

USAT Liberty Shipwreck Site in Tulamben, Karang Asem Regency, Bali is Under Threats

Nia Naelul Hasanah Ridwan, Semeidi Husrin, and Gunardi Kusumah
Research Institute for Coastal Resources and Vulnerabilities
Ministry of Marine Affairs and Fisheries Republic of Indonesia
Jl. Raya Padang – Painan Km. 16, Bungus, Padang, West Sumatera, 25245
Email: niahasanah79@gmail.com

Abstract

USAT Liberty shipwreck site located in Tulamben Village, Karang Asem Regency, Bali Province is the most popular shipwreck diving attraction in Indonesia. The shipwreck is well-known throughout the world and brings in many domestic and foreign tourists since the 1980s. This underwater cultural heritage has a historical-archaeological value; it is a US cargo ship that sank during World War II and now the shipwreck functions as an artificial reef and is home to various marine life. This makes the wreck a very important coastal resource of this region and has a significant impact in the local people's life. The condition of the site is currently considered to be vulnerable due to a variety of damage caused by natural and human factors. Threats due to high water dynamics such as currents and waves that could cause erosion, scouring, sliding, and other changes in the physical environment make this shipwreck site highly vulnerable to a variety of mechanical and physical damage as well as chemical weathering and corrosion. The large number of tourist who dive on this site also threatens the site. The marine archaeological research of 2013 conducted by Ministry of Marine Affairs and Fisheries is aimed at study the deterioration of the wreck, to collect hydrodynamics, sedimentation, and water quality data for providing an overview of recent conditions of this underwater site, the ocean dynamics of Tulamben waters, along with the damages suffered by USAT Liberty wreck which threatens its sustainability as an underwater cultural heritage and diving attraction. Identify the different types of potential vulnerabilities would become the basis of policy making for its preservation efforts in the future.

Keywords: *USAT Liberty shipwreck site, Natural and Human Threats, Vulnerability, Dive attraction, Bali*

Introduction

There are a lot of publications on *USAT Liberty* shipwreck site located in Tulamben Village, Kubu District, Karang Asem Regency, Bali Province that highlights the importance of the site; it is the best known shipwreck diving destinations throughout Indonesia and one of the best in the world. We could find hundreds of thousands posts

mentioning the site on the internet (Fig. 1). The research found also many publications

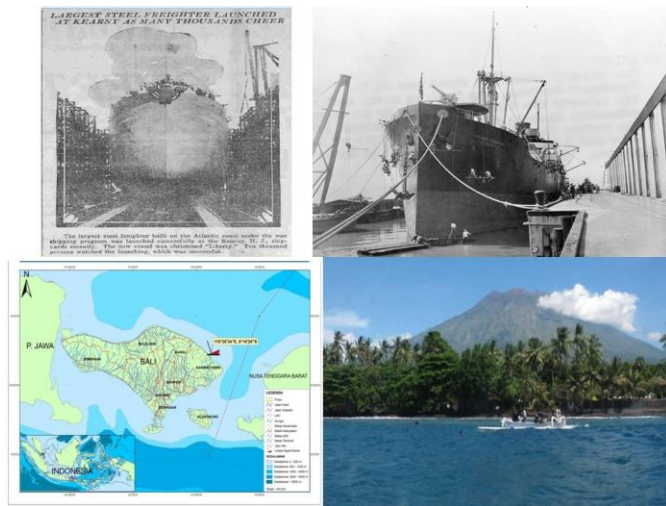


Fig. 1 USAT Liberty in 1918 and 1941 and Its Wreck Site Location. (US Army Signal Corps Photo SC 131484, US National Archives & Research Institute for Coastal Resources and Vulnerability)

discussing the locals attempt to protect the site by imposing their local traditional laws, *Awig-awig*, which includes fishing prohibitions nearby shipwreck location and prohibitions of destroying the ship's structure and coral reefs. The rules seemed indeed to be obeyed and nobody dares to intentionally violate this laws. Such matters have been discussed very comprehensive in the writings Kamaludin (2002), Supriyatun (2007),

Noerwidi (2007), and Ridwan (2011) and it has also been confirmed by the elders of Tulamben Village through interviews with Mr. Nyoman Karyasa (*Kelian Adat Tulamben*)ⁱ and Mr. Degeng (*Kelian Banjar Dinas Tulamben*)ⁱⁱ. However, until now there are no attempts from governments to discuss the vulnerability of *USAT Liberty* to withstand the effects of the natural environment and human factors. These risks are not covered by studies conducted by relevant institutions and authorities on the site. Thus far, undertaken studies are only focused on the stage of mapping and documenting, as the work carried out by Bali Office for Preservation of Cultural Heritage in 2011 (Tenaya, 2011). Therefore, this paper will discuss the vulnerability of *USAT Liberty* based on the identification of numerous factors threatening the shipwreck and its ecosystem, both environmental and human. This paper will also discuss what measures need to be considered to prevent further damage that could lead to the destruction and loss of the *USAT Liberty*. This extremely important issue requires to be addressed because the existence of *USAT Liberty* and its diving industry are the only basis of the villagers' life.

USAT Liberty History

According to Radigan (1996), *USAT Liberty* is American freighter ex *AK-35*, and ex *Liberty* (ID 3461), built in 1918 by Federal Shipbuilding Co., Hackensack, NJ with

125.43 x 17 x 8.08 m in dimension, 4,809 tonnage, and equipped with one piece 2500ihp power steam engine. She was launched on 19 June 1918, and the local newspapers at that time mentioned that she was the largest steel freighter ever made. In October 1918, this ship was used by US Navy and was named the *USS Liberty* (ID 3461). In 1939, it was used by US Army who renamed her as *Liberty US Army Transport (USAT Liberty)*. In May 1941, US Army and US Navy approved the decision that US Navy would return to take over the ship, but then US Navy did not get the personnel to be placed on her so that the ship eventually remains Army's property. In her journey from Australia to the Philippines carrying railroads, rubber, and logistics for the Allied Forcesⁱⁱⁱ, *USAT Liberty* torpedoed by Japanese Submarine *I-166* in January 1942 off Lombok Straits. US Destroyer, *Paul Jones*, and Dutch Destroyer, *Van Ghent*, attempted to drag her to Singaraja Port but she was already damaged and could not go very far and stranded at last on Tulamben shores (<http://pacificwrecks.com>; wikipedia). The ship then sank deeper and deeper into the depths and currently resides in a sandy slope at 3 - 30 m depth about 40 m from shoreline.

USAT Liberty Shipwreck Dive Attraction

Shipwrecks in Indonesian waters are one of the main potential marine resources that could be utilized for marine tourism (Ardiwidjaja, 2007). Under Indonesian regional autonomy law, shipwreck sites could become region's assets as marine tourism destination, as well as for the establishment of maritime museums. *USAT Liberty* is the most famous shipwreck dive site in Bali and has been included in the top 12 world shipwreck sites to be dived as noted by scuba diving website. Tourists regard this site as "a giant aquarium" due to the present of ± 400 marine life species which live around the site. There are also ± 100 species of high seas fish which visit the site regularly. Divers can find groups of *bumphead parrotfish*, *barracuda*, *grouper*, *pigmy seahorse*, *nudibranchs*, *murray eel*, *jackfish*, *napoleon*, *fusiliers*, *surgeon fish*, *trevally*, *bream*, *anthias mill*, *batfish*, *large sweet lips fish*, *angelfish*, *butterfly fish*, *anemone fish*, *lionfish*, *scorpionfish*, *hawkfish*, *pufferfish*, *coral trout*, *the gobies*, *blennies*, *shrimps*, *dottyback*, and others. Hard corals and soft corals i.e, giant barrel sponges, giant sea fans, *tubastrea*, *gorgonians* can also be found easily at this location. Scuba-mania claimed Tulamben as one of the most beautiful dive sites in Indonesia besides Komodo Island,

Bunaken, Wakatobi, Raja Ampat, Lembah Strait, Karimun Jawa, Bangka, Banda Sea, and Alor (Pickel, 2010; <http://gekodivebali.com>; <http://scuba-mania.com/>). In addition, it is the easiest location to enjoy recreational diving and to enjoy underwater scenery

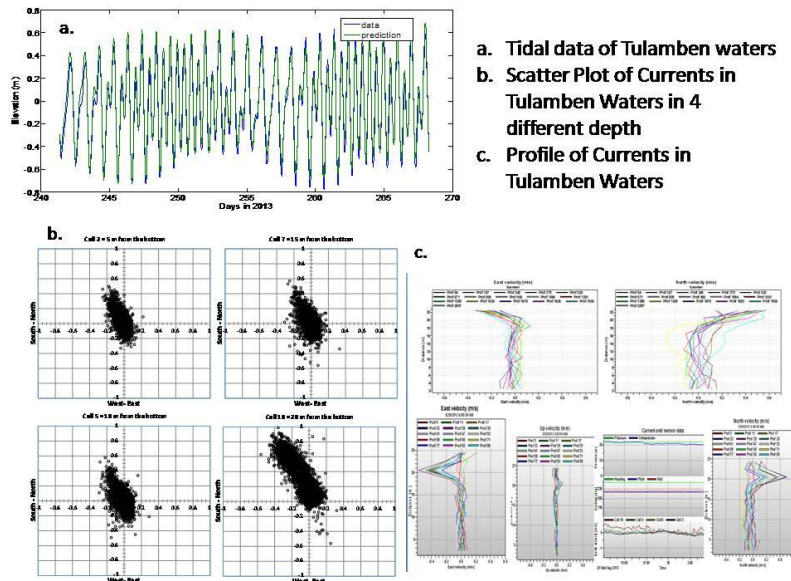


Fig. 2 Characteristics of Tides and Currents in Tulamben Waters.
(Research Institute for Coastal Resources and Vulnerability)

around the shipwreck. All skill levels divers could dive due to its unique positions in the seabed that ranging from shallow water until 30 m. *USAT Liberty* has brought immense benefits to Tulamben people's lives since 1980s and is closely related to people's livelihoods. It is important not only for the Tulamben villagers but also communities in Bali Province because all diving operators in Bali offer diving trips to *USAT Liberty* to the tourists. Nowadays, there are about 150-200/day tourists diving on the site and communities' income obtained from fees and services is about 500-1,000 USD/day. Meanwhile, the Tourism and Cultural Agency of Karang Asem noted that its regional revenue from tourism sector in 2012 was 1,200,000 USD and there were 416.363 foreigners came to the region to dive. This number is increasing continuously every year (<http://karangasembab.bps.go.id>; Ridwan, 2011).

Marine Archaeological Research

In 2013, Research Institute for Coastal Resources and Vulnerability conducted research at *USAT Liberty* shipwreck site in order to determine its significance and current condition as well as to carry out a visual observation of the deterioration and the extent of the damage. The research also aims to find out the physical environmental conditions and its changes as well as to identify the various factors threatening the site. This research result could become a basic reference for further conservation effort and a basis for the establishment of Maritime Conservation Area in accordance with the

Marine and Fisheries Ministerial Decree No. 17/2008 and the Underwater Cultural Heritage Site (UCH) determination in accordance with Law No. 11/2010 on Cultural Heritage. The field survey was conducted in June-July, August, and September 2013. Interviews with local communities, agencies, and relevant stakeholders to obtain data and information on the weather and climate conditions; shipwreck's history, and tourism industry development, had also been conducted. The team performed marine geology, ocean hydrodynamic, and water quality measurements to obtain sedimentation, water quality, and hydro-oceanographic data such as tidal, currents, and wave. Installing *Acoustic Doppler Current Profiler* (ADCP) equipment at 22 m depth with bottom-mounted system at *USAT Liberty* site location is a method to collect hydrodynamics data. Those data above are needed to determine water dynamics surrounding site location and to analyze the environment's influence on shipwreck sustainability.

Threats and Site conditions

Natural Factor

Nicholas Flemming (2011) said that globally, underwater archaeological sites are vulnerable to variety of damages caused by nature or human. A number of sites are devastated due to waves and erosion processes. Threats to shipwreck sites can be related to the changes in environmental factors due to the ocean dynamics in the region. The currents and winds could spur high waves and cause sedimentation, erosion, shifting, and sliding, thus making shipwreck sites susceptible to variety of physical-mechanical damages, as well as chemical damage i.e corrosion matters. *USAT Liberty* site is located in an area strongly affected by a very dynamic oceanographic conditions where the currents from Pacific and Indian Ocean meet. Tidal data measured by ADCP has 26.9 days duration commencing on August 29, 2013 until September 25, 2013 with a 10 minute data interval. Furthermore, the data were analyzed by using the T_TIDE processing program (Pawlowicz, 2002). Figure 2 shows the results of data analysis in which the tidal analysis results (predictions) appears closer to the actual data rate of up to 96.5% representation. Dominant tidal constituents are O1, K1, M2, S2, SK3, M4, S4, 2MS6 and M8. Based on the number formzahl ($Fz = 0822$), the nature of the tides in Tulamben waters is a mixture tidal tends to double

(Mixed predominantly semi-diurnal). ADCP current measurements enables us to see the profile of water mass flow column. Figure 2 shows the flow characteristics of Tulamben waters in the form of scatter plots at 4 different depths from the bottom waters, each 5 m, 10 m, 15 m, and 20 m. From scatter plot, it is clear that the current in Tulamben waters are generally dominant moving from East to West direction. Based on the wind data, other factors that lead to differences in the surface characteristics of the scatter plots clearly caused by currents driven by waves and a longshore. Profile of current flow also show the current tendency to move westward and northward, so that the resultant direction is predominantly to the Northwest. The current results measurements show the maximum current to the North reaches $v=1$ m/s, while to the West the maximum flow reaches $u=0.58$ m/s.

Volcanic sandy seabed around the wreck and the presence of strong currents at certain times can cause scouring in the shipwreck area. The hull



Fig. 3 Extreme Weather Condition in Tulamben Coast on Juli 2013. (Nia Ridwan)

section located in shallow waters can be affected by all kinds of weather conditions and there is also a large swell which can destabilize the fragile sections of the ship. The part of *USAT Liberty* shipwreck at the top is starting from a depth of 3-10 m so they could be affected significantly by the power of waves, currents, and winds at the surface. The weather conditions that are occasionally extreme lately in Tulamben waters most likely caused by climate change phenomenon. In extreme weather condition, wind will drive high waves and strong currents on the surface of Tulamben waters and could put strong pressure and make the ship parts in the shallow areas suffered the damage, became fragile, unsteady, and finally collapsed and fall down to the bottom, or befall the another ship part below it. So that successive events happened will cause even more damage

(Fig. 3). High waves on July 2013 hit Tulamben beach for 3 days and reached 3-4 m in height, and even had destroyed some hotels located right in front of shipwreck location. A few days after storms, we found there are 4 parts of *USAT Liberty* ship that are collapsed and dislodged from her superstructure: 1 point at the stern area, 1 point at the middle section, and 2 points at bow area. In fact, previously the collapsed parts of the hull have also experienced significant corrosion, so we strongly assumed that the high corrosion rate in these parts has weakened them, added by high waves effect so eventually those parts were no longer capable attached in her superstructure, then detached and fallen down (Fig. 4).

In 1998, *El Nino* caused severe bleaching in the coral reefs of the shipwreck site (Pickell, 2010) and from our observation, nowadays coral reefs attached to the hull are also experiencing stress. Tulamben dive guides stated that at this time many species of fish are disappeared from the site. The strong currents and waves in Tulamben waters also led to high erosion processes. Based on our observation, a process that deposited the *USAT Liberty* in its current location due to strong coastal erosion that occurs continuously. While the *USAT Liberty* initially shipwrecked on the beach, it has been moving to greater depths because the sandy bottom upon which it rests has been eroded by currents, tides, and waves. Although all existing publications indicate that the tremor from the 1963 Mount Agung eruption was a major contributor to the shipwreck's current location, our research shows that the erosion is probably the main process responsible to *USAT Liberty's* current location. Mount Agung tremor may also have affected her movement, but erosion is the most predominantly ocean and coastal dynamic process in that area. The elders of Tulamben Village mentioned that the difference between the distance of the current Tulamben beach and the previous shore line is about 100 m, thus, it can be said that there have been a shoreline change. The Regional Spatial Layout Plan 2012-2032 of Karang Asem Regency on Distribution of Protected Areas nowadays states that Tulamben is one of the coastal areas which is highly vulnerable to coastal erosion.

Tulamben beach is covered by black volcanic stones from Mount Agung's eruptions prior to 1963. We presume those stones used to be covered by sand, and then the sand was progressively run out and eroded by waves and currents. Eventually later, the

expanse of volcanic stones previously existed in the layer below the sand are appeared^{iv}. Since the erosion process has progressively "dropped" the *USAT Liberty* into the ocean and taking into account its position on a 60%-90% slope, it is highly likely that the *USAT Liberty* will move deeper into the ocean at depths that are no longer safely accessible by divers (Fig. 5).

Human Factor

The concept of in-situ preservation in protecting and managing UCH raises the idea of making an underwater museum in the site (Delgado, 2011) and a wreck dive attraction. In fact, the easy access to the shipwreck site for tourists and divers represent a potential threat even though it is an opportunity for archaeologist to present UCH to society. The marine tourism has improved the communities' welfare; however, the impact of yacht marina construction, coastal buildings, hotels, water sports resorts, touristic scuba diving, and the collection and souvenir sales have also impacted negatively in the preservation of the site (Fleming, 2011). The damage to the shipwreck

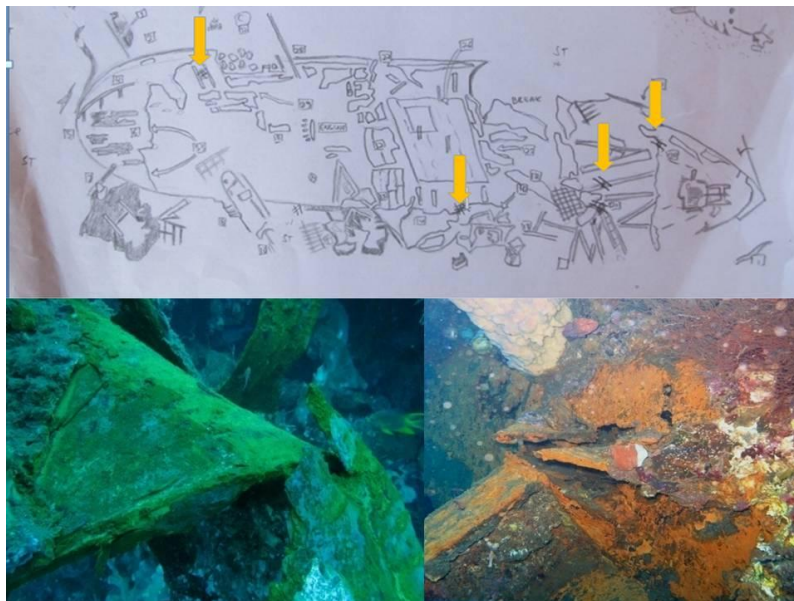


Fig. 4 The Heavy Corrosion Ship Hull at Bow Section which are Collapsed right after High Wave Event on July 2013. (Nia Ridwan)

caused by humans is not as dramatic as the damage caused by nature; however, this damage is cumulative and significant (Viduka, 2006, 62). The excessive use of *USAT Liberty* shipwreck in Bali is indicated by the large number of divers and their impact on ship preservation and its environment have not been examined by local governments. They do not realize that the large number of divers who perform

underwater activities have incurred in a tremendous pressure on *USAT Liberty* and its ecosystem. Increasing number of divers in *USAT Liberty* does give a significant

advantage to the development of that area, although on the other hand it could cause environmental damage problems to the sea floor and the shipwreck itself. The concern about its further degradation is actually emerging from the communities and local dive guide lately. They dive with the guests almost every day and they notice that there has been extensive damage to the *USAT Liberty* and its ecosystem. They also informed that at present time many fish species no longer appear on the site and many coral reefs are damaged and destroyed by the divers' negligence and carelessness (Pickell, 2010).

The tourists at *USAT Liberty* site are not intentionally damaging the site and breaking *awig-awig*, but it is certain that many divers unintentionally destroy the site. The ability

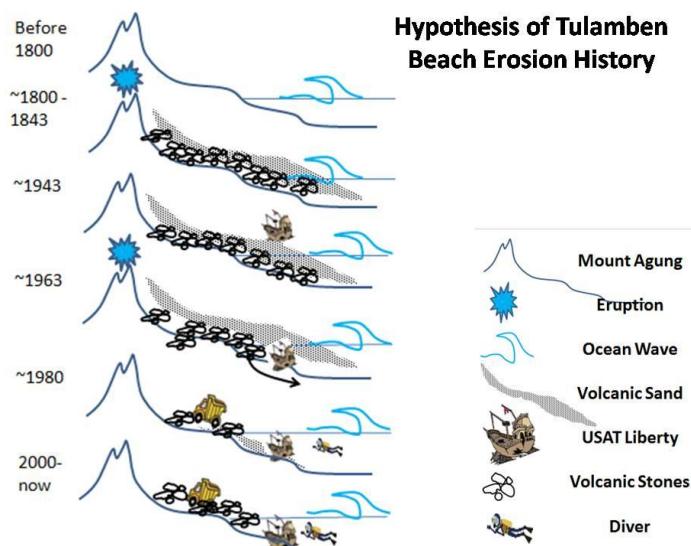


Fig. 5 The Hypothesis of Tulamben Beach Erosion History that Showing the Chronology of the Fall of USAT Liberty into Her Current Position. (Research Institute for Coastal Resources and Vulnerability)

of each tourist diving in *USAT Liberty* is not homogeneous. Many tourists do not have diving qualifications and they use the site to get their diving certification. Uncontrolled flapping fins, arbitrarily penetration into the hull, hands touching and holding the ship's parts directly could cause damage to *USAT Liberty*. Moreover, the habit of most divers to feed the fish is also against the rules of fisheries conservation. The large number of divers visiting the

site may also lead to exposure of the sandy sea floor in *USAT Liberty* site. The divers' fin kicking could agitate the seabed and kill unique animals and destroy some sensitive coral reefs^v. Besides physical-mechanical damage, the concentration of oxygen from air released by divers may transform into air pockets trapped in the ship's hull. This will accelerate the oxidation process which will increase the corrosion level and will accelerate the chemical destruction process, and corrosion is one of the most threatening chemical damage to iron objects (Fig. 6.)

Conclusion

Nowadays, extreme weather conditions often hit Tulamben area and the estimated effect is fairly severe on shipwrecks and its marine life. Erosion is the most dominant environmental changes in Tulamben which can substantially influence the preservation of the *USAT Liberty*. The movement of currents, tides, high waves, especially in extreme weather conditions causes physical damage and accelerates the mechanical fragility of shipwreck that has been previously corroded. Meanwhile, the sedimentation rate is relatively small and does not significantly affect *USAT Liberty*.



*Fig. 6 A Large Number of Divers in USAT Liberty Site.
(Nia Ridwan)*

Today, *awig-awig* protection is not sufficient and needs to be strengthened by other preservation efforts, i.e. limiting the number of divers on the *USAT Liberty*. This may not be easy to apply and there will be disagreeing parties who think it will reduce the community's income. Another solution could be to make the site an exclusive dive sites like *SS Yongala* in the *Great Barrier Reef*, Australia which has a limit of 7,000 tourists per year. We can monitor and limit the number of divers and still get a high income for the community by raising the entrance fee. In order to implement these policies, mapping this tourist destination according to its type becomes very important. Tulamben needs to be reviewed whether it is a mass-tourism, limited tourism, or eco-tourism area. Placing fish apartments and sinking another ship nearby can also be performed to build a new artificial reef and to provide an alternative dive site. The use of in-situ preservation methods such as corrosion prevention by *cathodic-anodic* protection using

sacrificial anode can also be done. Another site stabilization to anticipate problems caused by natural hazards can also be enforced. Depth study, long-term measurements and model analysis need to be done to get the complete of data. Measurement and monitoring the hull's progressive shift can be performed by regularly benchmarking and photo recording of the site after extreme weather conditions events. Making physical models, and numerical modeling are needed to prove the erosion evolution hypothesis that occurs over a fairly long period in Tulamben beach.

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Biography

Nia Naelul Hasanah Ridwan is Maritime Archaeology Research Scientist graduated from Department of Archaeology, Gadjah Mada University, Yogyakarta. Since 2005, she has been working in Ministry of Marine Affairs & Fisheries, Republic of Indonesia in Research Institute for Coastal Resources and Vulnerability. In 2011, Nia appointed as Head of Research Cooperation & Technical Services Division until present. She has researched several underwater sites throughout Indonesian waters. Her current research focuses to identify the factors threatening shipwreck sites and to examine ways to mitigate it. Nia had attended UNESCO Foundation Course on Underwater Cultural Heritage (2010) and In Situ Preservation Course (2011) in Thailand; 3 SEAMEO SPAFA-ICCROM trainings: in Thailand (2010), Singapore (2011), Philippine (2011); The Netherlands Cultural Heritage Agency Course on Managing Climate Risks towards a Sustainable Conservation of Mutual Cultural Heritage in Brazil (2011); and ICCROM Forum on Science in Conservation (Italy 2013).

Endnotes

ⁱKelian Adat is community leader who deal with social issues such as funeral rites, marriage ceremonies, rituals and traditional customs regulations.

ⁱⁱKelian Banjar Dinas is a hamlet head who is in charge in taking care of administrative matters, i.e. making residents identity card, family card, and then passing them to the village office, district office or civil registry office.

ⁱⁱⁱTulamben residents said that *USAT Liberty* also carried large quantities of black pepper and eucalyptus oil.

^{iv}This is confirmed by the village elders were say that they have no idea where those stones suddenly appeared. Even mentioned that these stones arise because of the "miracle of God". However, this can be explained scientifically associated with coastal erosion processes were fairly dramatic.

^vIn the 90s, a French photographer, who despite professional but was reckless, dived on *USAT Liberty* and dropped his fairly heavy camera. It hit a poisonous coral reefs attached to ship's hull. Besides destroying the hull and the reef, he and the other divers nearby also experienced severe poisoning (Pickell, 2010).