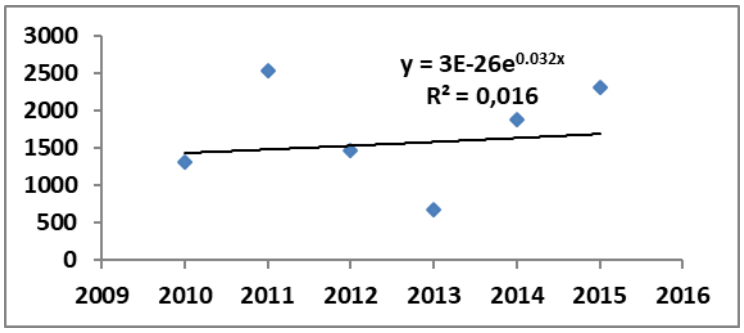
having the highest participation of rays as a target species. Surface nets were the type of net most used by fishermen in Zorritos, Mancora and Salaverry, while in San Jose the use of deep nets was evident(Córdova-Zavaleta et al., 2016).



(a)



(b)



(c)

Figure 6. Regression models (a) polynomial, (b) linear and (c) exponential of the total landings of elasmobranchs in the Port of Casma in relation to time 2010-2015.

Conclusions

It is concluded that the elasmobranch fishery of the Port of Casma, the most important landings were recorded in 2011 and 2015 with 2543 kg and 2305 kg respectively, presented 4 target species being the "eagle ray", "guitar", "common dogfish", "hammerhead shark", the main vessel used for the artisanal fishery of elasmobranchs was the boat and the fishing gear used was the curtain. The main fishing ports that contributed to the landings in the Port of Casma were Islote La Viuda, Isla Blanca, El Buey, Hogadero, Cajero, Batan/Perez, and the regression model that described the total annual landings and time relationship was the

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polynomial regression model with an r2 of 0.158.

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