

SUSTAINABILITY OF SEAHORSES: LESSONS LEARNED OF LOCAL WISDOM FROM BINTAN ISLANDS, RIAU ISLANDS PROVINCE

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Abstract. Seahorse (*Hippocampus* spp.) has a high economic value in Bintan Island that leads to its exploitation by coastal community intensively. This study was to assess local knowledge on seahorse ecology which was captured across shoreline near the coastal communities. The research was conducted in SebongPereh village Bintan Island. The data were collected by conducting depth interviews and focus group discussion on seahorse fishermen which was selected purposively. The results revealed local fishermen have ecological knowledge related to habitat types, behavior, and monthly variation in abundance, size and reproduction pattern. The result also showed that the existence of the seahorse during the catch season moves around, follow the condition of the seaweed and tidal of sea water. This local knowledge was used by fishermen as a strategy in determining the fishing time and catchment area of a seahorse. Through such local wisdom, local fishing communities established a local institution to manage conversation and sustainability use of seahorse in waters of SebongPereh village.

1 Introduction

One of the coastal areas in Riau Islands Province is Bintan Island. Bintan Island has a large coastal area, with many marine biological resources that have high economic value. One of the most valuable economic resources in Bintan Island is the seahorse (*Hippocampus* spp.[16], or commonly known as "ondok-ondok" by the local community. The existence of seahorse is mostly found in SebongPereh Village, District, Bintan Regency[14].

SebongPereh village was chosen as study area. Interestingly, in this site, the existence of seahorses was almost repeatedly observed from January to May in each year [14]. In that

season, many people are turning the profession into a seahorse catcher due to the higher value of the selling price of dried seahorses that reaches more than 5 million rupiahs/kg. Even when the catch season is over – according to the fishermen – the price of dry seahorse can reach 7 million rupiahs/kg. The high value of the seahorse had driven it catchment by Bintan Island's fishing community intensively. This condition makes the species more vulnerable to overexploitation [14].

However, although the price of seahorses is quite promising, not everyone can take a seahorse in considerable numbers. This is because the experience and the ability to distinguish between a seahorse and sea grass[2], mangroves [15], coral reefs [12], the roots of seaweed or sand[7],[11], becomes the determinant of how many seahorses can be captured. Other skills that are also needed are the diving skills of the fishermen, as well as knowledge of the right time to dive. This condition made not every fisherman can obtain optimal results, even though at that time there were many seahorses in the waters of SebangPereh Village.

Therefore, the knowledge and experience of fishermen in taking the seahorse became one of the keys successes in obtaining a considerable catch. A few studies about local knowledge has been conducted, but with another species such as dugong. Based on that result study, the local knowledge supported the development of appropriately targeted management strategies [17], [6]. This means seahorses could improve the welfare of the community if the fisherman has sufficient knowledge of the management and utilization of the seahorse itself. Such knowledge includes fishing time, fishing gear, catching ways, the condition of seahorse when captured and ecological conditions of seahorse fishing. Based on these conditions and to be better understand the impacts of the harvesting and trade of seahorse requires knowledge of their biology, along with population monitoring and fisheries management [4]. So it is necessary to conduct research to obtain information about local knowledge of local communities on seahorses. The aim of this study was to assess the extent of fishing community understanding on seahorse ecology in SebangPereh village which was captured across shoreline near their village.

2 Materials and methods

2.1 Study area

The research was conducted in SebangPereh Village, Bintan Island, and Riau Island Province. The study has been done on February – September 2017.

2.1 Survey design and methodology

Primary data were obtained from in-depth interviews using question guides to key informants[13]. Primary data were also obtained from Focus Group Discussion (FGD) on seahorse fishermen in SebangPereh village. The data was taken in this research consists the number of catches, capture frequency, catch time, fishing gear, the condition of seahorse when it catches, ecological condition of a catchment area, and sale price of a seahorse. While the secondary data obtained from the journal and other relevant references.

The data was collected from 3 key informants and 15 respondents. The technique to determine key informants and respondents in this study were conducted purposively based on information from the village community. The key informant in this study was the fishermen who got the most catches. While the respondents were those who did the catch in the water sea of SebangPereh. Data analysis is done by using a qualitative approach, by condensing, display data that have been processed, drawing and verifying conclusions[8].

The validity of data is done by comparing data obtained from the key informant with the result of discussion through Focus Group Discussion (FGD) until information is saturated[8], [10].

3 Results and discussion

3.1 Time and catch frequency

According to the fishermen, time of catches the seahorses in SebongPerih village was usually done in January until June, with the highest catches in February and March. In the 4th month, the number of seahorse catches reaches twice more than the 1st month, but lower than in the 3rd month. This information was then evaluated through the score table by making the 1st month (January) as benchmark comparison (h_0). Furthermore, fishermen mentioned that the highest time of peak season is not always same every year, but depends on the seasons

Table 1. Table of comparison of seahorse catches^a

Month											
1	2	3	4	5	6	7	8	9	10	11	12 ^b
1x	3x	3x	2x	1x	1x ^c	-	-	-	-	-	-

^aPrimary data

^bMonth in a year

^cComparison result with the 1st month as benchmarks

The fishermen usually catch the seahorse in low tide condition until it will tide between 2-3 hours. In one month, they usually catch the seahorse \pm 14 days. They only catch the seahorse in the morning until afternoon. According to the fishermen, in the time toward high tide, the seahorse is relatively easier to be found in the sea than at low tide. It's also easier to found the seahorse at low tide and rainy, compared to when the sea at low tide and sunny. In fishermen perception, at that time, they observed that the seahorse was known to come out from a coral reef, also from the hole of the seabed. According to the fishermen opinion, perhaps it was caused by the temperature and the content of the sea water effects to the presence of the seahorses.

3.2 The number of catches

The amount of the seahorses in one catch was various depend on the catch season. In the 1st month (January), fishermen could catch about 20 – 35 seahorses per catch, or around 150 – 350 seahorses in a week, or around 300 – 500 in a month. While in the 2nd and 3rd month, the fishermen could catch the seahorse between in range of 50 – 70 seahorses in once catch, or around 250 – 500 seahorses in a week. But there were also fishermen who can catch up reached 100 seahorses at once. Probably, the differences of the experience and knowledge among the fishermen resulted in various catch rate individually. When the amount of catch quantified in weight, at the peak season (in the 2nd and 3rd month), the fishermen could get as much as 2 kg – 4 kg dry seahorse. While in another month, the fishermen could get the dry seahorse in range of 1 – 2 kilograms.

3.3 Catchment area: habitat condition

According to the fishermen, the seahorses were found around brown macroalgae, *Sargassum* sp. This seaweed was known by the local community as a "rengkam". Furthermore, it was mentioned that seahorses were also found around the *seagrass* (or known as "setu") although relatively in small amounts. The seahorses more often found in *sargassum* at the edge of lagoon situated up to 200 m towards the beach. Seahorses or commonly known as "ondok-ondok" by local people were also found, likely, around reef crest where the fishermen mentioned it "siring tubir". The fishermen recognized "Siring tubir" is a part before reef slope. Usually around "siring tubir" there were corals, *sargassum* spp, and gorgonian (*Antipathes* spp.) or "akarbahar". Typically, seahorses that found around the seagrass were generally a type of seahorse that has crown and dark colored (Figure 1).



Fig.1. Types of seahorse often found in *seagrass*

Whereas the seahorse that commonly found around *Sargassum* sp were seen as a yellow horse (Figure 2). The seahorses that were often found in seagrass at seawater of SebongPereh were *Hippocampus spinosissimus*, *H. histrik*, and *H. kuda*[17]. While those found around the *Sargassum* sp were *H. barbouri* and *hippocampus comes*. The possibility of seahorses mentioned by fishermen included into these species[4].



Fig. 2. Types of seahorse found in the *Sargassum* sp

3.4 Monthly variation patterns

Based on the explanation of fishermen, on the first month (January) macroalgae “rengkam” in the lagoon waters are still in abundance and long lifeform condition (Fig. 3). In this month, the sea waves were strong enough, so that seahorses were found relatively tend in the base of the macroalgae.



Fig.3. Illustration of seahorses in January

On the 2nd month (February), strong wave cause *sargassum* at the base began breakage, so that, there were no leaves. This cause the fishermen have to dive deeper in order to get a seahorse because it commonly found in the base of the *sargassum*. Fishermen also said that on the 3rd month (March) some parts of the *sargassum* were fallen, some even begin to rot. In this month the seahorse was found at the base of the *sargassum*, above it, or in the fallen *sargassum* that has not been rotten yet.



Fig. 4 Illustration of seahorse in March

According to the fishermen, *sargassum* that has fallen means it has broken onto the coral reef so that the base and top of the *sargassum* were in parallel position. Broken *sargassum* usually does not drift. It will rot on the rock until it is destroyed. While the drifting *sargassum* usually is a *sargassum* that has broken away because of strong waves. The rotten *sargassum* is a *sargassum* that has been fallen and tends to have black colour.

In April the fallen *sargassum* are increasing. In this month, the seahorse could be found at the base, at the end, in a broken *sargassum* but not rotten yet, even in a rotten *sargassum* but not totally decomposed. In May, *sargassum* starts to run out or clear. In this case, most of *Sargassum* has been fallen and rotten, even destroyed. At this time, it began difficult to find the seahorse, but still could find it at the base of *sargassum*, inside the broken *sargassum*, in a rotten *sargassum*, even some of it was found in a coral reef.



Fig. 5. Illustration of seahorse in May

In the 6th month (June), the *sargassum* were getting worn out and clean, increasingly difficult to find seahorse in SebangPereh Village waters. This condition continues in the 7th month. In the 9th month, the *sargassum* began to grow again and progressively longer until the 12th month. But in the 12th month, the wind was so strong and so do the seahorse waved. This condition made the *sargassum* “berabuk”. “Berabuk” is the local conception about *sargassum* condition when the leaves of *sargassum* were covered up by the substrate.

3.5 Condition and behavior of seahorse

Fishermen mentioned that in the second month (February), they often found seahorses in the pregnant conditions. The number of pregnant seahorses in one catch reaches almost 70% - 80%. It means if the number of seahorses that have been caught reached 30 seahorses, as much as 21 – 24 seahorses were in pregnant conditions. They also could found seahorse in a pregnant condition in another month, but not as much as in the 2nd month. This information was collected from the fishermen using score table by making the 1st month (January) as benchmark comparison (h_0). Furthermore, in this month fishermen also frequently observed found when the seahorse wastransferring their eggs to each other.

Table 2. Table of comparison the amount of seahorse catches in pregnant condition^s

												Month ^b											
												1	2	3	4	5	6	7	8	9	10	11	12
												1x	3x	2x	1x	1x	-	-	-	-	-	-	-

^aPrimary data

^bMonth in a year

^cComparison result with the 1st month as a benchmarks

3.6 The distribution of seahorse

The fishermen use a hook and sunglasses to get the seahorse. The hook used to drill down the *sargassum*, or local people say it “memusing”. But they use hand to pick the seahorse. While the sunglasses were used to protect the eyes of fishermen when they dived. Furthermore, the fishermen mentioned that these seahorses were sold to collectors who come to Sebong Pereh village. But there were also fishermen who sell directly to the collector which is located in the market town of Tanjungpinang. Then the collectors sell the seahorses to overseas market. But until now, the fishermen do not have quota capture letter of the seahorse. They must have this letter because seahorses are listed as vulnerable or endangered on the 2003 IUCN Red List of Threatened Species [4], [5]. Officially, in Indonesia the trading of the seahorse is regulated by the Ministry of Environment and Forestry by issuing quotas of capture and export quota [4].

3.7 Local wisdom: local management institutionalization

Sebong Pereh village seahorse fishermen already have the initiative to form a group of seahorse fishermen. But this group will only be officially instituted in the coming year (2019). They - encouraged by Government Agent of Coastal and Marine Resource Management (Balai Pengelolaan Sumberdaya Pesisir dan Laut Padang/BPSPL Padang) – have also created a marine protected area through Village Regulation [4]. The area of conservation is about 15 ha (Fig. 6).

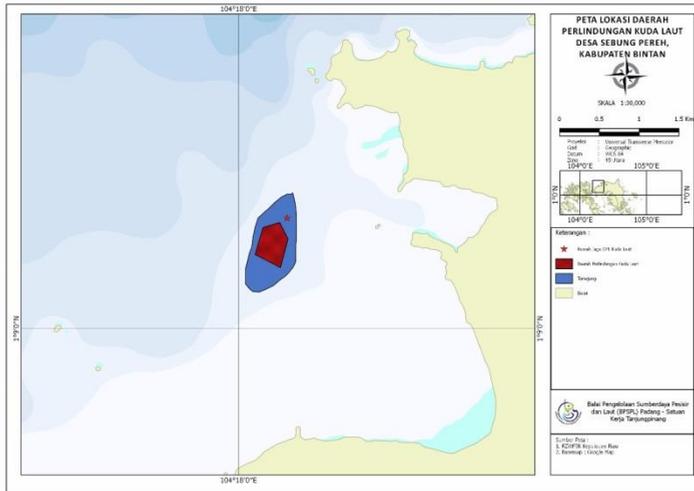


Fig. 6. Marine protected area of seahorse at SebangPereh village

As for the provisions on the conservation area is the fisherman is prohibited to make arrests in the conservation area. If a fisherman catches 1 (one) seahorse in a conservation area, then the fisherman is required to return 3 (three) seahorses to the area. Unfortunately, until now there have been no enforcement sanctions given if there are fishermen who violate the rules. In addition to the absence of sanctions for offenders, the SebangPereh Village fisherman has not yet placed supervisors in the conservancy area, even though there are already supervisory huts.

4. Conclusions

The results revealed that based on experience and daily observations, fishermen have quite complex the ecology knowledge to effectively utilize the seahorse as an important source of income from the waters of SebangPereh village. Seahorse fishing and related environmental knowledge can be used to development and implementation of sustainable it uses. Nevertheless, lack of best management practices could lead to the endangered of this types of fisheries. More consultation at interdisciplinary frontiers is needed in order to formulate practical solutions to the core problems of Bintan seahorse fishing community in the future.

The authors wish to thank the KEMENRISTEK DIKTI program for research funding, Dr. Syakti for re-reading the manuscript, community of SebangPereh village, and our students for technical support and research campaigns, Raja Ali Haji Maritime University.

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