Preservation of underwater cultural heritage: utilization of Lockheed P-38 lightning aircraft in Lae-Lae Island waters as a diving attraction

D S Makmur, M Nur, and K T Muda
Faculty of Cultural Sciences, Hasanuddin University, Makassar, Indonesia
E-mail: dwi.sumaiyyah14@gmail.com

Abstract. The preservation of Lockheed P-38 Lightning aircraft in the waters of Lae-Lae Island needs to be carried out optimally. It is necessary to encourage the preservation of covering aspects of the utilization of the Lockheed P-38 Lightning as a diving attraction. The diving attraction is one of the latest interests and is again favored by extreme explorers. The Community Empowerment Model for the preservation and utilization of the Lockheed p-38 aircraft as a diving attraction is one of the alternative approaches need to be developed to better accommodate the interests of local communities. Approaches that are oriented to local communities can be realized in two ways, namely a participatory approach and community empowerment. Utilization of the Lockheed P-38 lightning is a study that produces a reference or recommendation for use as a diving attraction.

1. Introduction
The wreck of the Lockheed P-38 Lightning is a sinking fighter in the waters of Lae-Lae Island, as a cultural heritage object. Research on the wreck of this aircraft has been carried out by BPCB Sulsel since 2016. The results of the study show that the remains of the wreckage were the former of World War II fighter, which was at a depth of about 23-25 meters with poor visibility (visibility), which was 3 meters. The results of the identification carried out by South Sulawesi BPCB show the notion that the wreckage of the aircraft is Lockheed P-38 Lightning, which was the first production of the United States in 1939.

Research on the wreck of the Lockheed P-38 Lightning was again carried out by BPCB Sulsel in 2017 on the mapping and depiction agenda on the wreck. The activity was carried out to collect data and map the wreckage of the P-38 Lightning aircraft. Based on the results of research conducted by BPCB Sulsel on the wreckage, it can be seen that the wrecked wreckage is a Lockheed P-38 Lightning fighter. At the front of the aircraft, there are four machine guns and one cannon. In addition, there are parts of the aircraft that strengthens the analogy, namely the discovery of a radiator that is separated from the frame of the aircraft. On the radiator section, there is a flat number, which is information about the type of aircraft, empty weight, the amount of fuel, pressure, and the origin of the company where the aircraft was made. In an article published on the website of the Ministry of Education and Culture written by Muh Tang [1] entitled "Study of Preservation of Underwater Cultural Heritage, Case Study of Aircraft Leaves in the Lae-Lae Waters of Makassar City" explains the Preservation of Lockheed P-38 Lightning aircraft which is one of only the underwater cultural heritage located in the BPCB South Sulawesi working area. The purpose of preserving the remains of underwater cultural preservation in the form of Lockheed P-38 Lightning that sank in the waters of the island of Lae-Lae.
Makassar City, needs to be protected. This is due to the potential threats that can damage and cause the loss of cultural heritage, both caused by natural factors and human activity (Vandalism).

The preservation of the wreckage of Lockheed P-38 Lightning aircraft is very necessary, given that the wreckage is underwater is very vulnerable to damage caused by natural factors. The damage by the natural is the corrosion of the wreckage of Lockheed P-38 Lightning aircraft caused by surrounding conditions in the form of climate change, the impact of strong current waves causing erosion. In addition, the damage caused by human activity (vandalism), namely damage or loss of some parts or completely from the wreckage of the Lockheed P-38 Lightning caused by the activity of taking iron on the wreck.

Taking into account the maritime potential that has developed in this region, the Lockheed P-38 Lightning wreck needs attention as the underwater archeological potential. In addition to preservation, development on the Lockheed P-38 Lightning aircraft wreck is also needed since there is potentially owned by the wreck, if viewed from the importance of the Lockheed P-38 Lightning aircraft wreckage for history, science, and culture so that it can be developed as an underwater tourist attraction in the waters of Lae-Lae Island, Makassar City. In addition, considering the condition of the location of the wreckage, which is located at a depth of 23-25 meters with poor visibility around 3 meters or turbid and buried in sand and a lot of garbage, so further action is needed.

2. Problem statement
The wreck of the Lockheed P-38 Lightning is one of the most important sources of data from an archaeological perspective that has its own uniqueness. The wreck of the Lockheed P-38 Lightning is one of the underwater archeological remains. This can be seen from several archeological studies that have been carried out on these objects. In addition, the object is located underwater so as to access it requires the expertise of diving and using SCUBA equipment. When looking at the condition of the aircraft wreckage that is buried in sand and trash scattered around it, as well as threats to the wreckage of the aircraft, so it is very necessary to preserve the wreckage of the Lockheed P-38 Lightning aircraft which includes aspects of protection, development, and utilization based on Law No. 11 of 2010. Considering that the wreckage of Lockheed P-38 Lightning aircraft is made of metal and iron, so it becomes the target of scrap metal hunters to be sold as scrap material, which results in a high level of threat, which requires an effort in preservation. Based on the explanation above about the reality that has been described previously, the authors propose the formulation of the problem: What is the appropriate preservation model for the Lockheed P-38 Lightning wreck in the waters of Lae-Lae Island, Makassar City that can be utilized as a diving attraction?

3. Purpose and significance
Based on the problems that have been raised, this research aims to formulate the management of the Lockheed P-38 Lightning wreck in Lae-Lae Island Waters, Makassar City, as a recommendation to the parties concerned. Therefore, this research is more directed to 1) Formulate a form of management of the wreckage of the Lockheed P-38 Lightning which includes aspects of protection, development and utilization, and 2) Formulate a form of preservation of the wreckage of the Lockheed P-38 Lightning aircraft which includes aspects of rescue, While the significances of this research are: 1) This research can be a reference regarding the remains of underwater archeology, 2) This research can be an additional insight, especially regarding maritime archeology, and 3) The concept offered can be used as a reference.

4. Research method
Basically, this research refers to the CRM taps, but the object of the wreckage is underwater, so the method to be used in this research generally follows what applies in CRM and underwater archeology, which is diving. The following is a series of activities carried out:
4.1 Data collection
This research began from collecting written data material sources by searching the internet in the form of electronic newspapers, articles, journals, and books that can support as the basis of this writing. Then in collecting field data, a research location point is first searched by referring to preliminary data from the BPCB Report for 2017. After that, a surface survey is conducted using a circular system. The circular system is applied because the visibility (visibility) of the object of the wreckage is less clear. Then, diving activities are carried out using SCUBA equipment. This dive activity is carried out 1 time in order to obtain data related to the condition of the wreckage and to record data in the form of taking pictures that include measurements, drawing sketches, videos and taking photographs using a waterproof camera. Subsequent dives were carried out 2 times in terms of location surveys that would be offered for the removal of the wreck. In addition, data collection was also carried out with open interviews. Interviews were conducted by giving freely questions structured to several stakeholders to support related data.

4.2 Analysis
The data obtained were then analyzed to determine the importance of cultural resources on the Lockheed P-38 Lightning wreck and assess the obstacles and opportunities in its management. In measuring the importance of value based on Law No. 11, the Year 2010 concerning Cultural Heritage in the form of historical values, knowledge, and culture. In addition, the assessment of management opportunities and constraints is measured by stakeholder perceptions.

5. Analysis of archeology and cultural resource levels
Initially, cultural resource management only covers material cultural preservation activities, in the form of data recording and preservation of physical remains, then develops into preservation activities on everything that falls within the broader understanding and concept of culture.

6. Landscape analysis (geological and geographical)
The context of the region becomes an important thing in the management of cultural resources, including the waters of the island of Lae-Lae. This means the management of cultural resources in this area cannot be separated from the landscape or landscape of the area as the place where the cultural resources are located. Related to this landscape or landscape, Yuwono (2005) states that the terms landscape, nature, and environment generally have the same meaning. The difference lies in the aspect of interpretation [2].

In this regard, Bintarto (1991) divides the types of landscaping, which consists of 1) Natural landscape, namely natural landscape as a phenomenon/manifestation on earth, such as mountains and seas. This landscape can be compared to the term "landscape" in general terms, 2) Physical landscape, namely landscapes that are still dominated by natural elements, interspersed with cultural appearance. Living systems and natural and non-natural components are contained in this landscape, 3) Social landscape, i.e., landscape with varying physical and social appearance due to heterogeneity of adaptation and population distribution to the environment, for example, cities and villages with various facilities both individually and publicly. In addition to reflecting adaptation patterns, this landscape also visualizes people's perceptions of the surrounding environment, 4) Economic landscape, i.e., landscapes dominated by various economically oriented buildings, such as industrial areas, trade areas, urban areas, and tourism areas, and 5) Cultural landscape, i.e., a landscape which is a building/cultural element with natural features as its background. For example, in the residential areas and their accessories, in the form of rice fields, gardens, and yards. This landscape is the result of the interaction between humans and their territories [3].

7. Preservation efforts
Mulyadi (2014: 4) revealed that in order to achieve the goal of conservation, several stages are needed. In his writings it states that the steps commonly carried out are as follows: 1) Assess the importance of
cultural resources, 2) Protect some or all of the cultural resources so that they can last longer in the cultural system, 3) As far as possible inhibit damage or deterioration of its important values, and 4) Presenting as well as possible the importance of cultural resources so that they can be felt by the wider community [4].

Based on the description above, the assessment of the importance of a cultural resource is the initial stage before conservation or utilization [5,6]. Therefore, the important value contained in the P-38 lightning aircraft such as historical value, the wreck can be one of the evidence that in the area of Lae-lae Island and its surroundings in the past there had been an important event in the form of a battle between the Allies and the Japanese. Then the important value of science knowledge, In the field of archeology, the existence of the wreck of Lockheed P-38 Lightning aircraft can be the object of research because the wreckage is a legacy of important events in the past. In addition, the wreckage of the aircraft also has a scarcity value that cannot be renewed. Through the study of archeology, the wreckage can be further investigated and can also be managed in accordance with the rules of archeological science. The wreck of the Lockheed P-38 Lighting aircraft also has an important value for other sciences, namely aviation science. Aviation is the study of the world of aviation. The Lockheed P-38 Lighting was a reflection of the advances in aviation science in America during World War II. Economic value.

Efforts to preserve Lockheed P-38 Lightning wrecks are directed by increasing and empowering the role of the community. Suppose it is associated with an understanding of public archeology that aims to promote publicity to the public, in the sense that the community truly owns the cultural heritage. For this reason, community empowerment is important to consider in the conservation and management of cultural heritage.

The biggest challenge is the sea condition found on the Lockheed P-38 Lightning wreck, which is less clear visibility. In addition, considering that the underwater remains are made of metal and iron so they are the target of scrap metal hunters to be sold as junk. One solution that can be done to save the wreckage of the Lockheed P-38 lightening is by moving to another place. Moving objects that fall into the category of Cultural Heritage can be carried out as regulated in Law No. 11 of 2010 concerning Cultural Heritage.

Figure 1. An intact component of the Lockheed P-38 Lightning aircraft.

The wreckage of the Lockheed P-38 Lightning in the waters of Makassar's Lae-Lae Island, which needs attention is how to lift and maintain the wreckage so that it is not damaged. This is very important considering the excavation effort, not only on land but also in water, which is basically damaging and, therefore must be held responsible not only on paper (preserved by record) but also that the object must be physically safe from environmental changes (preserved by action), seeing the condition of the aircraft in such a way as to the level of structural damage and natural damage, lifting the plane ashore is a risky job. Of course, due to such conditions, the risk that will arise is, at the time of appointment, there are parts of the wreckage of the plane that is broken because of the compressive power. The second risk is that the environmental conditions underwater will be very different from the environment on land, so the weathering process will be faster than if the wreckage of the aircraft
remains underwater. Therefore, before a rescue action is carried out, it is necessary to first prepare preventive measures to keep all findings that will immediately be handled if they are to be appointed.

![Figure 2. The wreck of the Lockheed P-38 Lightning, seen from above [7].](image)

8. **Dive tourism potential of Lockheed P-38 lightning aircraft**

Tourism in Kurt Krapf's mindset is indeed positioned as a factor in economic development, so it is not surprising that tourism then becomes an activity laden with economic values. Tourism that utilizes cultural resources, such as sinking ships and their cargo, sinking building or city structures, and shipwrecks, are accompanied by promoting the economic understanding that causes conflicts of interest by preserving the values contained behind these resources [8]. It is possible to use a marine tourism approach, as part of ecotourism based on nature conservation efforts as an attraction to overcome this situation. Maritime tourism by the Government is included in special interest tours with activity zones on the coast, above the surface or seascapes and submarines or below sea level [9].

Dive tourism is one of the products of marine tourism which is grouped under the submarine type of activity. Dive tourism is a special interest tour that is defined as a form of travel that tourists have an interest in or attraction to special attractions or activities in locations or tourist destinations [10]. In fact, tourism in this segment is most sought after by foreign tourists because of its appeal related to the conservation of the natural environment and preservation of cultural heritage through community participation in its management.

The wreck of the Lockheed P-38 Lightning has the potential of a marine-based tourist attraction as it is known that marine tourism can be a tool for utilizing underwater cultural heritage on an ongoing basis. In supporting and helping administrators and law enforcers to get to what extent the boundaries of the underwater cultural heritage.

9. **Conclusion**

Underwater cultural heritage is the Lockheed P-38 Lightning aircraft, which was a fighter aircraft during World War II of the United States. The potential of the aircraft wreck, if viewed from the important value that is important for history, science, and culture so that it can be developed as an underwater tourist attraction in the waters of the island of Lae-Lae. In addition, judging from the condition of the location of the wreckage is located at a depth of 23-25 meters with poor visibility around 3 meters or turbid and buried in sand and a lot of garbage, so further action is needed.

Efforts to preserve the wreckage of Lockheed P-38 Lightning aircraft are very necessary, given that the wreckage is underwater is very vulnerable to damage caused by natural factors. Damage by natural factors in question is damaged, and the corrosion of the wreckage of Lockheed P-38 Lightning aircraft caused by surrounding conditions in the form of climate change. In addition, ways to improve and empower the role of the community aimed at promoting public publication.
References
[1] Tang M 2006 Kajian Pelestarian Cagar Budaya Bawah Air, Studi Kasus Tinggalan Pesawat di Perairan Lae-Lae Kota Makassar.
[2] Yuwono J S E 2005 Mozaik Purba Gunung Sewu: Hipotesis Hasil Eksplorasi Gua-gua Arkeologis Di Kecamatan Tanjungsari-Gunung.
[3] Bintarto 1991 Metode Analisis Geografi (Jakarta).
[4] Mulyadi L 2014 Review on Main Characteristic of Historical City as an Urban Design Alternative: A case study in Cakranegara City, Indonesia Int. Rev. Spat. Plan. Sustain. Dev. 2 30–43.
[5] Duli A 2014 Pemanfaatan Cagar Budaya vol 17 (Makassar: Balai Pelestarian Cagar Budaya Makassar).
[6] Duli A, Mulyadi Y and Rosmawati. 2019 The Mapping Out of Maros-Pangkep Karst Forest as a Cultural Heritage Conservation IOP Conference Series: Earth and Environmental Science 270 (2019) 012042.
[7] BPCB Sulawesi Selatan 2016 Laporan Survei Situs Bawah Air Perairan Lae-lae Kota akassar (Makassar).
[8] American Anthropological Association 2003 Resolving Conflicts in Heritage Tourism: A Public Interest Approach In Annual Meeting Chicago Hilton Towers.
[9] Departemen Kebudayaan dan Pariwisata (Depbudpar) 2001 Rencana Induk Pengembangan Wisata Bahari (Jakarta).
[10] Cooper, Chris, Fletcher J, Gilbert D and Wanhil S 1996 Tourism Principles and Practice (Malaysia: Longman Group Limited).