Study of the Historic Shipwreck Sites Area Development for Marine Ecotourism in Thousand Islands

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Abstract. The historic shipwreck sites are a part of the Maritime Archaeological Resources. They are currently occupying an important position as one of the non-conventional marine resources with blue economy potential in it. Sites are usually found in the conditions that have been integrated with the marine ecosystem in their environment. Some have even been completely covered with coral reefs, so that this uniqueness becomes the added value of the site for a tourist attraction. The research was carried out in Thousand Islands waters, which having kept many records of the maritime history of the Nusantara Archipelago for centuries and in their current development, the Jakarta’s Thousand Islands are included as one of the Marine Tourism Village areas (Desa Wisata Bahari/Dewi Bahari). The purpose of this research is to determine the value of the shipwreck sites potency which are suitable for marine ecotourism development area in Thousand Islands waters and for obtaining the sustainable management model that can be integrated with the ecosystem in their environment. The research methods used sites surveys, focus group discussions, and interviews. Data processing was done by using Site Significance Assessment analysis. The result shows there are 4 (four) of historic shipwreck sites potency area in Thousand Islands waters which can be recommended as the attraction for marine ecotourism with the model of the Marine Eco Archaeological Park (MEA Park). These sites areas include 1) Shinta wreck in Pari Island waters, 2) Tabularasa wreck in Pramuka Island waters, 3) Poso wreck in Karang Congkak waters, and 4) Papatheo wreck in Sepa Island waters.

1. Introduction

The World Tourism Organization (UNWTO, 2009) stated that over time, tourism has become a key driver for socio-economic progress through job and business creation, infrastructure development and income generation. It is estimated that the global contribution of tourism for Gross Domestic Product (
GDP) is around 5% and more than 10% for countries where tourism is an important economic pillar, and even greater for small island countries and developing countries where tourism is a key of economic sector. One of the marine resources that has an attraction as a marine tourism object is the historic shipwreck sites which are part of the maritime archaeological site [1].

The historic shipwreck sites are a part of the Maritime Archaeological Resources. They are currently occupying an important position as one of the non-conventional marine resources with blue economy potential in it. Sites are usually found in the conditions that have been integrated with the marine ecosystem in their environment. Some have even been completely covered with coral reefs, so that this uniqueness becomes the added value of the site for a tourist attraction.

The ancient shipwreck sites have maritime historical and cultural values from the past. These are the great benefit for education and diving tourism potential attraction. Currently in foreign countries, such as the ancient shipwreck sites area incorporated in the Marine Sanctuary of Florida Keys and American Samoa Sanctuary [2], have become one of the diving tourism trends by providing revenues of up to 8 billion dollars/year, and has also supported more than 1,400 job opportunities for coastal communities in the region.

Meanwhile, in Indonesian waters, there are many areas having potential for historic shipwreck sites that have not been fully managed optimally. There were about 463 locations of the historic shipwreck sites in Indonesia [3], and only about 10% of them have been carried out exploration research and management models.

One of them is the Karang Asam waters area in Bali with the historic shipwreck sites become a current tourist attraction for diving in Indonesia, namely Tulamben Wrecks (a historic shipwreck site from World War II). It has been supporting the income of coastal communities in its environment. Those who dive at this dive spot can reach 173 divers/day, and 63,204 people/year, about 81.1% of the total visits and has become a world diving spot [4]. However, the utilization model must be based on the sustainability of the historic shipwreck site, considering that the historic shipwreck site is a non-renewable marine resource and it’s very vulnerable to vandalism, treasure hunters and natural water conditions threats. So that the concept of marine ecotourism is very appropriate to be a reference in making future development models.

In accordance with [5], ecotourism is tourism that involves traveling to undisturbed natural areas with the aim of admiring, researching and enjoying the beautiful scenery, wild plants and animals and culture that can be found there. Furthermore, ecotourism is a form of tourism that emphasizes responsibility for the preservation of natural resources, where the ecological aspect is a top priority that must be considered in its management [5].

The Marine Research Center, since 2014, has been conducting studies related to the in-situ management model for the historic shipwreck sites for the development of marine ecotourism integrated with the sustainability of the sites and the condition of the ecosystem.

The results of the study were identified four models the development of historic shipwreck site locations for marine ecotourism, i.e.: 1) Marine eco-archaeological parks; 2) Marine archaeological park; 3) Historic Maritime Landscape Park, 4) Excavation / not ideal to be developed in situ.

Marine Eco-Archaeological Park (Mea Park) is a development concept of the in-situ preservation for underwater cultural heritage site management which allows visiting the site buried on the seabed [6]. Besides having historical and cultural values, ancient shipwreck sites are also home for coral reef ecosystem growth. This is why underwater cultural heritage site are more valuable and unique if kept on the seabed. In situ preservation is an efficient concept for managing maritime archaeological sites [7]. The development of MEA Park is a strategy to harness the archaeological remains sites and their ecosystem as a marine tourist attraction as well as to protect them in situ. Most of the ancient shipwrecks have been fused with their marine ecosystem. Through marine eco archaeological park, ancient shipwreck and the ecosystem can be protected at the same time. The positive impact and
multiplier effect for the coastal people at the site environment are the objective of the marine eco-archaeological park. [8] & [9] Ultimately, the positive impact and increased income for the coastal people of the site environment are the objectives of the marine eco-archaeological park. The example of positive impact and increased income of the MEA park concept can be found in SS Yongala shipwreck [10].

Marine archaeological park refers to the concept of [11], namely underwater historical park, but for Indonesian waters, this model is more accurately called a marine archaeological park [10] to illustrate for only one characteristic of the site or its environment that has high value to be able supporting marine ecotourism.

Then Historic Maritime Landscape Park refers to term of Maritime Cultural landscapes. It can be viewed generally as settings created by humans over time that reveal important associations and relationships among people and the land or sea [12] A formal definition, developed in the United States by the National Park Service (NPS), describes a cultural landscape as “a geographic area, including both cultural and natural resources, and the wildlife or domestic animals therein, associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values” [13] The term maritime commonly refers to relationships among humans and their water-based environments (e.g., oceans, lakes, streams, wetlands), and, there are very few artifacts or structure of the shipwrecks found in these location, as well as the marine environmental conditions of the shipwrecks, especially the condition of the coral reef and biodiversity are only below 30%. So, the maritime landscape park, according to maritime cultural landscapes term, they can and are a powerful tool for place-based management [14] (Barr, 2013).

Excavation is one of the historic shipwreck sites management model with removal or lifting up the artifacts from the submerged for saving them from the threats of environmental condition. The assessment results of sites and the environment are not supporting for marine ecotourism development.

Then, this research was carried out in Thousand Islands waters, which having kept many records of the maritime history of the Nusantara Archipelago for centuries and in their current development, the Jakarta’s Thousand Islands are included as one of the Marine Tourism Village areas (Desa Wisata Bahari/Dewi Bahari). The purpose of this research is to determine the value of the shipwreck sites potency which are suitable for marine ecotourism development area in Thousand Islands waters and for obtaining the sustainable management model that can be integrated with the ecosystem in their environment.

2. Research Method

The study was conducted at three locations of shipwrecks sites in Thousand Island Waters, i.e., Pramuka wreck site area, Karang Congkak Wreck Site area and Papatheo wreck site area. At three locations, data taken consist of the site condition, structure remains of the shipwrecks, sediment, bathymetry and marine ecosystem (marine life) of the sites. Methods of data collection were conducted through observation, diving and marine survey equipment i.e water Quality Measurement.
The methods of analysis used are site significance assessment based on archaeological approach and ecological approach. There are five parameters of archaeological approach and five parameters of ecological approach for site assessment significance of sites for marine ecotourism development in the area. Five parameters of archaeological approach are 1) the period/historical value; 2) Educational Value; 3) position of the site; 4) distribution pattern of the site; and 5) the data quantity of the site. Then, the environmental condition supporting of the ancient shipwrecks sites will be analyzed using five parameters for site significance assessment based on marine ecological approach i.e 1) ecosystem of the site, 2) seabed floor morphology of the site, 3) sediment substrate, 4) water quality of the site, and 5) the Regional Issue of the site.

The periods/historical values of the site can accrue in several ways: from its rarity or uniqueness, from its technological qualities, or from its archival/documentary potential [15]. This value describes about the chronological aspects and meanings of the site. The capacity of the site to convey, embody, or stimulate a relation or reaction to the past is part of the fundamental nature and meaning of heritage objects [15]. Site significance assessment used scores that range between 1 up to 3 for explaining the level of the shipwreck sites in supporting Marine Eco-Archaeological Park in Thousand Island. For the site periods or historical value of the site. Score 1 was given for the lowest level, or “not ideal” in order to support MEA park. This score refers to the early period of the Indonesian history which highlights after independence day and no historical event on site. Then, score 2 was a medium or “quite ideal” level and the site in score 2 refers to the colonial history in Indonesia until after the Independence Day of Indonesia. Score 3 was for the highest level referring to an "ideal" site caused having the older period (beginning from pre-history, 1 Hindu-Budhis period until Islamic Period in Indonesian history). The educational value of heritage lies in the potential to gain knowledge about the past in the future through, for instance, archaeology or an artist creative interpretation of the historical record embodied in the heritage [15]. For educational values of the site, score 1 was given for the site supporting local history, score 2 for National history and score 3 for supporting the World history, such as World War II.
Table 1. The Periods of The Historic Shipwreck

| No. | Periods                          | Year                  | Scores | Remarks       |
|-----|----------------------------------|-----------------------|--------|---------------|
| 1.  | Protohistory, Hindu Budha, Islamic Period | BC – 14 CE            | 3      | Ideal         |
| 2.  | colonial history & after the Independence Day | 15 CE – >= 50 years   | 2      | quite Ideal   |
| 3.  | After Independence               | <= 50 year            | 1      | less than ideal |

Table 2. Education (History, Science and Technology knowledge)

| No. | Education Values       | Scores | Remarks   |
|-----|------------------------|--------|-----------|
| 1.  | World History & Science | 3      | ideal     |
| 2.  | National History & Sci  | 2      | quite ideal |
| 3.  | Local History          | 1      | less than ideal |

The position of the sites in the water column are very important related to the possibilities for marine tourism, such as diving activities on the MEA park. Diving activities need the safety environment, because each person has a level of proficiency in diving abilities, open water or deep diving. As shown in Table 1, the deep diving (>20 – 30 m) has more danger and greater risk than basic open water diving (15 – 20 m). Then the water column depth of the site location between 6 – 15 m is very ideal for diving tours, particularly for supporting marine eco-archaeological park.

Table 3. the position of the sites

| No. | Water Column Depth (meters) | Scores | Remarks |
|-----|-----------------------------|--------|---------|
| 1.  | 6 – 15                      | 3      | Ideal   |
| 2.  | 15 – 20                     | 2      | quite   |
| 3.  | 20 – >30                    | 1      | less than ideal |

Source:[15]

Table 4. Distribution pattern of the site

| No. | Types of Maritime Archaeological Sites | Scores | Remarks       |
|-----|----------------------------------------|--------|---------------|
| 1.  | Artifact/structure distribution above 50% | 3      | Ideal         |
| 2.  | Artifacts/structure Distribution 30% -50% | 2      | quite ideal   |
| 3.  | artifacts/structure distribution under 30% | 1      | less than ideal |

Source: [16]
Distribution pattern of the site described was more important criteria for supporting MEA Park. Score 3 was given for the distribution site condition above 50%, Score 2 for 30% - 50% site condition, and score 1 for the distribution pattern of the site under 30%. Then, the assessment for the sites data quantity refers to a score of 3 given for intact conditions, a score of 2 for incomplete site conditions, and a score of 1 for damaged conditions.

Table 5. The Sites Data Quantity

| No. | Site Condition | scores | Remarks |
|-----|----------------|--------|---------|
| 1.  | intact         | 3      | Ideal   |
| 2.  | incomplete     | 2      | quite   |
| 3.  | damaged        | 1      | Less than |

Source: [16]

In terms of the environmental vulnerability assessment) of the site (the seabed morphology characteristics, sediment substrates/characteristic, ecosystem of the site, water quality and the Regional Issue of the site. The determination of their values was based on the existing conditions during the survey as the data was retrieved. Because the objective of MEA Park in the Natuna Islands were for the preservation in situ of the shipwreck and as well as for marine tourism, the geodynamic condition analysis was needed for determining the level of vulnerability. For the seabed morphology characteristic of the site supporting MEA park, score 1 was given for the sites with the continental slope, the score refers to the lowest level that was related for the high vulnerability of the site stability (unstable). Then score 2 was for the relatively flat and slightly sloping, referring to the normal condition for site stability (medium stability) and score 3 was given for the flat condition which highlight to ideal condition for site stability. Sediment characteristic assessment was related to support MEA park for marine tourism development, in relation to the possibilities of diving there. The size and type of sediment substrates can influence underwater visibility on the site. The assessment focused for the three characteristics of the sediment substrates: sand, silt and clay [17] Based on the characteristics of sediment substrates, score 1 was given for the clay, referring to the non-ideal condition. Because clay particles were very fine-grained and light, then the effect of underwater visibility on the site can be a very poor due to increase in water turbidity. Score 2 was given for the silt (medium level/normal condition) and score 3 for the sandy (the highest level). That was because sand particles had a coarse-grained and heavier than clay and silt as well as relatively less affected by currents and provide good underwater visibility on the site.

Table 6. The Seabed Morphology Characteristic of the Sites

| No. | The characteristic of the seabed | Impact for the sites | Scores | Remarks |
|-----|---------------------------------|----------------------|--------|---------|
| 1.  | Flat                            | stable               | 3      | Ideal   |
| 2.  | Relatively Flat & slightly sloping| Medium stability    | 2      | quite ideal |
| 3.  | Drop off Continental Slope      | unstable             | 1      | less than ideal |

(Source: [10] Troa et al 2018, Modified from [17] Wibisono, 2011: 23-41)
Table 7. Sediment substrates of the sites

| No. | Substrates Type | Impact                | Impact scores | Remarks     |
|-----|-----------------|-----------------------|---------------|-------------|
| 1.  | Sandy           | The highest visibility | 3             | Ideal       |
| 2.  | Silty           | Good visibility       | 2             | quite       |
| 3.  | Clay            | Poor visibility       | 1             | Less than   |

(Source: [10], Modified from [17])

Then, parameter of the site environmental assessment was marine ecosystem living on the remains of the underwater cultural heritage sites, such as coral reefs. The coral reefs living on the sites remains can increase the site value. They would become the most interesting attraction for recreation diving at the MEA park in the Natuna Islands. The assessment focused on life coral cover and the amount of living coral (Table 2). The last parameter for the environmental assessment was the water quality of the site environment. Water quality is fundamental for good marine health. The assessment need to be done for supporting underwater cultural heritage site as the best spot diving in MEA park and as well as preservation in situ of the underwater cultural heritage site. As shown in Table 3, the main parameters of the water quality assessed were dissolved oxygen (DO), hydrogen-ion concentration (pH), temperature and salinity (according to the sea water quality standards for marine parks: modified after [18]; after [19] Krumbein & Garrels, 1952; and after [17]).

Table 8. Life form of coral cover (%) and the amount of living coral for supporting MEA park

| Nr. | Coral Cover (%) | The Amount of Living Coral | Scores | Remarks  |
|-----|-----------------|----------------------------|--------|----------|
| 1.  | >75             | >12                        | 3      | MEA Park |
| 2.  | 50 – 75         | 7 – 12                     | 2      | Arch Park|
| 3.  | ≤ 25 – 50       | ≤ 4 – 7                    | 1      | LS Park  |

(Source: Modified after [15])

Table 9. Standard of water quality for marine tourism and marine park

| Nr. | Parameters | Unit | Average Value                      | Scores | Remarks   |
|-----|------------|------|------------------------------------|--------|-----------|
| 1.  | Temperature| °C   | 28 – 30                            | 3      | Ideal     |
|     |            |      | 25 – 28                            | 2      | quite Ideal|
|     |            |      | < 25 & >30                         | 1      | not Ideal |
| 2.  | pH         | -    | 8                                  | 3      | Ideal     |
|     |            |      | 7 – 8                              | 2      | quite Ideal|
|     |            |      | < 7 & > 8                          | 1      | not Ideal |
| 3.  | Salinity   | %    | 35%o – 37%o                        | 3      | Ideal     |
|     |            |      | 33%o – 35%o                        | 2      | quite Ideal|
|     |            |      | < 33%o & >37%o                     | 1      | not Ideal |
| 4.  | DO         | mg/liter | >5                                    | 3      | Ideal     |
|     |            |      | 5                                    | 2      | quite Ideal|
|     |            |      | < 5                                  | 1      | not Ideal |

(Source: Modified after [18]; after [19], and after [17])
The Marine Regional Area Issues are the fifth parameter and becomes very important in the assessment of the historic shipwreck Site location for the marine ecotourism development. Score 1 were given for the Natural & human threats or Vulnerability area Issues of the shipwreck sites, score 2 for the conservation area and score 3 were given for Marine tourism Development area issues of the sites.

**Table 10. The Marine Regional Issues of the Sites**

| No. | The Marine Regional Issues                        | Scores | Ideal     |
|-----|--------------------------------------------------|--------|-----------|
| 1.  | Marine tourism Development area & Conservation   | 3      | Very ideal|
| 2.  | Conservation area / Marine tourism development   | 2      | quite     |
| 3.  | Natural & human threats /Vulnerability area      | 1      | Not ideal |

Furthermore, the results of the assessment will be included in three categories of ecotourism development models, specifically i.e 1) Marine eco archaeological park with a total scoring 26 – 30; 2) Underwater Archaeological Park with a total scoring 21-25, 3) Historic Maritime Landscape Park with total scoring 17 – 20, then 4) Ekskavation or not ideal for marine ecotourism, with total nilai only 16 or under 16.

3. Results and Discussion

3.1 Tabularasa Shipwreck

Tabularasa wreck site was a STP training ship sank in Pramuka waters in 1995. Damage in the ship's engine room was the caused of the sank. From the assessment, the site gets a score of 22 which refers to the suitability of the potential of the site to be developed as a marine ecotourism area with a underwater archaeological park. Tabularasa wreck period was still under 50 years, but it had the maritime national history value. This provides sufficient value for standardization for the site as a marine ecotourism attraction. Then, The scoring 3 was given for position of the site, because it was located at a water column depth of 27-35 m is quite ideal for a diving spot and relatively safe for advance level divers. The ideal position of Tabularasa Wreck for supporting underwater archaeological park cannot be separated from seabed morphology of the site, but the score was only given 2. It refers to the seabed morphology relatively flat and slightly sloping in some area of the site.

The scoring 2 was given for the water quality, because The water quality of the site with an average temperature values of 30,1 – 31,6 °C was indeed slightly above the ideal value, because the measurements were carried out at day time, but the site was still in the ideal category or suitable for marine tourism, especially for diving tourism caused the average values of the site water quality was still in ideal category, i.e the pH value of 7.82 – 8.1, Salinity 33.4±0 .33, and DO 5.14±0.57 mg/L.

![Figure 2. Tabularasa Shipwreck](image)
Table 11. Results of the site significance assessment in Tabularasa shipwreck site in Pramuka Waters

| Name of Shipwreck Site: Tabularasa Shipwreck | Parameters | Description | Score |
|--------------------------------------------|------------|-------------|-------|
| Archaeological criteria                    | 1. Period/ Historical value | After Independence & under 50 years old- sunken ship from 1995 in Pramuka waters | 1 |
|                                            | 2. Educational value | Giving the information about the national historical events in Indonesia (Regional history) STP Training Ship – National Maritime History | 2 |
|                                            | 3. Position of the site | Depth 27-35 m | 1 |
|                                            | 4. Data quantity | Structure & Complete condition (intact) | 3 |
|                                            | 5. Distribution pattern | Above 50% structure of the wreck | 3 |
| Ecological criteria                        | 6. Seabed morphology | Relatively flat and slightly sloping in some areas of the site | 2 |
|                                            | 7. Sediment substrates/ characteristic | Sandy (relatively less affected by currents and provide good underwater visibility on the site) | 3 |
|                                            | 8. coral cover (%) and the amount of living coral | Coral cover 34, 92%; living coral 22 | 2 |
|                                            | 9. Water Quality | Temperatur 30,1 – 31,6 °C (not ideal) pH 7,82 – 8,11) – (ideal) Salinity 33,4±0,33, (quite ideal) DO 5,14±0,57 mg/L,. (Ideal) | 2 |
|                                            | 10. The Marine Regional Issue | Marine tourism development in RZWP3K DKI Jakarta | 2 |
| Total Scores                               |            |             | 22    |

Classification:

| ≤ 16 | Excavation or not supporting for marine ecotourism |
| 17 – 20 | Historic Maritime Landscape Park |
| 21 – 25 | Underwater Archaeological Park |
| 26 – 30 | Marine Eco Archaeological Park |

Scoring 2 gave for the wreck site position which was still relatively flat, stable and slightly sloping in some areas of the site. This will support for safety diving for the advance divers, as well as the sediment substrate in the form of sand and coral fragments, so as not to interfere with visibility for diving. However the Scoring 3 was given for this condition. At the site, it was identified that the coral cover was 34.92%, which is still not at an ideal level, but has up to 22 types of coral reefs and biodiversity, so this condition also supports the site to be developed as marine ecotourism with a marine archaeological park model, including the quality of the site's waters, which is still ideally developed as a marine tourism area.
3.2. Posso Shipwreck Site
Posso shipwreck site got the highest score for marine ecotourism standardization, which was a score of 26 with the Marine eco archaeological Park model. Based on its periods history, the Posso shipwreck had include in a underwater cultural heritage categorized protected under the regulation of [18] Law no.11 / 2010, because it’s age was over 50 year old , then scoring 2 was given to the wreck.

Table 12. Results of the site significance assessment in Posso Shipwreck Site in Karang Congkak Waters

| Name of Shipwrecks Site: Posso Shipwreck | Parameters | Description | Score |
|------------------------------------------|------------|-------------|-------|
| **Archaeological criteria**              |            |             |       |
| 1. Historical value                      | After independence & above 50 years old – sunken ship from 1970 | 2      |
| 2. Educational value                     | the shipwreck carrying construction equipment for the Thousand Islands and the structures believed to have come from the Netherlands (Word Maritime History) | 3      |
| 3. Data quantity                         | Structure & Complete condition, (intact) | 3      |
| 4. Distribution pattern                  | Above 50% structure of the wreck | 3      |
| 5. Position of the site                  | Depth 25 – 30 m | 1      |
| **Ecological criteria**                  |            |             |       |
| 6. Seabed morphology                     | Flat/stable | 3      |
| 7. Sediment substrates/characteristic     | Sandy (relatively less affected by currents and provide good underwater visibility on the site) | 3      |
| 8. coral cover (%) and the amount of living coral | Coral cover 80,18 %; living coral 28 | 3      |
| 9. Water Quality                         | Temperatur 30,1 – 31,6 °C, (not ideal) pH 7,82 – 8,11 (ideal) Salinity 33,4±0,33, (quite ideal) DO 5,14±0,57 mg/L (quite Ideal) | 2      |
| 10. The Marine Regional Issue | Restrictid use zone in conservation area | 3      |
| **Total Scores**                         |            |             | **26**|

Classification:
- ≤16 : Excavation or not supporting for marine ecotourism
- 17 – 20 : Historic Maritime Landscape Park
- 21 – 25 : Underwater Archaeological Park
- 26 – 30 : Marine Eco Archaeological Park
The Posso shipwreck site was estimated sunk in 1970 because it collided with the Berdikari ship coming from the direction of Panggang Island, both ships sank in the Karang Congkak waters. The KM Posso ship was formerly a Dutch ship which was later used as a cargo ship carrying cement material. It was estimated that the Posso shipwreck was a maritime trading Netherland ship in its history, so the history of the shipwreck was be able categorized as world maritime history which can provide additional knowledge of maritime history in the Thousand Islands Waters, or the role of the Thousand Islands waters in world maritime history. The historical potential of the site was also supported by the condition of the Poso shipwreck structure which was still very intact, and the ecological conditions of the waters were ideal for marine ecotourism. The shipwreck position was lied in a flat position at the bottom of the waters and had a coral cover of up to 80.18% with a total of 28 species of live coral and was supported by water quality conditions that are ideal for diving, the shipwreck site was very feasible to be developed with a marine eco archaeological park.

3.3. Papatheo Shipwreck Site
The Papatheo shipwreck obtained scores nearly perfect for water conditions and the physical condition of the site structure with a total value of scoring 23. This assessment refers to marine ecotourism development with the underwater archaeological park model, but from the historical and educational values, the Papatheo shipwreck got scores 1. The Papatheo shipwreck come from the young period, After Independence and it was still under 50 years old. It was sunk at 1980, and just having local maritime history, but the Papatheo wreck had the flat of the seabed morphology condition (good condition) (score 3), with the sandy as its substrate sediment supporting visibility for diving on the shipwreck site. Papatheo shipwreck had the coral cover above 50%, it was about 57.4% and 36 types of living corals and biodiversity for supporting the site area for ecotourism development with underwater archaeological park.( this was got scores 3 for ideal).
Table 13. Results of the site significance assessment in Papatheo shipwreck site in Sepa Waters

| Name of Shipwreck Site: Papatheo Wreck | Parameters | Description | Values / score |
|----------------------------------------|------------|-------------|----------------|
| Archaeological criteria                |            |             |                |
| 1. Historical value                    | After Independence & under 50 years old, sunken ship from 1980 | 1 |
| 2. Educational value                   | cargo shipwreck carrying woven cloth (Local Maritime History) | 1 |
| 3. Data quantity                       | Structure & Complete condition, (intact), but break into three parts | 3 |
| 4. Distribution pattern                | Above 50% structure of the wreck | 3 |
| 5. Position of the site                | Depth 20 – 30 m | 1 |
| Ecological criteria                    |            |             |                |
| 6. Seabed morphology                   | Flat/stable | 3 |
| 7. Sediment substrates/characteristic  | Sandy (relatively less affected by currents and provide good underwater visibility on the site) | 3 |
| 8. coral cover (%) and the amount of living coral | Coral cover 57.14 %; living coral 36 | 3 |
| 9. Water Quality                       | Temperatur 30,1 – 31,6 °C pH 7,82 – 8,11 Salinity 33,4±0,33, DO 5,14±0,57 mg/L, | 3 |
| 10. The Marine Regional Issue          | conservation area (in the particular zone) | 2 |
| Total Scores                           |            |             | 23             |

Classification:
≤ 16 : Excavation or not supporting for marine ecotourism
17 – 20 : Historic Maritime Landscape Park
21 – 25 : Underwater Archaeological Park
26 – 30 : Marine Eco Archaeological Park

The scoring 1 was given for position of the site, because it was located at a water column depth of 20 – 30 m is still saving for the advance diving spot. The scoring 2 was given for the characteristic of water quality of the site. It was quite ideal for supporting the diving activity on the site. The result of water quality measurement of the site indicated Ideal (score 3), it was ranked in the allowed condition (Ideal) for supporting Marine ecotourism. Papatheo shipwreck still had the complete and intact structure (scores 3 was given), but it had broken be three parts. This will be the interesting attraction and adventure for the advance diving. According to the Marine regional issue, Papatheo shipwreck was located in the the particular zone of Thosand Island of the National Park. This is the opportunity for the Papatheo Shipwreck development for being marine ecotourism with integrated management.
4. Conclusion
The result shows there are 3 (three) of historic shipwreck sites potency area in Thousand Islands waters which can be recommended as the attraction for marine ecotourism with the model of the Marine Eco Archaeological Park (MEA Park) for Posso shipwreck, and Underwater archaeological Park for Tabularasa Shipwreck and Papatheo Shipwreck. Posso shipwreck site obtained the highest scores (26), the Papatheo shipwreck with the scores 23, and the Tabularasa with the scores 22.

Integrated management between the Posso shipwreck site with the marine environment condition is the challenge for increasing the shipwreck site potency for marine ecotourism with the marine eco archaeological park model. This is because the characteristics of the Posso shipwreck and the environment condition having a balanced fascination in their utilization.

Meanwhile, the Tabularasa and Papatheo sites which are recommended for the underwater archaeological model, have the high assessment results for their environment, but on the other hand, the archaeological values of the sites are not too high, because both of the sites are still under 50 years old, so those are an asset for a Thousand Island in the future and for the next few years, the sites will be included in the category of Cultural Conservation Sites, as well as the marine environment which supports their development from model of underwater archaeological park being marine eco archaeological park.

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