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Composition of Shark Catches With Conservation Status in Mukomuko District, Bengkulu

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***Abstract*— Mukomuko Regency is one of Bengkulu Province's regencies with abundant marine resources. It has a fishing port, one of which is the Ipuh sub-district fishing port and the Teramangjaya sub-district fishing port. This study aimed to determine the size, length, weight, and composition of shark species landed at the Mukomuko Regency fishing port to identify the types of sharks that are protected based on the IUCN conservation status and the suitability of shark catches. The survey method was used to visit the research location at the ship's landing port, measure the length and weight of the sharks, and take pictures of them. The results of the sharks obtained were two species of sharks, namely the kejen shark (Loxodon Macrorhinus) with a status of almost threatened NT, 35 were found, and the Hammerhead Shark (Sphyrna lewini) with a status of very threatened CR, 15 were found. Of all the types of sharks caught, they were still juveniles and not yet suitable for catch.**

Keywords— Composition, Sharks, conservation, Loxodon Macrorhinus, Sphyrna lewini

I. INTRODUCTION

Shark fisheries are one of the fishery commodities that play a vital role in Indonesia. The high demand for sharks in the market will increase fishing activities and threaten the sustainability of shark species in the waters [8]. Based on their biological characteristics, sharks have very slow growth and long lives, so they are very slow in reaching gonad maturity (low fecundity) and have a small number of offspring [6][7]. Thus, fishing makes sharks very vulnerable to mortality rates [15]. As the number of shark species in an ecosystem decrease, it will significantly impact the community structure's natural structure, resulting in damage to the balance of the ecosystem [14]. Fishermen in the coastal waters of West Sumatra (Indian Ocean) in Bengkulu Province still carry out shark fishing activities. One of them is in Mukomuko Regency, Bengkulu Province. Geographically, the Mukomuko Regency is located at 101o01'15.1''– 101o051'26" East Longitude and 02o16'32"– 03o07'46" South Latitude, with a coastline of ± 98.218 km and a sea area of ± 727.60 km2 if calculated as far as 4 miles from the coastline. Mukomuko Regency has several centers of capture fisheries or fishing ports, one of which is in Ipuh District and Teramang Jaya District. In Mukomuko Regency itself, many sharks are caught from bycatch whose size is still not suitable for catching. Lack of awareness of the fishing community, particularly regarding the importance of the ecological role of sharks in the waters [12]. The fishing gear used by fishermen to catch sharks are Longline Fishing, Gill Nets, and Trawls used by fishermen in Mukomuko Regency. From the number of shark species caught, it is strongly suspected that it is influenced by several factors, namely the type of fishing gear, the potential location of sharks in the waters, and the time of fishing operations [13].

The high price of shark fins on the international market will cause fishing activities to continue even though the results of the shark catch are bycatch; if this is not controlled, it will continue to be a severe threat to the sustainability of shark resources in Indonesian waters [17]. Catching sharks with immature juveniles will threaten marine resources' sustainability [5][13].

Lack of supervision from the Fisheries and Marine Service (DKP) in Mukomuko Regency regarding the implementation of shark fishing regulations. Therefore, there must be supervision related to the fishing gear used in shark fisheries to minimize pressure on the catch of shark species [4]. If there is no action from the relevant agencies in this condition, it is feared that the shark population will decrease, leading to extinction [1].

The increasing number of sharks experiencing extinction in the world (including Indonesia) should be a concern for relevant state agencies to create better and more sustainable shark population management [18]. From this problem, there still needs to be more law enforcement and better implementation of existing regulations [6].

In the notes of The International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, it is noted that several types of shark species are endangered animals. According to research results [2]. Several types of sharks are almost threatened with extinction Near Threatened (NT), namely 1) Heptranchias person (Aruey Shark); 2) Hexanchus griseus (Cucut Mekong); 3) Centrophorus niaukang (Coral bottle shark); 4) Cirrhigaleus barber (Taji shark); 5) Chiloscyllium indicum (Bongol shark); 6) Chiloscyllium platinum (Bongo shark); 7) Chiloscyllium punctatum (Rock shark); 8) Isurus oxyrinchus (Mackerel shark) and; 9) Pseudocarcharias kahawai (crocodile shark).

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II. METHOD

A. Analysis of the Length and Weight Distribution of Sharks

Collecting the types of sharks caught will be taken and then the length and weight distribution will be calculated. The procedure for analyzing data on the distribution of length and weight of sharks is to measure the overall length of the shark starting from the tip of the head to the tip of the shark's tail fin using a meter. The next stage is measuring the weight of the shark using a digital hanging scale.

The distribution of shark length and weight was analyzed according to Walpole (1995) in Imaniar (2013), calculated using the following formula:

$$K=1+3.32xLogn \quad (1)$$

$$I=R/K \quad (2)$$

Note: K = Number of classes
n = Lots of data
I = Class interval
R = Largest value minus smallest value

The types of sharks obtained will then be tabulated based on the date on which the catch data was collected. Shark types are used to analyze the conservation status of sharks landed at the port of Mukomuko Regency. The total length of sharks is measured using a measuring instrument with an accuracy of 0.5 cm, then tabulated based on the type obtained and identifying the conservation status of the Redlist for shark species. The total length of sharks is used to analyze the catchability of sharks landed in Mukomuko Regency. The method used in collecting primary data was purposive sampling (shark data collection was carried out on all fishing fleets that landed shark catches in Mukomuko Regency).

B. Analysis of Shark Conservation Status

Primary data in the form of data on the number and types of sharks is used to analyze the conservation status of shark fisheries landed in Mukomuko Regency. The analysis used to determine the conservation status of shark fisheries is by knowing the number and types of sharks at high risk of extinction in nature. The management approach to the status of shark resources landed in Mukomuko Regency is:

conservation approach. The international organization working in the field of nature protection and conservation (IUCN) has developed several criteria for the conservation status of animal/biota species based on their level of vulnerability to extinction in a red list. According to Fahmi and Dharmadi (2015), shark types/species according to threat categories can be defined as follows:

1. Extinct (Extinct, EX);
2. Extinct in nature (Extinct In The Wild, EW);
3. Very rare (Critically Endangered, CR);
4. Rare (Endangered, EN);
5. Vulnerable (VU); And
6. Near threatened (Near Threatened, NT).

III. RESULTS AND DISCUSSION

A. Distribution of Shark Length and Weight

Based on the results of the study conducted for one month, it is known that the total length of sharks caught at the Ipuh District fishing port and the Teramang Jaya District fishing port, Bantal Village, Mukomuko Regency with a total number in the two locations, namely, Kajen Shark Loxodon Macrorhinus as many as 35 and Hammerhead Shark Sphyrna lewini as many as 15. According to Effendie (1997), length frequency analysis is used to determine fish size groups based on the assumption that the length of individuals in a particular species will vary following a normal length distribution.

a) Distribution of Kejen Shark Length and Weight (Loxodon Macrorhinus)

The results of the study for one month at two locations of the Ipuh District fishing port and the Teramang Jaya District fishing port, Mukomuko Regency, it is known that for the Loxodon Macrorhinus keen shark species, 35 were found with a lower-class interval of 44 cm and an upper-class interval of 100 cm.

Figure. 1. Measuring the length of a shark

TABLE 1.
LONG DISTRIBUTION OF THE KEJEN SHARK (LOXODON MACRORHINUS)

Long Distribution of the Kejen Shark *(Loxodon Macrorhinus)*							
No	**Bottom Distribution (cm)**	**Top Distribution (cm)**	**Lower Limit (cm)**	**Upper Limit (cm)**	**Middle Value (cm)**	**Frequency (Fi)**	**Percentage (%)**
1	44	52	44	52	48	15	42,9
2	52	60	52	60	56	4	11,4
3	60	68	60	69	64	10	28,6
4	68	76	68	77	72	0	0,0
5	76	84	76	85	80	2	5,7
6	84	92	84	93	88	3	8,6
7	92	100	92	101	96	1	2,9
Total Number						35	100

TABLE 2.
WEIGHT DISTRIBUTION OF KEJEN SHARKS (RHIZOPRIONODON TAYLORI)

Weight Distribution of Kejen Sharks (Loxodon Macrorhinus)							
No	**Bottom Distribution (kg)**	**Top Distribution (kg)**	**Lower Limit (kg)**	**Upper Limit (kg)**	**Middle Value (kg)**	**Frequency (Fi)**	**Percentage (%)**
1	0,1	0,7	-0,4	1,2	0,4	17	48,6
2	0,8	1,4	0,3	1,9	1,1	12	34,3
3	1,5	2,1	1,0	2,6	1,8	0	0,0
4	2,2	2,8	1,7	3,3	2,5	2	5,7
5	2,9	3,5	2,4	4,0	3,2	2	5,7
6	3,6	4,2	3,1	4,7	3,9	0	0,0
7	4,3	4,9	3,8	5,4	4,6	2	5,7
Total Number						35	100

TABLE 3.
LONG DISTRIBUTION OF THE HAMMERHEAD SHARK (SPHYRNA LEWINI)

Long Distribution of the Hammerhead Shark (Sphyrna lewini)							
No	**Bottom Distribution (cm)**	**Top Distribution (cm)**	**Lower Limit (cm)**	**Upper Limit (cm)**	**Middle Value (cm)**	**Frequency (Fi)**	**Percentage (%)**
1	48	55	48	56	52	7	46,7
2	55	62	55	63	59	0	0,0
3	62	69	62	70	66	1	6,7
4	70	77	69	77	73	4	26,7
5	77	84	76	84	80	2	13,3
6	84	91	83	91	87	1	6,7
Total Number						15	100

TABLE 4.
WEIGHT DISTRIBUTION OF HAMMERHEAD SHARKS (SPHYRNA LEWINI)

Weight Distribution of Hammerhead Sharks (Sphyrna lewini)							
No	**Bottom Distribution (kg)**	**Top Distribution (kg)**	**Lower Limit (kg)**	**Upper Limit (kg)**	**Middle Value (kg)**	**Frequency (Fi)**	**Percentage (%)**
1	0,50	0,85	0,00	1,35	0,68	8	53
2	0,95	1,30	0,45	1,80	1,13	1	7
3	1,40	1,75	0,90	2,25	1,58	2	13
4	1,85	2,20	1,35	2,70	2,03	1	7
5	2,30	2,65	1,80	3,15	2,48	1	7
6	2,75	3,10	2,25	3,60	2,93	2	13
		Total Number				15	100

Based on Table 1, the distribution of the length of the Kejen Loxodon Macrorhinus shark, the highest frequency is in the class range of 44 cm – 52 cm with a median value of 48 cm, with 15 individuals with a percentage value of 42.9%. and the fewest were in class 92 with a median value of 96 cm with 1 animal with a percentage value of 2.9%. Based on everything that has been found, this shark is not yet worth catching because it is still a juvenile.

Based on Table 2, the distribution of the weight of the kejen shark, Loxodon Macrorhinus, has the highest frequency in the class range of 0.1 kg – 0.7 kg with a median value of 0.4 kg, with 17 fish with a percentage value of 48%. Burhanis et al. (2019) stated that physical boundaries among marine fish populations are unclear. However, the formation of a population depends on environmental conditions (ecology).

b) Based on the results of research for one month at two locations of the fish harbor in Ipuh District and the fish harbor in Teramang Jaya District, Mukomuko Regency, it was discovered that 15 Sphyrna lewini hammerhead sharks were found with a lower grade interval of 48 cm and an upper-grade interval of 91 cm.

Based on Table 3, the distribution of the length of the Sphyrna lewini hammerhead shark, the highest frequency is in the 48 cm – 55 cm class interval with a median value of 52 cm; there are seven individuals with a percentage value of 46.7%. The fewest were in class 55, with a median value of 62 cm, and 0 individuals, with a percentage value of 0.0%. Based on everything found, this shark is not yet worth catching because it is still a juvenile.

Based on Table 4, the weight distribution of the Sphyrna lewini hammerhead shark, the highest frequency is in the class range of 0.50 kg – 0.85 kg with a median value of 0.68 kg for eight individuals with a percentage value of 53%. Analysis of the frequency of individual lengths in a species with the same age group will vary following a normal distribution (Effendie, 2002).

B. Types of Sharks Protected Based on Conservation Status

Based on the results of observations, two types of sharks were recorded that were landed at the Ipuh District fishing port and the Teramang Jaya District fishing port, including.

a) Kejen Shark (Loxodon Macrorhinus)

Based on the research conducted, there were 35 sharks of the Loxodon Macrorhinus type called the Kejen shark, with the following general characteristics:

1. It has spiracles and is small in size.
2. Small gill slits, less than two times the length of the eye.
3. The shape of the fins is not sharp and curved.
4. Teeth do not stick out when the mouth is closed.
5. The mouth is rather long and curved sharply.
6. The lower front teeth are short, with straight ends (the base is curved).

This shark has the local name of kejen shark, which is included in the Carcharhinidae family. This type of shark has been included in the IUCN red list, including in the Near Threatened (NT) criteria. Catches of kejen sharks are often found in the waters of the Indian Ocean which are considered to have been exploited or overfished

TABLE 5.
SHARK SPECIES COMPOSITION

No	**Shark Species Name**	**Scientific Name**	**Conservation Status**	**Amount**	**Percentage**
1.	Kejen Shark	*Loxodon Macrorhinus*	(NT)	35	70%
2.	Hammerhead Shark	*Sphyrna lewini*	(CR)	15	30%
			Total	50	100%

Figure. 3. Kejen Shark (Loxodon Macrorhinus)

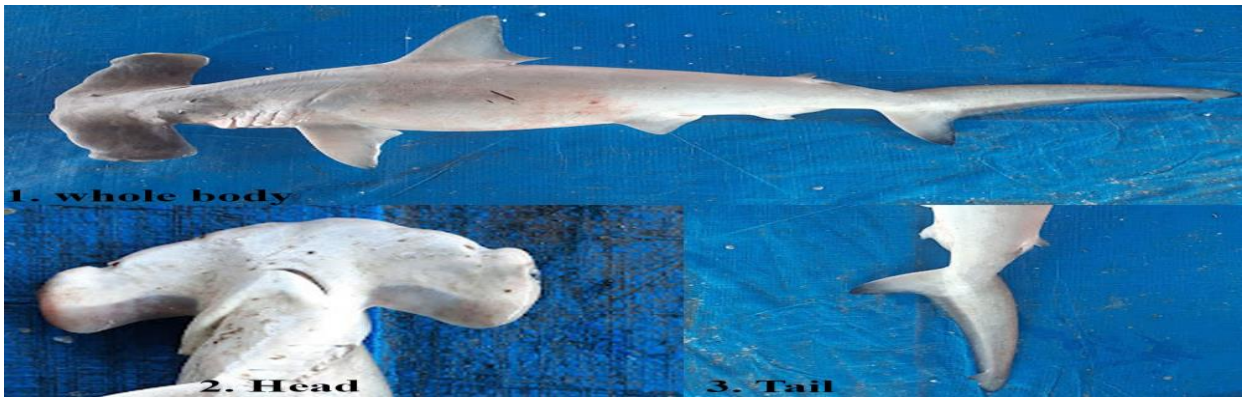

Figure. 4. Hammerhead Shark (Sphyrna lewini)

(FAO, 2006; Pierce et al., 2008).

The maximum length of the Kejen shark Loxodon Macrorhinus is up to 90 cm [11]. At the same time, the type of shark size of a baby or newborn has a length of 40-45 cm [11][19].

This greatly influences why this type of shark is often caught because of the type of fishing gear used and the potential zone of shark presence in the waters. It can be seen from Avriansyah's research (2015) that the factors that influence sharks being caught are fishing gear factors such as trawls and nets. At the same time, environmental factors considered to greatly influence the distribution of sharks in tropical areas are water depth and temperature because these two factors are considered relatively unchanged (Stevens, 1989).

b) Hammerhead Shark (Sphyrna lewini)

Based on the research, 15 types of sharks were found, with the local name Hammerhead Shark Sphyrna lewini. There are general characteristics of the Hammerhead Shark Sphyrna lewini;

1. The head widens to the side and is less than a third of its body length.
2. The front edge of the head is very curved.
3. The first dorsal fin is high and slightly tapered, and curved.
4. The second dorsal fin is short, with a long rear end and a slightly concave edge.
5. The hole at the top of the base of the tail is crescent-shaped.

This shark has the local name hammerhead shark and is included in the Sphyrnidae family. Rigby et al. (2019) stated that this type of shark has been included in the IUCN red list, including the criteria for critically endangered (CR). The body length can reach 370-420 cm. The distribution of this shark is almost throughout tropical waters, found in archipelagic waters and continental shelves from the surface layer to a depth of 275 m. The reproduction of this shark is viviparous, with egg yolk in the form of a placenta; the number of offspring born is 12-41, with a gestation period of 9-10 months. The distribution of the Sphyrna lewini species starts from tidal areas to a depth of 275 m. The body size of the Sphyrna lewini shark can reach a length of 370-420 cm, in adult males between 165-175 cm and females 220-230 cm, and the size at birth between 39-57 cm.

IV. CONCLUSION

The study's results, which revealed a total of 2 types of sharks in 2 fishing ports in Mukomuko Regency, namely in the Ipuh sub-district fishing port and the Teramanagjaya sub-district fishing port, are a rare and valuable contribution to our understanding of shark populations in these areas.

The types of sharks found were 35 kejen sharks (Loxodon Macrorhinus) and 15 hammerhead sharks (Sphyrna lewini). It's important to note that the length

and weight of the sharks were still the size of juveniles and not yet suitable for catching, which indicates a potential issue with the maturity and sustainability of the shark populations in these areas.

The results of the sharks in conservation status are particularly concerning. The kejen shark Loxodon Macrorhinus is listed as Near Threatened (NT), indicating it is at risk of becoming threatened in the near future. The hammerhead shark Sphyrna lewini is even more at risk, with a Critically Endangered (CR) status, suggesting it is very close to extinction. These findings underscore the urgent need for conservation efforts in these areas.

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