Detection Of Community Knowledge Level Of Economic, Ecological Benefits And Causes Of Damage To Mangrove Forest Ecosystems

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Abstract: Mangrove forests are natural resources in coastal areas that have an important role in terms of social, economic and ecological aspects. However, the utilization of the mangrove ecosystem makes it vulnerable to damage. This study aims to determine the level of public knowledge of the economic, ecological benefits and damage that happened to mangrove areas in Tarakan City. The scoring method was used to determine the total score or the total score of the respondents' answers, which amount to 50 people. that the community's knowledge of the economic benefits of mangrove forests was categorized as know for the benefits of mangroves as firewood, mangrove areas as a place for settlement, mangroves as a place to get fish and mangrove benefits as aquaculture areas with total scores of 226, 200, 232, 230 respectively. However, the level of community knowledge about the benefits of mangroves as a medicinal ingredient obtained a total score of 164, which means the level of community knowledge was in the doubtful category. While the level of community knowledge of the ecological benefits of mangrove forests as coastline guards, sea wave barriers, sea wind protectors, and animal breeding sites were included in the category of "Know" with a total score of 228, 224, 234, 240 respectively, but the level of knowledge was in the doubtful category. The community regarding the benefits of mangroves that can manage household waste was in the "doubtful" category with a total score of 128. The community was aware of the damage to mangrove forest ecosystems caused by garbage, logging / mangroves, expanding aquaculture, settlements and increasing population. with a total score of 234, 232, 210, 228 and 200 levels of knowledge, respectively, which are included in the "Know" category.

Keyword: Mangroves, economic benefits, ecological benefits, level of knowledge

1. Introduction

The mangrove forest ecosystem is one of the natural resources in the coastal area which has an important role from a social, economic and ecological point of view. The main function is to balance the ecosystem and provide various benefits or necessities of life for humans and other living things. The role of mangrove forests in life is indicated by the function of mangroves in terms of socio-ecological, socio-economic, and socio-cultural.[1]. The most prominent ecological function of mangrove forests is to protect the coastline and the life behind it from the onslaught of tsunamis and winds, to prevent salination in the areas behind it, and as a habitat for aquatic biota. Economically, the use of mangrove forests comes from wood products as building wood, firewood and paper as well as non-wood forest products, as well as being used as a natural coastal tourism area.[2]. Socially, mangrove forests also serve to preserve social relations with local communities, as a place to find fish, crabs, shrimp, and medicinal ingredients. [3].

Based on the Regional Regulation of the City of Tarakan No. 04 of 2012, the area of mangrove forests owned by the City of Tarakan is around 869 hectares, which are spread across 4 Districts, namely: in West Tarakan District: Karang Rejo Village, Karang Anyar Pantai Village, and Karang Harapan Village. In Tarakan Tengah District: Sebengkok Village, Kampung Satu / Skip Village and
Selumit Pantai Village. In East Tarakan District: Lingkas Ujung Village, Mamburungan Village and Amal Beach Village, and in North Tarakan District: Juata Laut and Juata Permai Villages. The mangrove forest in Tarakan City has a very strategic function for the balance of the coastal ecosystem in Tarakan City, including as a habitat for fish, wave breakers, abrasion barrier and a source of germplasm. However, the condition of Tarakan City's mangrove forests scattered along the coast of Tarakan City in general is experiencing a decrease in quality, so it needs intensive management[4].

The visual condition of the mangrove forests in Mamburungan village is quite good because of several rehabilitation programs that have been carried out, and that is visible by several types of mangroves with quite good density that can be found in the area. With all that being said, the mangrove forests in this area, however, are threatened with degradation due to community activities including disposal of household waste, construction of human settlements, construction of ponds, bridges and so on. [5]. According to Tandjung damage and extinction of mangrove forests need to be prevented and need to be managed properly, based on ecological principles and socio-economic considerations of the surrounding community[6].

The management and protection of mangrove areas by the Tarakan City government is supported by community participation that consistently maintains, manages, and develops the mangrove so that their functions and roles can be continuously improved in accordance with the dynamics of progress and in accordance with Regional Regulation No. 04 of 2012 concerning the prohibition and supervision of mangrove forests in Tarakan City. According to the database of infrastructure, there are prohibited signs or appeals about the importance of mangrove forest preservation and mangrove forest rehabilitation activities by the surrounding community.[7]. Queiroz also said that the community has a social responsibility in maintaining ecosystem services around mangrove areas so that economic and ecological activities can run optimally. [8].

The mangrove forest area in Tarakan City has high economic and ecological value for the community around the ecosystem. Public knowledge is very important in maintaining the preservation of mangrove forest areas with economic use that takes into account ecological values so that it is hoped that there will be no decline in the ecological function of the mangrove area due to the high utilization of mangroves for community economic activities. As stated by Bsett, the decline in the function of mangrove forests will increase the occurrence of erosion, degradation of coastal areas and allow for extreme effects during the Tsunami. [9]. In article 9 paragraph (1) of Law no. 41 of 1999 concerning forestry states "for the benefit of microclimate, aesthetics, and water absorption, in each city a certain area is designated as an urban forest". Furthermore, the affirmation of a forest area needs to be carried out through several processes such as forest area designation, forest area arrangement, forest area mapping, and forest area designation. Based on this, the authors conducted a study entitled "The Level of Community Knowledge of the Economic Benefits of Mangrove Ecosystem Forests in Mamburungan Village, East Tarakan District, Tarakan City. The objectives of this study were to determine the economic and ecological benefits of mangrove forests for the people of Mamburungan Village.

2. Research methodology
This research was conducted in Mamburungan Village, East Tarakan District, Tarakan City. The research was conducted in August 2019 to January 2020, which included data collection, data processing, and report preparation. The type of data used in this study is primary data obtained by informants using a questionnaire instrument. Also, in-depth interviews were conducted with respondents to explore the information needed to answer the research objectives. The data analysis used in this study was the scoring method with a 1-3-5 scale. To scale by using this method, each respondent was asked to state the answer to the statements in the questionnaire, in the three answer categories that had been provided, namely as follows: Don't know = 1, Doubt = 3, Know = 5. The highest score obtained from the multiplication of the highest score with the number of respondents, namely 5 x 50 = 250, and the lowest score multiplied by the number of respondents, namely, 1 x 50 = 50. Thus the range of scores (class width) obtained is (250 - 50) / 3 = 66,[10]. so that the range of scores obtained was 333. The following is the flow chart of the research methodology:
3. Results

3.1 Level of Community Knowledge of the Economic Benefits of Mangrove Forest Ecosystems
Based on data analysis related to the observed variables, the level of community knowledge about the benefits of mangroves as firewood was 226, the benefits of mangroves as medicines was 164, the benefits of mangroves as residential land was 200, the benefits of mangroves as a place to find food for fish was 232 and the benefits of mangroves as community aquaculture land was 232. Details can be seen in the Table 1.

Table 1. Level of Community Knowledge of Economic Benefits of Forest Ecosystems Mangrove

| Variable                                      | Community Knowledge Level | Score | respondents | Total score | Percentage (%) |
|-----------------------------------------------|---------------------------|-------|-------------|-------------|----------------|
| Benefits of mangroves as firewood             | Don’t Know                | 1     | 0           | 0           | 0              |
|                                               | Doubtful                  | 3     | 12          | 36          | 24             |
|                                               | Know                      | 5     | 38          | 190         | 76             |
| **Total**                                     |                           | 50    | 226 (Know)  | 100         |
| Benefits of Mangroves as Medicines            | Don’t Know                | 1     | 16          | 16          | 32             |
|                                               | Doubtful                  | 3     | 11          | 33          | 22             |
|                                               | Know                      | 5     | 23          | 115         | 46             |
| **Total**                                     |                           | 50    | 164 (Doubtful) | 100   |
| Benefits of mangroves as land for settlement  | Don’t Know                | 1     | 2           | 2           | 4              |
|                                               | Doubtful                  | 3     | 21          | 63          | 42             |
|                                               | Know                      | 5     | 27          | 135         | 54             |
| **Total**                                     |                           | 50    | 200 (Know)  | 100         |
| The benefits of mangroves as a place to find fish | Don’t Know                | 1     | 0           | 0           | 0              |
|                                               | Doubtful                  | 3     | 9           | 27          | 18             |
|                                               | Know                      | 5     | 41          | 205         | 82             |
| **Total**                                     |                           | 50    | 232 (Know)  | 100         |
| Benefits of mangroves as aquaculture land for the community | Don’t Know                | 1     | 0           | 0           | 0              |
|                                               | Doubtful                  | 3     | 10          | 30          | 20             |
|                                               | Know                      | 5     | 40          | 200         | 80             |
| **Total**                                     |                           | 50    | 230 (Know)  | 100         |

3.2 The Level of Community Knowledge of the Ecological Benefits of Mangrove Forest Ecosystems

Based on interviews conducted with respondents regarding the level of public knowledge of the ecological benefits of mangroves, the following data were obtained:
### Table 2. Level of Community Knowledge of Ecological Benefits of Mangrove Forest Ecosystem

| Variable                                                                 | Community Knowledge Level | Score | Respondents | Total Score | Percentage (%) |
|-------------------------------------------------------------------------|---------------------------|-------|-------------|-------------|----------------|
| Mangrove forests can help protect the coastline                          | Don’t Know                | 1     | 0           | 0           | 0              |
|                                                                         | Doubtful                  | 3     | 11          | 33          | 22             |
|                                                                         | Know                      | 5     | 39          | 195         | 78             |
| Total                                                                   |                            | **50**| **228 (Know)** |             | **100**        |
| Mangrove forest as a barrier to sea waves                                | Don’t Know                | 1     | 1           | 1           | 2              |
|                                                                         | Doubtful                  | 3     | 11          | 33          | 22             |
|                                                                         | Know                      | 5     | 38          | 190         | 76             |
| Total                                                                   |                            | **50**| **224 (Know)** |             | **100**        |
| Mangrove forests are able to process waste materials well                 | Don’t Know                | 1     | 23          | 23          | 46             |
|                                                                         | Doubtful                  | 3     | 15          | 45          | 30             |
|                                                                         | Know                      | 5     | 12          | 60          | 24             |
| Total                                                                   |                            | **50**| **128 (Doubtful)** |         | **100**        |
| Mangrove forests can provide protection against sea breezes              | Don’t Know                | 1     | 0           | 0           | 0              |
|                                                                         | Doubtful                  | 3     | 8           | 24          | 16             |
|                                                                         | Know                      | 5     | 42          | 210         | 84             |
| Total                                                                   |                            | **50**| **234 (Know)** |             | **100**        |
| Mangrove forests are useful as breeding places for aquatic animals.      | Don’t Know                | 1     | 0           | 0           | 0              |
|                                                                         | Doubtful                  | 3     | 5           | 15          | 10             |
|                                                                         | Know                      | 5     | 45          | 225         | 90             |
| Total                                                                   |                            | **50**| **240 (Know)** |             | **100**        |

From The Table 2., it can be concluded that the ecological benefits of mangrove forests as coastline guards has a score of 228, the score of mangrove benefits as a barrier to sea waves was 224, benefits as waste material processing was 128, benefits as protection from sea breezes with was 234, and the ecological benefits of mangroves as a breeding ground for aquatic animals has a score of 240.

#### 3.3 The Level of Community Knowledge of the causes of Damage to the Mangrove Forest Ecosystem

Based on exploration related to people's knowledge of the causes of mangrove ecosystem damage, the majority of respondents knew the causes of mangrove ecosystem damage, including due to household waste dumped around the mangrove area, cutting down of mangrove forests by taking wood products but without replanting what has been cut, expansion of ponds using land mangroves, the need for housing / community settlements and the increasing population of Tarakan City. Details can be seen in the following table:
Table 3. Level of Community Knowledge of the causes of Mangrove Forest Ecosystem Damage

| Variable               | Community Knowledge Level | Score | respondents | Total score | Percentage (%) |
|-----------------------|---------------------------|-------|-------------|-------------|----------------|
| Rubbish               | Don’t Know                | 1     | 0           | 0           | 0              |
|                       | Doubtful                  | 3     | 8           | 24          | 16             |
|                       | Know                      | 5     | 42          | 210         | 84             |
| Total                 |                           | 50    | 234 (Know)  | 100         |                |
| Illegal logging       | Don’t Know                | 1     | 0           | 0           | 0              |
|                       | Doubtful                  | 3     | 9           | 27          | 18             |
|                       | Know                      | 5     | 41          | 205         | 82             |
| Total                 |                           | 50    | 232 (Know)  | 100         |                |
| Aquaculture           | Don’t Know                | 1     | 6           | 6           | 12             |
|                       | Doubtful                  | 3     | 8           | 24          | 16             |
|                       | Know                      | 5     | 36          | 180         | 72             |
| Total                 |                           | 50    | 210 (Know)  | 100         |                |
| Settlement            | Don’t Know                | 1     | 0           | 0           | 0              |
|                       | Doubtful                  | 3     | 11          | 33          | 22             |
|                       | Know                      | 5     | 39          | 195         | 78             |
| Total                 |                           | 50    | 228 (Know)  | 100         |                |
| Increase in population| Don’t Know                | 1     | 6           | 6           | 12             |
|                       | Doubtful                  | 3     | 13          | 39          | 26             |
|                       | Know                      | 5     | 31          | 155         | 62             |
| Total                 |                           | 50    | 200 (Know)  | 100         |                |

4. Discussion

From these results, it can be concluded that the knowledge of the people of Mamburungan Village and the level of community knowledge of the benefits of mangrove forest as firewood has a total score of 226. This value can be grouped into the "know" category. Mangrove forest ecosystems can be used as forestwood by taking the dried wood which can be used as firewoods to fulfill the needs of every member of the surrounding community. Mangrove forest wood was used by the community as firewood because it easy to obtain, and it had become a habit for local people [11]. The total score of the benefits of drugs was that the 164 scores fall into the "doubtful" category because most people did not know what types of plants can be used as drugs. However, some people in the mangrove area knew that the trunks of mangrove trees can be used as a medicine for stomach aches and diarrhea, this was also expressed by Kustanti that mangrove stems (Rhizophora apiculata) can treat diseases including diarrhea, vomiting and bleeding [12]. The level of community knowledge about the influence of residential land (table 3) has a total score of 200, which means that the community fell into the “knows” category. In addition, the community also understood that change of mangrove forest into settlements for people can have negative impacts on the environment such as flooding, erosion and so on. Dahuri et al stated that the main problem regarding the influence or pressure on mangrove habitat came from the desire of humans to convert mangrove forest areas into areas for housing development, commercial, industrial and agricultural activities.[3].

The community's knowledge of the benefits of mangrove forest as a place to find fish has a total score of 232 which was included in the “know” category. The community knew that the mangrove forest ecosystem was a place for fish to find food. The water of the mangrove forest has at least one life cycle of various species of fish and invertebrates utilizing the mangrove ecosystem as a place to find food. Not only for fish food, the mangrove area was also used by the community to catch fish to fulfill their household needs. The level of community knowledge about benefits of Mangrove forest being turned into fish pond has a total score of 230. That score fell into the “know” category. They understood the various benefits it brought. Fauzi stated that one of the functions of ponds for aquatic
ecosystems is the enrichment of aquatic biota. The increase in the types of biota came from the introduction of cultivated biota.[13].

The level of public knowledge about the ecological benefits of mangroves, including maintaining the coastline has a total score of 228, which was included in the “know” category. The community knew that the mangrove forest ecosystem was able to protect the coastline. So far the function of mangrove forests has been felt by the local community by the presence of trees. These mangrove trees can protect the coastal area of the mangrove area so that the coastline is maintained. Dixon explained that the function of mangrove forests was to protect the coastline from erosion. Also, mangroves also can withstand the hit of waves. Its roots can hold mud very tightly, so that mangroves can grow out and accelerate the formation of soil layers [14]. The level of community knowledge of the benefits of sea wave retaining results of the total score 224 which fell into “know” category. The community knew that the mangrove forest ecosystem functions acted as a sea wave barrier because mangrove trees were not like regular trees. Mangrove roots grew upwards and strong which made mangoroves able to withstand the impact of sea waves. The community knowledge of mangrove ability in recycling waste has a score of 128. It showed that their knowledge fell into the “doubtful” category. It is because more than half of the respondent were doubtful in answering this question because they did not know that mangrove forest had the ability to recycle natural waste.

Mulyadi in Rizki Utami et al. explained that mangroves act as the last reservoir for waste from urban activities carried by river flows to river estuaries [15]. The level of public knowledge about the benefits of sea breeze protection has a total score of 234. This value is included in the “know” category. This means that people knew that the mangrove forest ecosystem can provide protection against sea breezes. The benefits of mangrove forests related to ecological functions were disaster mitigation such as absorbing waves and storm winds for the area behind it, shoreline protection from abrasion, tidal waves, tsunamis, mud retaining and sediment trapping transported by surface water flows, preventing intrusion. sea water to land, and can be used as a neutralizer of water pollution to a certain extent [16]. Mangrove forest ecosystem is very useful as a breeding ground for aquatic animals and the score of respondents that knew about this function was 240 so it fell into the “know” category. Mangrove forest, other than acting as a breeding ground and nursery place of various type of animals, also acted as the source of food thus helping the area to accumulate sediments and nutrients for its surrounding [17].

The results of identification and interviews with respondents who live in the mangrove area found that the cause of damage to the mangrove forest area was due to the community throwing garbage around the mangrove area. This condition was closely related to the increase in population in the City of Tarakan which in turn also increased the number of community settlements living around the mangrove area. This condition made the number of people disposing their household waste to be higher. This condition can damage and kill vegetation and animals that live in the area around mangroves due to contamination of their habitat. Another reason was due to the community increasing needs that forced them to cut the wood, expand the ponds to the mangrove area in order to meet their household needs. The decline in economic and ecological services from mangrove areas was due to the conversion of mangroves into residential and cultivation areas, this has happened in Asian regions such as Vietnam and Indonesia [18].

5. Conclusion
The discussion above showed that the community in the mangrove forests surrounding area seemed to understand the benefit of Mangrove forest benefit in term of economic benefits and its ecological benefits such as the sea wave barrier. However, the community seemed not to understand the benefit of mangrove forests in term of medicinal benefits and how much damage they caused as the number of their community increased over time.

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