A Site Formation Study of a Possible Submarine Chaser in Tanapag Lagoon, Saipan

Jeffrey Pardee

Image courtesy of Matt Hanks, Flinders University.

Flinders University
Department of Archaeology
2010
Declaration

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person where due reference is made in the text.

NAME

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Abstract

In June 2010, a group of students from Flinders University and several other colleges took part in an archaeological survey of the World War II Heritage Sites in Saipan. One of the heritage sites included a possible Japanese submarine chaser in Tanapag Lagoon with the main objectives being the determination of site formation processes impacting the current state of the site, and the identification of this unknown vessel.

A basic site plan was created using a baseline offset survey to retrieve available data. A second survey was developed specifically to identify examples of destructive human interference on the vessel. Site formation literature was utilized in the interpretation of the results. Once the plan view was completed, those results were compared to Japanese vessels thought to have been sunk in Tanapag Lagoon before, during or immediately following the Battle of Saipan.

The results of the site formation study indicated that the vessel’s decrepit state was due more to cultural than natural processes with emphasis on extensive salvage and demolition. Identification of the vessel was difficult because large portions of the wreck, such as the stern, were missing. Without the vessel in its entirety, it was difficult to make a positive identification given the vast amount of ships in the Japanese Imperial Navy.

Because of the minimal amount available information, historical and archaeological, additional study is warranted.
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Primary Research Question: What type of site formation process impacted the current state of the possible submarine chaser in Tanapag Lagoon; cultural or natural events or a combination of both?

Subsidiary Research Question: Is the vessel a Japanese submarine chaser and if so, can a positive identification be made?

Consideration for Future Research

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Chapter 1: Introduction

Statement of Purpose

The island chain of the Marianas, now known as the Commonwealth of the Northern Mariana Islands (CNMI), was a pivotal defensive position used by the Japanese forces during World War II (WWII). In fact it was Japan’s last line of defence from a homeland invasion by the allied troops. The same islands were also crucial to the overall military strategy employed by the United States (U.S.). For both, the location of the Marianas was key, as they are located in close proximity to both Japan and the Philippines. Possession of the Marianas stood between the U.S. and air supremacy over Japan. The U.S. began an offensive operation with the invasion of Saipan in June 1944, now known as the Battle of Saipan. The main objective of the Battle of Saipan was the capture of Isley Airfield (originally called Aslito Airfield while the island was under the auspices of Japan), which brought Japan and the Philippines within range of U.S. long distance Boeing B-29 Super Fortress Army bombers (van der Vat 1991: 316). The battle resulted in an U.S. victory but at the expense of many U.S. and Japanese lives.

In 1981, an archaeological survey was completed on the southwest coastal area of Saipan to document objects associated with the U.S. invasion in Tanapag Lagoon (Thomas & Price 1980). The survey indicated several high profile sites that appear to be associated with the Battle of Saipan. In 1984, a group from the Pacific Basin Environmental Consultants firm conducted an underwater survey of Tanapag Lagoon for historic properties. Through their survey, they documented several wreck sites, including a possible Japanese submarine chaser (PBEC 1984: 10-11). The wreckage had actually been discovered by local divers long before the survey, but no archaeological work was attempted. The vessel is described as having the first 10 meters of
the bow of the vessel as being intact; however the rest of the ship is in a decrepit state, with the appearance of being pulverized by a natural event, salvage or explosives. There was no report of the stern being present.

Japanese submarine chasers were purpose-built small naval vessels designed for high speed on the open ocean in order to overtake enemy submarines and small crafts. The dilemma with this identification is that the historical record shows no submarine chasers were sunk during the Battle of Saipan (Jentschura et al. 1977: 214-220). Through an archaeological investigation and relevant historical research, and a consideration of current concepts regarding site formation, this thesis will attempt to ascertain the causes of the present condition of this submarine chaser, as well as identify the type of ship.

Background

Due to their geographic proximity to the mainland of Japan, both offensive and defensive strategists realized the potential of the Marianna Islands. Defensively speaking, since the Mariana Island group is located approximately 2,000 kilometres from Japan, they naturally form a last line of defence from any enemy invasions (Crowl 1960: 55: Figure 1.1). Defensive positions on these islands did not receive much attention until after the battles of Midway and Guadalcanal.
Offensively, the Marianas were not given a high priority by the Allied high command until the U.S. began realizing victories with the island hopping campaign. The capture of the Marianas was then considered to be crucial for victory against Japan (Figure 1.2).
The invasion of the Marianas by the U.S. began with the Island of Saipan during the month of June 1944. The Japanese defences of Saipan were already lacking supplies, men, and raw materials for construction due to U.S. attacks on Japanese merchant shipping. Defences were further weakened by an extensive naval bombardment which began on June 11, 1944. This bombardment lasted nearly four days, destroying multiple defensive targets and many aircraft on the island. On June 15th, 1944 the land invasion of Saipan began (Russell 1994: 14).

When U.S. ground forces landed on the beaches of the southwestern end of Saipan, they encountered a larger than expected Japanese force determined not to let their island fall. Fighting went on for nearly twenty five days until the Island was declared “secure” by the U.S. The atrocities on the island did not end with the fighting, as thousands of Japanese civilians committed suicide over fear of U.S. treatment and the shame of defeat (Hammel 2010: 188-189).
The concept of the submarine chaser utilized during WWII by both the allied and the axis nations, was a direct result of the inadequacies of naval anti-submarine warfare employed during WWI. While each nation had its own design, this thesis will concentrate only on the Japanese submarine chasers. After the cease fire following WWI, the potential for an arms race was apparent. The Washington Naval Treaty of 1922 was created to quell this arms race among the five major maritime powers: France; England; Japan; and Italy. Included among the many restrictions imposed by this Treaty was the mandate that no nation was allowed to build any new warship in excess of 10,000 tons (Jackson 2008: 44-45). Exhibiting total disregard, Japan in secret began building up its naval forces with the introduction of the first of four naval construction programs between 1930 and the beginning of WWII (Evans 1979: 238-250).

The Japanese submarine chasers were built for high speed, open sea combat, with the main purpose being the destruction of allied submarines. The first submarine chasers in the Imperial Japanese Navy (IJN) fleet were poorly designed, with a top heavy super structure rendering them unseaworthy (Jentschura et al. 1977: 214). Five more variations of the first construction followed, with minimal success (Jentschura et al. 1977: 216).

All classes of submarine chasers suffered from a lack of proficient anti-air weaponry and as a result, suffered major losses in the later stages of the war. These vessels were not suited for ship-to-ship action since they possessed no large caliber guns. Lack of sufficient armaments kept the submarine chasers from fulfilling the original intent, which was the rationale behind delegating these ships to escort duty. Nearly the entire submarine chaser fleet was destroyed either by Allied air attacks or naval engagement (Jentschura et al. 1977: 215-218).
Research Questions

Since there is minimal information available about this site, there are a few obvious questions that must be answered.

The main question to be considered is:

- What type of site formation processes impacted the current state of the possible submarine chaser in Tanapag Lagoon: cultural or natural events or a combination of both?

The subsidiary question is:

- Is the vessel a Japanese submarine chaser and if so, can a positive identification be made to which vessel it is?

Significance

In a locale such as Tanapag Lagoon that is rife with historical incident, it is of paramount importance to accurately identify historic wrecks. As noted by Konstam, “…Each vessel lost during a shipwreck sank at a particular moment in our past…” (Konstam 1999: 10). An identification of the possible submarine chaser will be a positive reference for the cultural and historical heritage of the area as it pertains to WWII. It is necessary to assess not only the historical impact of this site, but to develop a starting point for future projects focussing on sunken Japanese naval vessels in decrepit states with minimal historical information available.

To date, there has been no archaeological recording of a submarine chaser in Tanapag Lagoon. This research provides an opportunity to test basic archaeological techniques against a more modern and complex wreck site, as opposed to the traditional older or wooden wrecks. An archaeological investigation will aide in identifying the site and explaining why the site is in such a damaged state. Little information is readily available on the design and evolution of
submarine chasers and an archaeological investigation may reveal some design characteristics not yet known outside of the Japanese naval sources.

The island of Saipan is a heavily visited tourist location and it is the responsibility of archaeologists as scientists to provide correct information. It is also important to include the accurate causation of these sites.

Limitations

The absence of eyewitnesses and official Japanese government military accounts of the IJN naval inventory in Tanapag Lagoon at the time of the Battle of Saipan indicates a need to complete research of data not currently available. Research scope should include Japanese military records, IJN ship logs, and documentation still considered classified. Official Japanese historical records located were for the most part in Japanese, with no English translation available. Much of the information regarding U.S. military and government activities during and after the war is still considered classified and not available.

Additional obstacles included: insufficient time to obtain adequate information to create other than a basic site plan; difficulty in making identification of the vessel; and determination of possible site processes because a large portion of the ship was obliterated by as yet unknown forces. Safety issues regarding the presence of non-detonated ordinance within the wreck site were also cause for concern, as well as harmful biota such as stonefish (*Synanceia verrucosa*) (Australian Fauna 2004). As he bow is the only identifiable feature, comparison of the existing structure must be made to all similar vessel types utilized by the IJN, which is a daunting task.


**Literature Review**

Following the two archaeological surveys of Tanapag Lagoon previously mentioned, a third survey was completed in 2008 by Southeastern Archaeological Research, Inc. (SEARCH). This report included a remote sensing survey of the lagoon, revealing nearly 1,500 anomalies which may be associated with the Battle of Saipan (Burns 2008). One of these anomalies was identified as the possible submarine chaser. This vessel was found lying on its starboard side on a sandy bottom, with its sleek design indicative of a fast moving patrol vessel. According to both the SEARCH and NPS reports, the aft section is badly damaged and the stern is missing. The completion of a more thorough archaeological survey may be necessary to accurately identify the wreck and locate the official records regarding its existence.

In addition to archaeology reports on Saipan, articles written regarding site formation processes will be reviewed, as the current state of the site is a major concern of this thesis. Formation processes of fully submerged shipwreck sites are driven by many factors, which include, but are not limited to, the environment of the site, the age and construction of the vessel, human involvement and the cultural norms at the time of the wreck. The works of Schiffer (1971), Muckelroy (1976), Gibbs (2006) and Ward et al. (1999) will be reviewed, as well as the subsequent site formation process models.

**Chapter Outline**

This thesis is comprised of six chapters. Chapter 1 is an introductory chapter, which outlines the research scope of this thesis. Chapter 2 provides the history WWII in Saipan, as well as the evolution of the Japanese submarine chaser. It provides a general understanding of the historical and political importance of the wrecksite. Chapter 3 explores the previous surveys and reports pertinent to the discovery of the information necessary to make an accurate determination...
of the background of the vessel. It will also delve into the concepts of site formation, which includes human and environmental interference, as well as the site formation process models. 

Chapter 4 gives an overview of the methodology employed. Chapter 5 deals with the analysis of the data recovered and Chapter 6 is a discussion of the relevance and a conclusion of this research.
Chapter 2: Historical Background

Introduction

The island of Saipan is rich in historical context and figures prominently in several wars. Ownership or control changed several times as a result of war time reparation. Its role in WWII elevated it from an insignificant holding in Micronesia to a famous locale figuring prominently in the end of a world conflict.

Saipan

The largest island in the CNMI archipelago, Saipan was populated by a culture group which has come to be known as Chamorros, with archaeological evidence dating to 1000 A.D (Kirch 2000: 184-187). In 1521, Spanish explorer Ferdinand Magellan happened upon the Marianas during his navigational exploration of the Pacific, and the Marianas, named for Queen Mariana of Austria, were formally claimed by Spain in 1667. They remained a Spanish possession until being sold to the Germans in 1899. After WWI, the League of Nations gave control of the Marianas to Japan. Guam was not included as it has been a U.S. territory since 1898 (Purcell 1967: 153).

Geographically, the island is 23km long and 8km wide. The interior of Saipan is mountainous with dramatic cliffs located toward the northern end of the island. Two of these northern cliffs, Bonzai Cliff and Suicide Cliff, figure prominently in the Battle of Saipan. The highest peak is Mount Tapochau. Sandy beaches flank the western and southern coasts, but the eastern coast is rugged and rocky (Goldberg 2007: 30).
Role of Saipan in WWII

Japan viewed the acquisition of the Mariana Islands as “essential to their economic and military security” (Purcell 1967: 151). The League of Nations awarded Japan a Class C Mandate over Micronesia with one restriction being that no island in the group could be fortified (Purcell 1967: 171). Ignoring these limitations, Japan spent the next two decades building up holdings in Micronesia, which included renovating port facilities at Tanapag Harbour. This 10 year program culminated with the completion of a pier facility that could accommodate ships in excess of three thousand tons (Anon 1944: 132). The need for such a facility was met with scepticism by the U.S.

U.S. suspicions that the Japanese government was secretly fortifying the Mariana Islands were never confirmed since there was no policy in place allowing the League of Nations to investigate (Russell 1994: 7). These reservations were increased by two actions. The first was the Japanese invasion of Manchuria, China (Morston 2005:19). The second was Japan’s decision to terminate membership in the League of Nations prior to being censured for the attack on China (Haskew 2008: 28 & 143).

U.S. fears concerning unlawful Japanese actives were finally affirmed with the bombing of Pearl Harbour in December of 1941, leading to the beginning of WWII in the Pacific. With the U.S. Pacific fleet severely crippled, Japan quickly conquered most Allied holdings in the Pacific. Japan’s quick rise to power in the Pacific came to halt with the defeat at the battles of Guadalcanal and Midway in 1942. These U.S. victories were said to be the turning points in the Pacific conflict (Fisher & Forney 1996: 1-5).
Operation Forager

Admiral C.W. Nimitz, Commander-in-Chief of the U.S. Pacific Fleet, proposed a move through the Central Pacific with the control of Saipan the ultimate objective. Nimitz cited three reasons for his plan. The islands would provide bases for the eventual attack on Japan mainland. It would also bring about the final showdown between the U.S. and Japanese naval forces, and most importantly, provide air bases for B-29 bombers. The B-29 had an effective range of 5,600 kilometres with a bomb capacity of 4000 tons. The one drawback with the deployment of this weapon in the Pacific theatre was the lack of sufficient airbases to launch effective air missions (Willis 2007: 145-146).

Within striking range, the Mariana Islands were an ideal location to open Japan to the depredation of the B-29s. U.S. Joint Chiefs of Staff approved, and the plan named Operation Forager was put into action in 1943 with the invasion of Tarawa (Gailey 1995: 301). Nimitz was assigned 535 ships and 25000 troops to carry out Operation Forager (Olson 2007: 118).

The main invasion of Saipan was scheduled for 15 June 1944, with an extensive naval bombardment to begin on 11 June 1944. This bombardment lasted nearly four days, destroying multiple defensive targets on land and on water, as well as many aircraft on the island (Russell 1996:14). Fortunately for the U.S. forces, the Japanese commander, General Saito, erroneously expected an attack from the coral free eastern coastal area of Magicienne Bay and concentrated his troops at this location. Nimitz anticipated this, and ordered the troops to invade from the western coast, giving him a slight element of surprise. Elements of the 2\textsuperscript{nd}, 4\textsuperscript{th}, 8\textsuperscript{th}, 23\textsuperscript{rd}, 25\textsuperscript{th} and 29\textsuperscript{th} marine division landed on Saipan on the morning of the 15 June 1944 (Shaw et al. 1966: 264-274). These divisions landed on four invasion beaches code named blue, red, yellow and
green (Figure 2.1). The Marines, supported by army and armour divisions, were met at the beaches with heavy enemy artillery and machine gun fire (Figure 2.2).

Figure 2.1: Image of Saipan showing the colour coded invasion beaches
(Chapin 1994, accessed 13 September 2010)
By the end of the first day of combat, the U.S. forces had a firm hold on the southwestern beaches. The first night of combat on Saipan, the Marines were met with a massive counter attack across all of their lines (Figure 2.3). The counterattack by the Japanese was meant to break the U.S. lines and drive the invaders back into the sea (Shaw et al. 1966:278-279). The main attack was centered near the southwestern beach village of Charan Kanoa, with a smaller feint toward Tanapag. Fierce fighting ensued until July 9, when the island was declared secured. (Gailey 1995: 304-307).
The Great Turkey Shoot

Simultaneously as the invasion of Saipan, the U.S. fleet was on the move to meet the remains of the Japanese Navy in the Philippine Sea. Over a two day period, between 19 June 1944 and 20 June 1944, the Japanese Navy suffered a major defeat in which the bulk of IJN vessels were sunk. This battle is referred to as the “The Great Marianas Turkey Shoot” and sealed the fate of the defenders on Saipan (Morison 1953: 257-277).

Civilian Suicide

Emperor Hirohito took action to ensure no civilians would fall under control of U.S. forces. He felt surrendering would subvert the patriotism of the Japanese throughout his empire. Suicide was ordered and expected. Those in the military were of the belief that to fulfilling the responsibility as a member of society was a choice as well as honour, even if it meant death.
Death while defending the Empire assured one of an exalted honour in the afterlife. The civilians of Saipan who chose suicide were granted the same spiritual status of soldiers who die in battle. Over 10,000 civilians committed suicide, many jumping from Suicide Cliff and Bonzai Cliff (Ohnuki-Tierney 2002: 1-27).

While this event is a sad moment in world history, it was the catalyst for deploying the atomic bomb. U.S. command realized that the Japanese people would fight to the end. If unchecked, this fanatical resistance would result in the deaths of thousands of U.S. troops as well as Japanese civilians. Cost for the war was also escalating rapidly. A rapid end would be the answer.

Submarine Chasers

The concept of the submarine chaser vessel can be traced back to the actions of World War I. During this war, the world was witness to the destructive power and effectiveness of the German U-boat. The U-boat was such a powerful naval tool that the Germans made it the main offensive force of their navy (Jackson 2008: 32). Depth charges, developed in 1915, proved to be an effective weapon, but their relative scarcity made no real impact in anti-submarine strategies (Sternhell & Thorndike 1946:1-2). In the end, the only truly effective weapon against submarines was the development of the convoy system (Barratt 2002: 2). The convoy system was the grouping of merchant ships under the protection of naval warships.

The cease fire of World War I in 1918 created an arms race between the navies of Japan, Britain, France, Italy and the U.S. The Washington Treaty of 1922 was created to quell this arms race among the five major maritime powers. Included among the many restrictions imposed by this Treaty was the mandate that no nation was allowed to build any new war ship in excess of
10,000 tons (Jackson 2002: 44-45). The Great Depression of the 1930’s hindered shipbuilding in the U.S., which to an extent ensured Japanese naval superiority at the beginning of WWII.

**Auxiliary Submarine Chasers**

In addition to the purpose built submarine chaser fleet, the Imperial Japanese navy also employed a secondary or auxiliary fleet. This fleet consisted mainly of conscripted, captured or converted ships (Jentschura et al 1977: 217). The Cha 1 Class auxiliary submarine chaser was the only purpose built vessel in this fleet (Figure 2.4).

The design of Cha 1 submarine chasers was based on experimental 130 ton Yosuka type tug boats (Jentschura et al 1977:267). They were built under the Maru 4 Keiakus between 1939 and to 1944 (Evans 1979: 246-247). Constructed from wood, these vessels measured 28 meters long with a beam of 6 meters and a draft of 2 meters. The intention for building such a small combatant craft was to employ them after the war as fishing vessels. Each was armed with a 7.7 mm machine gun and 22 depth charges. With a maximum speed of only 11 knots, these vessels proved very ineffective against any U.S. submarine or aircraft attack. In total, 201 vessels from 17 different shipyards were built, but nearly the entire fleet was either destroyed or captured.

In addition to the Cha 1 class, the Japanese also used a variety of merchant, fishing, whaling and captured vessels that were modified with depth charges and machine guns for anti-submarine warfare (Jentschura et al 1977: 217-226). As with the main submarines chaser fleet, the auxiliary vessels lacked sufficient anti-aircraft weaponry and were vulnerable to aircraft attack. This diverse fleet did little to stop U.S. submarine attacks on the Japanese merchant fleet.
Naval Armaments Supplement Program

Not hampered by economic issues and exhibiting total disregard for agreements, Japan in secret began building up its naval forces with the introduction of the first of four naval construction programs between 1930 and the beginning of WWII under the Naval Armaments Supplement Program. The programs were referred to as Maru Keiakus and began in 1931 (Sajima and Tachikawa 2009: 55-59). Ironically, Japan had ratified the London Naval Treaty in 1930, along with the U.S. and Great Britain. This treaty was basically an extension of the Washington Treaty, but regulated submarine warfare, and placed additional limits on aggregate tonnage and shipbuilding. The intent was to further limit and reduce naval armament until 1937, with a meeting scheduled in 1936 to re-visit the situation. France and Italy declined to ratify the Treaty. Unfortunately, in 1934, Japan announced the decision not to extend the Treaty past 1936, as the production of Yamato super battleships had already begun four years earlier (Figure 2.5). Again, Japan did not feel inclined to honour its agreement (Goldstein et al. 1994: 147-150).
Under the first Naval Supplement Program, many new naval warships were constructed, including the first purpose built submarine chaser (Evans 1979: 238-240). Construction of the first two submarine chasers began in 1933 with both models completed in 1934 (Maru 1 Keiakus). Named Type 1 and 2 respectively, both models were shallow draft vessels powered by two diesel engines capable of over 20 knots (Figure 2.6). At a length of 65 meters, they were the smallest combatants in the Imperial Japanese Navy. They were armed with two British made 40mm Vickers “pom pom” anti-aircraft guns, two 7.7mm light machine guns and 36 depth charges (Jentschura et al. 1977: 214). These crafts were far from perfect, as the draft was too shallow, making them top heavy and very unseaworthy. An incident in which Tomozuru, a Japanese torpedo boat sharing similar design characteristics to the submarine chasers, capsized in a storm forced the IJN to rethink ship stability (Jentschura et al. 1977: 128). The submarine chasers received additional ballast to counter their excessive top heavy design. This incident
also forced the Japanese Navy to restructure the plans for the next version of the submarine chaser.

![Figure 2.6: Image of CH-2 submarine chaser (Imperial Japanese Navy, accessed 11 September 2010)](image)

Construction of the next version of submarine chaser, Type 3, began in 1935 (Maru 2 Keiakus) and was completed in 1936 (Jentschura 1977: 214). This version was slightly modified from its predecessor with a shorter length, 55 meters, and a lower bridge superstructure. Powered by two diesel engines, the Type 3 could also reach speeds of up to 20 knots. Armament for this version was the same as the Type 1 with the exception of the removal of the two light machine guns (Figure 2.7). Only one Type 3 was actually completed, but Type 4 vessels shared the same dimensions (Evans 1979: 240-242).
The next version of submarine chaser, Type 4, was constructed under the Maru 3 Keiakus program in 1937. All nine vessels were constructed between 1937 and 1939. These ships were similar to the Type 3 in terms of dimensions (Jentschura 1977: 215). The biggest differences were the addition of a negative shear from bow to aft and a low long bridge structure. The vessels were also reinforced with slightly thicker hull plating. Armament and speed capability was the same as the Type 3 (Figure 2-8).

In a continuation of the process to develop an efficient ship, Type 13 was completed under the Maru 4 Keiakus between 1939 and to 1944 (Evans 1979: 246-247). All 40 vessels were based on the previous designs but with numerous modifications. The Type 13 had a very
compact design measuring 51 meters long but was wider than the Type 4 by nearly two meters. In addition to this, the vessels also featured a “clipper bow” or a curve of the bow from the ship’s forward waterline. Though slower than its predecessor, the Type 13 was much more seaworthy. They were powered by two diesel shaft engines with a maximum speed of 17 knots. Armament for these vessels included one 80mm heavy machine gun, two 13.2mm antiaircraft guns, two depth charge throwers and 36 depth charges. The Type 13 also had two subclasses, the Type 28 and the Type 60, but were all considered Type 13 in official Japanese documents (Figure 2-9). The Type 28 design abolished the slant of the stern for the sake of mass production and was shortened to a length of 49 meters. The Type 60 was identical in appearance to the Type 28; the only difference was some changes to the internal supports (Jentschura 1977: 215-216).

Figure 2-9: Images of CH-25, CH-30 and CH-32 submarine chasers, examples of type 13 and 28 designs. Note the addition of the clipper bow and the negative sheer aft. (Hackett 2010, accessed 18 September 2010)
Role of Submarine Chasers

At the beginning of WWII, submarine chasers were used as fast moving troop transports and support crafts for the invasion of the Philippines, Java, Sumatra, Borneo and most of the early invasion activities of the Japanese Navy. (Hackett 2010: accessed 18 September 2010). At this time, Japanese convoys tended to be relatively small in numbers because it was well known that the U.S. possessed an extremely low number of submarines due to financial difficulties. As a result, the U.S. concentrated on locating and destroying Japanese carriers and warships, and was forced to all but ignore the merchant vessels (Galantin 1987: 128). By mid-1942, all submarine chasers were assigned to escort services of merchant vessel convoys. The reassignment was due to many factors: lack of escort warships; Japanese defeats at Midway and Guadalcanal; and the eventual superiority of U.S. aircraft carriers and quality of air squadrons. The one constant was the Japanese supply of raw materials and fuel quickly being depleted because the merchant fleets were no longer able to easily and safely navigate the Pacific. Japan’s ability to match the industrial capacity of the U.S. was drawing to an end (Galantin 1987: 165).

The obvious solution was for the Japanese submarine chasers to take on the responsibility of escorting the precious merchant convoys. Early problems with weak anti-aircraft weaponry became apparent when Unit 14 was damaged by RAAF aircraft in Truk Lagoon, October 1942. Realizing the lack of proper air cover from the 40mm Vickers “pom pom”, the Japanese Navy began to search for an alternative (Campbell 1985: 202). In 1944, all surviving submarine chasers were refitted with three French made Type 96 25mm anti-aircraft guns and the updated Type 13 or 22 radar systems (Jentschura et al. 1977: 216). The Type 96 anti-aircraft gun was vastly superior to the 40mm Vickers, but it still suffered from a low fire rate due to its inefficient
ammunition loading system (Hackett et al. 2009: accessed 19 October 2010). Even with the rearming, the submarine chaser fleet proved to be ineffective against allied submarine, aircraft, or naval attacks on Japanese merchant ships. This inadequacy resulted in many tons of raw materials and troops being lost. The entire submarine chaser fleet was either captured or sunk during the course of WWII (Jentschura et al. 1977: 216-217).

Salvage Operations and Underwater Demolition

Throughout WWII, Naval operations included a policy regarding marine ship salvage, which is not to be confused with preservation. Clarification of three pertinent terms must be addressed. Marine salvage is the process of rescuing a ship its cargo, or other property from peril. This may include rescue towing, refloating, repairing, and recovering valuable parts for resale or scrap. Scuttling is defined as the deliberate sinking of a ship. Often explosives are employed, such as torpedoes. Scrapping is the breaking up of a ship for recycling. Each may have had an impact on the site.

In 1943, several engagements in the Pacific indicated a U.S. need for hydrographic reconnaissance to determine issues such as depth, bottom composition, location of reefs and any human obstacles, as well as underwater demolition. The result was the Amphibious Training Base Training Program, which became Underwater Demolition Teams (UDTs). The teams saw combat as early as January 1944, and were involved in the Battle of Saipan. Prior to the battle UDTs preformed preliminary reconnaissance and were tasked with blowing up coral segments blocking the ship channel (Holland 2000: 127).

The UDTs not only cleared the way for ships and troops, but also located any re-usable materials. In addition to the UDTs, several salvage ships were deployed to Tanapag Lagoon
immediately following the battle beginning in mid-July 1944. There is evidence that the following vessels were among those salvage ships: USS Clamp, USS Preserver, USS Tawakoni, USS Valve, and USS Vent (Navy History 2005, accessed 27 September 2010). Unfortunately, the U.S. Navy ship logs found did not specify the ultimate fate of any salvaged materials. After the battle, Saipan was basically flattened by bombing, with re-building aided by salvaged materials. According to Galatin (1987: 210), “No scrap of salvable, usable materials was wasted…”
Chapter 3: Literature Review

Introduction

Archaeological surveys of this historic site have been conducted. Unfortunately, these surveys are not in-depth and only serve to pinpoint and record the location. Other than a few pictures no actual site survey has been conducted. These surveys will be the subject of this chapter. Because this is a site formation study, the fundamentals of site formation processes will be discussed in this chapter.

Past Archaeological Investigations

Thomas and Price

Several archaeological surveys have been completed over the past few decades in Tanapag Lagoon. The earliest report was conducted by Michael Thomas and Sam Price (1980) of the Pacific Studies Institute, under contract by the U.S. Corps of Engineers. The survey was an archaeological and historical reconnaissance of the small boat basin in Saipan (Thomas & Price 1980). They inspected the reef north of Micro Beach and the fishing base dock and channel west of Garapan. Unfortunately, since this was a surface survey, no excavations were attempted. Only cultural material located on the surface of the seabed sediment was recorded (Thomas & Price 1980: 22-25). This visual inspection led to the recording of only a few sites in detail, including a small calibre anti-aircraft gun located near shore and a light house or channel marker which was used as part of the Japanese coastal navigation system. The submarine chaser was not included in this report, but it is important to acknowledge that this was the first archaeological survey completed in Tanapag Lagoon.
National Park Service (1983 and 1984)

The next survey of Tanapag Lagoon was a two part investigation conducted by the National Parks Service (NPS) in 1983 and 1984. The first portion of the survey was completed in 1983 within the confines of U.S. Memorial Park. In October of that same year, the search was expanded to include Micro Beach, Smiling Cove, Outer Cove Marina and Inner Tanapag Lagoon. Nearly forty historical sites were located and consisted mostly of barges and pontoons associated with WWII. The most notable find was 14 railroad cars that were employed by the island’s sugar cane railroad (Manibusan & Miculka 1983:2). A year later in 1984, the NPS and the University of Guam’s Micronesia Area of Research recorded three landing crafts, two Sherman tanks and two Japanese planes in Tanapag Lagoon (Miculka et al. 1984: 2). The reason for the second survey was to assess the removal of certain sites from Tanapag Lagoon to preserve the historical integrity (Carrell 2009: 466). The possible submarine chaser was not mentioned in the NPS report.

Pacific Environmental Consultants, Inc.

In 1984, a team from Pacific Environmental Consultants (PBEC), Inc. conducted an underwater survey of Tanapag Lagoon. The objective of this survey was to photograph and record known and unknown sites within the search parameters. During this investigation nearly 20 sites were recorded including a Japanese sea plane, steel barges, a cement barge, landing crafts and a possible submarine chaser (PBEC 1985: 5-22). The possible submarine chaser at that time was known as “the submarine” by local divers. After close examination of the bow structure it was determined to be some sort of fast moving patrol vessel of Japanese origin (PBEC 1985: 15-16). No attempt at proper identification was made in this survey, nor were the references utilized to make the vessel class determination included in the report.
National Parks Service (1990)

In 1990 NPS conducted an assessment surveying the Mariana Islands, as well as several other Micronesia island chains, with four major objectives: to thoroughly document and describe the remains of a number of specific shipwrecks in Kosrae, Guam and Belau; to evaluate and describe the present condition of shipwreck sites in Saipan, Rota, Guam and Belau; to examine and document, when possible, the remains of a variety of non-shipwreck sites in Saipan, Rota, Guam and Belau; and to provide baseline information on the submerged resources of the islands for evaluation of site significance and suitability for nomination to the National Register of Historic Places and the cultural resources registers of the various islands (Carrell 1991: 23).

According to the report there were almost 40 wreck sites located in or near Saipan (Carrell 1991: 343). These sites date from recent WWII wrecks to the seventeenth century Spanish Galleon *Nuestra Senora de la Concepcion*. The report also claims only five sites have received more than basic cataloguing. These five sites include the possible submarine chaser and *Concepcion*. A basic description of the possible submarine chaser site was presented, including the length (46 meters), the fact that the first 15 meters were intact, but the remainder of the site was in fragments (Carrell 1991: 335).

The *Concepcion* was excavated by a treasure salvage group but the site itself and surrounding reef were destroyed during this process. Due to the outcome of this project, the NPS report recommended all sites remain under public ownership and that no removal be attempted. According to NPS, all sites, including the possible submarine chaser, should be excavated only by trained archaeologists.
Southeastern Archaeological Research, Inc.

The latest archaeological survey was conducted by the Southeastern Archaeological Research, Inc. (SEARCH) in 2008 (Burns 2008). They conducted a remote sensing survey on the west coast of Saipan outside the fringing reef and within Tanapag Lagoon. Seven hundred and seventy-eight unknown magnetic anomalies were detected, as well the recording of already known sites. Fifty-four sites were examined by the team via SCUBA and included previously located Japanese landing crafts and a sea plane (Burns 2008: 25-65). Simultaneously, another survey was being conducted off the west coast of Saipan in and outside the Garapan and Chalan Kanoa Lagoons. Here, the team located another 765 additional magnetic anomalies. Eighty-eight of these anomalies were chosen for further examination and were determined to be either previously located sites or items associated with WWII. Among one of the many sites recorded with side-scan sonar was the possible submarine chaser site (Figure 3.1). In addition to the possible submarine chaser site, a second possibly affiliated site exhibiting similar construction was also discovered. The report states the second site may actually be a piece of the first possible Japanese submarine chaser site “… that was moved to the edge of the lagoon” (Burns 2008: 72).

Figure 3.1: Side scan sonar image (SEARCH 2008: 68)
In 2009, Carrell revisited the 1991 NPS report of the Marianas, summarized all previous archaeological record, and included additional information, specifically regarding both possible submarine chaser sites. The two possible Japanese submarine chaser sites were discussed, with emphasis on a comparison. The discovery of the second possible Japanese submarine chaser site was based on the hull debris which resembled construction found at the first site (Burns 2008: 72). However, lack of engine components discredits this (Carrell 2009: 387).

Carrell introduces the possibility that two auxiliary submarine chasers, *Kyo Maru* 8 and 10, may have been sunk in Tanapag Lagoon in February of 1944. Both vessels were designed as steam powered whaling vessels but were requisitioned for anti-submarine warfare activities (Jentschura et al. 1977: 225). It is also stated that these two vessels were recorded by a Japanese ship loss database as being sunk 6 kilometres west of Tinian (Carrell 2009:387; Figure 3.2).

Figure 3.2: Auxiliary Japanese submarine chaser *Kyo Maru* 8 (Carrell 2009: 383)
The first site was described as a vessel on its starboard side in approximately 10 meters of water. The site measures 46 meters long with the first 15 meters of the bow section still in relatively good condition. Aft of the bow section, the vessel was completely demolished. The state of the site may be attributed to an extensive Tanapag Lagoon ship channel dredging operation completed in 1945. NOAA Chart 81076 places both possible submarine chaser sites near this ship channel (Carrell 2009:387). The ship channel separates the sites by nearly 1,000 meters. According to Carrell, this distance discredits the hypothesis that the possible submarine chaser site 1 and site 2 are the same vessel (Carrell 2009: 387). It was proposed that the second site may be an unidentified vessel. Additionally, Carrell stated that both sites may have been used for target practice by the CIA, or were extensively salvaged (Carrell 2009: 387).

Site Formation Studies

Formation processes of fully submerged shipwreck sites are driven by many factors, which include, but are not limited to: the environment of the site, the age and construction of the vessel, human involvement and the cultural norms at the time of the wreck (Muckelroy 1976). The actual definition of a site formation process readily accepted by archaeologists refers to the events that caused or created the site, and the actions that impacted the site after formation (Muckelroy 1976). In the past, the actual study of these methods was overlooked by many. Archaeologists often used interpretative frameworks, but rarely addressed the issue of how a site was formed (Schiffer 1972: 156). It was not until Schiffer (1972) wrote a paper titled *Archaeological Context and Systematic Context* which drew the attention of archaeologists to site formation processes.

It is now widely accepted that many processes affect a submerged wreck, but these processes sometimes can be difficult to identify in the archaeological record. Consideration
should always be given to site-specific processes and the wrecking event, as well as to accepted or anticipated effects. The following is a review of relevant studies on site formation processes.

Schiffer

In his work, Schiffer claims that archaeologists use assumptions about site formations, but these postulations are never adequately discussed in depth. Due to this, the assumptions can never be recreated, tested or modified. Archaeologists have come to identify two general types when considering formations: artefacts define the site or artefacts are useless peripheral refuse (Schiffer 1972: 166). Neither of these polar opposite views is normally correct, with the accurate assumptions a combination of both. Schiffer attempts to introduce this middle ground via several flow models. The first details five steps which most, if not all, artefacts must pass through: procurement; manufacture; preparation; consumption; and discard and refuse (Schiffer 1972: 156-158). Though he admits this is an over simplified model, it does highlight the main stages of the life of an artefact, with the exception of two additional phases: storage and transport. He goes on to state that some items may be reused and gives two terms for this, recycling and lateral cycling. Recycling is defined as the routing of an element at the end of its useful life to the manufacture stage. This simply means when an item proves no longer useful, it is then broken down for reusable parts and included in another item (Schiffer 1972: 157). Lateral cycling is the termination of use in one aspect and the resumption in another. Clothes, tools, and furniture are the best examples of these types of items (Schiffer 1972: 157-158). Schiffer addresses the issue that many useable items are often found on sites; he explains that it is not what is abandoned but how the site is abandoned that may explain this issue. To address the spatial view, Schiffer claims that each stage of an artefact’s life has a spatial relationship though he admits that they are very complicated (Figure 3.3). Spatial location of an item can
aide in interpretation of site formation (Schiffer 1972: 159-160; Figure 3.4). These definitions and concepts are necessary to outline for this research. They will be addressed in later chapters in relation to the site under study.

Figure 3.3: Flow model showing the life cycle of consumable elements (Schiffer 1972: 159)
Figure 3.4: Simplified flow model explaining differences between primary, secondary and de facto use (Schiffer 1972: 162)

Muckelroy

Site formation processes in maritime archaeology were not truly addressed until Muckelroy (1976) published his paper on the site formation of wrecksites. His theories were the basis for modern site formation studies (Gibbs 2006: 4).

In 1976, and again in 1978, Muckelroy began to elaborate on the site formation processes involved in shipwrecks (Figure 3.5). He proposed that the overall wrecking action of a ship is a single event, but each event consists of several stages: process of wrecking; salvage operation; disintegration of perishables; sea bed movements; characteristics of excavation; and observed sea-bed distribution (Muckelroy 1976: 158). He notes that the survival of wreck sites is dependent on their environment, with particular emphasis on the topography of the sea bed. A soft muddy bottom is more favourable for the survival of archaeological remains, as heavy objects can sink into the substrate, protecting them from a potentially destructive environment (Muckelroy 1978: 285-327)
He elaborated on the different stages of the wrecking process, noting that cultural impact upon wreck sites is found in the salvage or excavation phase. He also noted the rate of deterioration is dependent on disturbance and the environment of the wreck site. Muckelroy’s work was just the beginning of the study of site formation processes now used in maritime archaeology, but is not necessarily appropriate for all wrecks. His efforts with the deterioration of wrecks sites were biased towards wooden wrecks, likely because many iron wrecks were not considered historic at the time. His study into cultural impacts of a site does not include any events leading up to the point of wrecking but more about the evolution of the wreck site (Muckelroy, 1976: 158-166). His model for the wrecking and deterioration processes are quite
simplistic, but continues to be the basis for current studies and for the evolution of the standards utilized by maritime archaeologists.

Ward, Larcombe and Veth

In 1999, Ward, Larcombe and Veth presented a paper to the *Journal of Archaeological Science* that introduced an innovative concept for consideration: focus on the process of wreck disintegration instead of the results (Figure 3.6). Utilizing this concept, a model for assessing predicability of the wrecking process was developed based on physical, chemical and biological factors. They incorporated other factors in the sinking process, thereby extending the original flow chart proposed by Muckelroy (1978).

![Figure 3.6: Expanded version of Muckelroy’s original flow diagram, highlighting main processes affecting wreck disintegration: (a) the wreck, (b) the sedimentary environment, and (c) the hydrodynamic environment (Ward et al. 1999: 564)](image)
The physical model represents the deterioration factor of waves and tidal movement which have an effect directly and indirectly upon a wreck site (Ward et al. 1999: 1-3). Directly speaking, deterioration from physical forces is greatest at the time of sinking and the time the ship spends above the sea bed, since so much of the wreck is exposed. As the vessel sinks into the sediment, the deterioration rate from the physical forces begins to decrease. Indirectly, physical forces are responsible for sediment movement and can greatly affect the deterioration rate of other factors (Ward et al. 1999: 2-561).

Biological deterioration rates rely on the composition of the vessel. A wooden ship is vulnerable to wood borers. A vessel is made of iron is more susceptible to the indirect effect microorganisms have on the rate of concretion (Ward et al. 1999: 565-566). At the time of wrecking, marine biota occur naturally either in the water column or the surrounding sediment. After the initial wrecking, biological population will increase once the wreck has provided habitat and food resources. Exposed areas of the wreck will be affected by aerobic bacteria, while the buried parts are affected by anaerobic bacteria. Sediment movement or events such as a storm may result in a decrease of biological population due to removal of food resources or substrate. These events may be soon followed by an increase in biota since the event may have exposed parts of the wreck that had not been previously buried. As more of the wreck is eroded away or buried by sediment, the rate of aerobic bacteria may decrease while the activity of anaerobic bacteria may increase. Biological deterioration seems to stay at a constant rate, spiking only with sediment movements (Ward et al. 1999: 566).

Chemical forces are present on a vessel long before it sinks. The rate of chemical deterioration increases with the wrecking because parts that have been protected from seawater are now exposed. Exposed parts of a wreck will be affected more than buried parts. The
corrosive effects coat the wreck in metallic salts that may actually protect the site. Even if reducing factors are applied to all deterioration forces, disintegration of a wreck site will continue (Figure 3.7). Natural site formation processes will have some impact on any shipwreck.

**Figure 3.7:** Models showing rate of disintegration of three factors affecting shipwrecks; disintegration history of a wreck during a storm event described in terms of the rates of physical (dip/dot), biological (dB/dot), and chemical disintegration (do/dot), each plotted against the rate of sediment accumulation (+do/dt) or erosion (−dS/dt). The positive values up the y-axis represent the rate of relative sediment accumulation around the wreck, whilst negative values represent the rate of relative sediment erosion (Ward et al. 1999:565)

Gibbs

In 2006, Martin Gibbs took a new look at the cultural processes first introduced by Muckelroy, but sadly overlooked since (Gibbs 2006: 4-6). Gibbs expanded this process to include the impact of, and relationship between human behaviour and shipwrecks as well as cultural inferences at the specific moment of the wreck (Gibbs 2006: 7-17). According to Gibbs, shipwrecks are categorized into two distinct classes, catastrophic and intentionally deposited. His proposed model is introduced as a “disaster response” model, incorporating events before, during and after the actual ship wreck (Gibbs 2006: 8-10). The phases are: pre-impact; impact; recoil; rescue; and post-trauma (Figure 3.6).

Within the rescue and post-trauma phases, Gibbs explores the concept of salvage as opportunistic and systemic and reminds that it can occur often and over an extended period.
Opportunistic was defined as a non-systematic removal performed by people non-affiliate personnel. It is “...low intensity short duration...” process focusing mainly on easily accessible and removable items. Systematic salvage performed by affiliated personnel was described as an “...intensive and sustained...” process to remove any recyclable or valuable material regardless of difficulty (Gibbs 2006:14). He also concludes that salvage is dependent upon historical, locational, environmental, and legal factors (Gibbs 2006: 15-17). Gibbs presents two different types of salvage: opportunistic and systematic. These cultural processes may in part explain the state of the possible Japanese submarine chaser site.

Figure 3.8: Extended flow diagram showing cultural factors (Gibbs 2006: 16)
Use of Site Formation Process Models

A thorough understanding of site formation processes of shipwreck sites is crucial for conducting appropriate survey and the interpretation of the results. To better comprehend the possible Japanese submarine chaser site in Tanapag Lagoon, it may be beneficial to employ aspects of both natural and cultural site formation processes models. Both of these models are extensions of the theory developed by Muckelroy, which include the natural and cultural evolution of the material remains. The wreck sits on a sandy bottom with over half of the vessel scattered behind the bow. The Ward et al. model calls into play the actual wreck, the sedimentary process and hydrodynamics of the site as integral components of the formation process. Since the sediment layer of the Lagoon has risen, the relative sedimentation rate may be indicative of one the causes of structural instability and site degradation (Thomas and Price 1980: 3).

The Gibbs model focuses on cultural site formation processes while maintaining the principles of Muckelroy. Ward’s focus is on the natural site formation processes. Using both schools of thought will aid in the study of possible Japanese submarine chaser site.
Chapter 4: Methodology

Introduction

The purpose of this chapter is to present the research, methods and field techniques utilized during this project. It will outline and describe the archaeological and historical data collected in this process. There are no available primary sources available. Secondary sources investigated include: Jentshura Jung and Mickel (1977), experts in the development of the Japanese submarine chaser; a day by day chronology of the U.S. Navy during WWII by Robert Cressman (2000); and the list of Japanese Naval and merchant ships lost during WWII in the report submitted by the Joint Army-Navy Assessment Committee (1947).

Archaeological Research

A review of all available archaeological data indicates the need for further on site research to supplement known data collected by previous researchers. The most obvious need is the preparation of a site plan accurately recording any and all features of the vessel in Tanapag Lagoon. The data collection for this new site survey was accomplished in June 2010, as part of the Flinders University field practicum in Saipan. This practicum coincided with the U.S. NPS American Battlefield Protection Program Grant regarding WWII Invasion Beaches Underwater Heritage Trail. As stated in the NPS Heritage Preservation Services press release (2009), the ultimate goal of this project is to “…identify and document submerged remains of the Battle of Saipan for use in the future development of an underwater maritime heritage trail.”

The underwater portion of the survey took place over a two day period, as this was the time frame allotted. The research group assigned to assist on this project on first day consisted of four teams of two divers. On the second day, participants formed three teams, one with three
members and the others with two members. All participants were certified SCUBA divers involved in some stage of maritime archaeology and experienced in the underwater site survey process.

The visibility during this period was good with some fluxuation due to the overcast and cloudy conditions. Visibility never decreased below 10 meters. The current was minimal to zero. The actual location of the sunken vessel is approximately three kilometres from shore, requiring transport by boat. Since the site was located at a depth of ten meters, this project was diving only access. Snorkelling was not an option for an in-depth survey on the first day due to weather conditions. Due to the fact that previous reports indicated that there were unexploded ordnances (UXOs) in the area, the research team was advised to use extreme caution. The purpose of this survey was to archaeologically record the site and search for features that may aid in the identification and provide clues as to the current state of this ship.

In order to make site formation an integral part of this research, several works on site formation were reviewed. The first reviewed were the works by Muckelroy and Schiffer, which are the fundamentals from which all site formation research stems. The more comprehensive and up to date works of Gibbs and Ward were also reviewed, providing more in-depth information. This information prompted the overall research to include possible site formation processes in determining the current state of the Tanapag Lagoon site. Not only were cultural inferences included, but also natural processes, which was necessary to conclude how the different site formations could have impacted the site. During the site survey, team members were tasked with not only recording ship measurements, but also noting indicators of cultural site formation processes, such as, bent or broken hull segments, twisted metal, and signs of salvage.
Site Survey Process

During a topside snorkel survey before the first dive on the site, it was determined that the bow section of the vessel was the most intact and obvious feature to anchor the baseline on. In order to map the site quickly and accurately, the baseline was laid lengthwise down the middle of the wreck. A piece of wreckage at the stern end at nearly the same height as the tip of the bow served as the opposite point where the baseline was tied (Figure 4.1).

![Image: View of bow with baseline attached (Flinders University, photo by Matt Hanks, June 2010)](image)

The site measured 46 meters in length, so the wreck was divided among three dive teams in approximately 15 meter sections. These teams were equipped with a tape measure and mylar paper taped to a clipboard, and were instructed to take offset measurements from the baseline
(Figure 4.2). These measurements were first taken at three meter increments along the baseline, but eventually the increments were altered to one meter to enhance the formation of the basic outline of the vessel.

![Image of two team members taking offsets measurements](image)

Figure 4.2: Two team members taking offsets measurements (Flinders University, photo by Matt Hanks, June 2010)

The fourth dive team was responsible for a photographic survey, circling the site, photographing features such as the UXOs, hatches on the deck of the bow, internal structures and anchors, or any object that might aid in identification. One team member was responsible for taking photographs while the other was responsible for placing the north arrow and scale (Figure 4.3).
The first day on the site consisted of two dives with all but one team completing their assigned tasks. The second day of diving on the site was a continuation for one team to complete their section measurements from the day before. Another team of two divers was responsible for making a profile view of the bow in order to record hatches not visible in the plan view site plan (Figure 4.4). Since the bow is the most recognizable feature of the site, it was imperative to accurately record in detail.
The third team of three was tasked with searching for site formation processes to ascertain if any evidence was available to indicate the cause of sinking or disposal. This required one team member to identify examples of possible features, while the second member recorded what and where these examples were located and prepared a quick sketch (Figure 4.5). The third member photographed each example.
After the dives were completed, the topside weather conditions improved substantially which allowed one member to snorkel over the site and create a photo mosaic of the site. After each dive, a rough site plan was prepared in 15 meter increments to ensure each area was represented with sufficient detail. If any area was lacking, team members were able to revisit and add necessary details.

The last dive of the day was a reconnaissance mission, made to ascertain the composition of a nearby site. This location, referred to as "possible submarine chaser site 2," was first recorded by SEARCH in 2008 due to the overall resemblance of the large pieces of debris to
pieces found at the first site. Upon closer look, the research team determined that the site actually consisted of several pieces from a variety of unidentified sources.

**Historical Research**

Once a fairly accurate likeness of the overall structure of the vessel emerged, an assessment of historical documentation commenced. Researching the different vessel designs of the IJN used during WWII to find a bow shape matching the possible submarine chaser was the first step in this portion of the historical review. Personal communication with American historian and military author, Robert Cressman, was instrumental in locating documented information regarding the IJN. Information on IJN vessels came mainly from a book authored by Hansgeorg Jentshura, Dieter Jung, and Peter Mickel (1977), which detailed designs and fates of various vessels. In addition, a listing of IJN vessels composed by Cressman (2000) was also utilized. Eventually a listing prepared by the U.S. Joint Army-Navy Assessment Committee of Japanese merchant ships utilized during WWII was also located (King 1947).

Unfortunately, since only the bow of the Tanapag Lagoon vessel is intact, and strong evidence as to the exact history of this ship is non-existent, an extremely wide range of ships was included in the search. The search was further hampered by the fact that the stern was missing, and the hull area aft of the bow was badly damaged making exact measurements nearly impossible to determine. Only the bow is usable for identification purposes. One factor that did limit the search was the availability of the exact coordinates for the vessel in Tanapag Lagoon. Since most listings of WWII ships included longitude and latitude of sinking, this was the first manner of research. Access to WWII plans of different vessels is needed but may not be available due to age and availability. In all, the locations of sinking or damage of 669 IJN vessels
and 2,385 merchant and auxiliary vessels were compared to the latitude and longitude within the entire area of the Tanapag Lagoon. Only three vessels were found.

A review of available accessible historical documentation became the first stumbling block for this portion of the research process. While this vessel was most likely sunk approximately 60 years ago, which is basically considered relatively modern, several factors impeded the research process. Some information concerning U.S. government activities crucial to the research is still classified. Requests covered under the Freedom of Information Act were made to the United States Navy and Central Intelligence Agency to determine if any demolition training took place in the northern area of the island after WWII. No response has been received.

Only the first 15 meters of the bow section remain intact and useful for comparison. Many ships share a similar design as this bow section, but may differ further aft. Further, the sheer volume of ships utilized during WWII is overwhelming. These ships were mass produced by nearly all nations engaged in the war, resulting in similar designs. Factoring in the detail that ships captured by one country were often re-fitted, re-named and entered into the line-up of a new naval entity, makes identification methodology even more cumbersome. Merchant and private ships were also commandeered by the Japanese Navy for service in WWII, adding to the number and type of vessels to be considered. Comparing one small section of a vessel to thousands of ships engaged in service during WWII is a difficult task (Jackson 2008: 43-61).
Chapter 5: Analysis

Introduction

The initial premise for this thesis was to positively identify using archaeological methods the possible Japanese submarine chaser on the sea bottom in Tanapag Lagoon. After the initial research, it is uncertain whether a positive identification can be made for this vessel. The existing wreck site depicts what appears to be a fast moving WWII vessel of possible Japanese origin, but available historical evidence does not provide any conclusive information. Archaeological survey was necessary to not only record the vessel but to determine how different site formation processes have affected the site.

Analysis of the Site

The site sits in Tanapag lagoon at 15°13’86”N and 145°43.142”E in 10 meters of water (Figures 5.1 and 5.2). The entire site measures 46 meters, with the first 15 meters consisting of an intact bow section (Table 1). Beyond 15 meters, the site is fragmented and badly damaged with pieces ranging from 1 to 30 meters in size, with several running the full length of the hull. What appears to be the keel is present but it is mangled and runs the full length of the site. It is difficult to determine if it is completely intact due to overlying structure. The ship rests on its starboard side with the port side exposed to the elements. The keel and hull sections have broken away from the intact bow sections at 15 meters along the baseline. While large pieces of the hull are present, the dilapidated state renders identification difficult, even though the debris field does follow the original design of the vessel (Figures 5.3 and 5.4).
Table 1: Basic information on possible submarine chaser 1 site

<table>
<thead>
<tr>
<th>Latitude</th>
<th>Longitude</th>
<th>Site Depth</th>
<th>Site Length</th>
<th>Site Width</th>
<th>Bow Length</th>
<th>Bow Height</th>
<th>Bow Deck Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>15°13’55.86N</td>
<td>145°43’19.142E</td>
<td>In 10 meters of water</td>
<td>46 meters</td>
<td>16 meters at widest point</td>
<td>15 meters</td>
<td>7 meters</td>
<td>3.75 meters at widest point</td>
</tr>
</tbody>
</table>

Figure 5.1: Image of Saipan and the submarine chaser location within Tanapag Lagoon (Google Earth, accessed 23 October 2010)
Figure 5.2: Image of the Location of the Possible Japanese submarine chaser in relation to the opening of Tanapag Lagoon (Google Earth, accessed 11 October 2010)
Figure 5.3: Site Plan (Flinders University, drawing by Jeffrey Pardee, November 2010)
Figure 5.4: Photo Mosaic (Flinders University, photo by Jennifer McKinnon, June 2010)
Bow

The bow is in relatively good condition with the exception of a large dent on the port side near the keel, measuring approximately 2 meters long and 1 ½ meters wide. The depression depth is approximately 10 centimetres at the deepest point (Figure 5.5).

![Figure 5.5: Image of the dent in the hull of the bow section – 1m scale (Flinders University, photo by Sarah Nahabedian, June 2004)](image)

The deck of the vessel in the bow section is also intact with visible deck supports, and six hatches (Figure 5.6). Unfortunately, the hatch covers are missing. Existence of these hatch covers would have been important in identification. There was no evidence of railing on the gunnels, although this may have been salvaged.
The sharp design of the bow is indicative of a fast moving patrol or anti-submarine vessel (Figures 5.7 and 5.8). There is no evidence of a hawsehole, or the opening for an anchor cable or rope to travel through, on the port side. As the starboard side of the ship was obstructed from view, locating the hawsehole on that side was unattainable. The fact that there was no hawsehole on the port side was one of the first indicators that the vessel in question may not actually be a submarine chaser, as all evidence suggests double hawse holes, one on the port side and one on the starboard side should be present (Figure 5.9).
Figure 5.7: Profile view of bow (Flinders University, drawing by Jeffrey Pardee, November 2010)
Figure 5.8: Photo mosaic of bow (Flinders University, photo by Jennifer McKinnon, June 2010)

Figure 5.9: Image of bow showing lack of hawsehole as well as 90 degree angle of stem - 1m scale (Flinders University, photo by Matt Hanks, June 2010)
Mid-Ship

At the mid-ship section, the port side of the hull is collapsed. The keel and some segments of the lower hull plating appear to be partially intact, but only rise a maximum of 2 meters from the sea floor. A crack separates the intact lower keel section from the collapse hull. At this crack, the hull fragments are angled sharply toward the sea floor before flattening. There appears to be internal support beams in this area, but they are not attached to any part of the vessel. Because they are not attached, it is difficult to accurately determine their purpose (Figure 5.10).

Figure 5.10: One of the broken support beams -1m scale
(Flinders University, photo by Sarah Nah Abedian, June 2010)
A section of the starboard side of the hull was located at a distance 10 meters to the east of the baseline between measurements 15 and 30 meters along the baseline. Identification was based on the observation of the internal ribs of this section measuring 15 meters long by 5 meters at the widest point (Figure 5.11).

![Figure 5.11: Image of internal ribs of severed starboard side hull segment - 1m scale (Flinders University, photo by Sarah Nahabedian, June 2010)](image)

This section was partially buried and showed no sign of attachment to the rest of the vessel. There is evidence of sand movement as not all of the wreck is exposed. Sections of the starboard side of the hull are partially hidden, and, since there were no permits for excavation, the exact nature of extant hull planking could not be recorded. Four unexploded artillery shells were located approximately 3 meters west of the baseline at 28 meters. Three of the shells were resting on hull segments, but the fourth was partially buried and hidden by hull debris (Figure 5.12). This shell could not be measured but was documented.
Figure 5.12: Image of the unexploded shells sitting on a section of hull - 1m scale (Flinders University, photo by Matt Hanks, June 2010)

Three of the shells measured 35 centimetres long by 15 centimes wide. It is unclear if these shells still have their cartridge cases or have been fired because of the corroded state. This corrosion also limits any identification of the origin of the shells. Because of their location on the outside of the collapsed hull planking, lack of any ship armament, and corroded state, it would be conjecture to positively state these shells were part of the vessel’s cargo or they were fired or dropped by another vessel or from shore. Due to their size, it is possible that these shells were fired by a six inch gun during the naval bombardment.
A Danforth fortress style anchor was found 28.4 meters along the baseline on the east side (Figure 5.13). The anchor is 2.4 meters long and at the widest point, 1.7 meters. This type of steel anchor was developed in 1939 and was meant for small boats, but could be adapted for a larger vessel. The limit of vessel length this anchor could support is 23 meters. The limit alone makes it difficult to associate this anchor with the vessel. This anchor is most likely from a much smaller vessel such as a small dive or fishing boat (WM Marine n.d., accessed 27 November 2010).

![Image of the anchor – 1m scale](Flinders University, photo by Matt Hanks, June 2010)

**Aft Section**

At 46 meters on the baseline, there is an abrupt end to the vessel followed only by a barren sandy bottom. This end point does not appear to be the stern as it is a very jagged edge as if the ship was ripped in half (Figures 5.14 and 5.15).
Figure 5.14: Abrupt end of aft section on west side of site - 1m scale (Flinders University, Sarah Nahabedian, June 2010).

Figure 5.15: Image of east side of aft section; note the angle of profile - 1m scale (Flinders University, Matt Hanks, June 2010)
The engine components should have been in this area but were missing, indicating possible signs of salvage or other destructive forces. Because of this, it is not possible to determine the overall length of the vessel. The SEARCH team searched for an extension of the stern, or for the stern itself, but made no additional discovery (Burns 2008: 67). In a wreck of this type, with the stern apparently missing, the expectation would be to find more scatter on the around the parameters of the site. This could be due to sand movement burying the pieces, but due to the shear volume of material missing, this is not likely.

Second Site

The survey of the second possible submarine chaser site was only for reconnaissance in order to determine if it was associated with the main site (Figure 5.16). What was found on the bottom was nothing more than a dumpsite consisting of random parts from at least two ships based on the construction techniques (Figure 5.17).

Figure 5.16: Image of possible submarine chaser 1 and 2 sites (Google Earth, accessed 11 October 2010)
There was evidence of welded hull sections consistent with the main site. However, there were also examples of riveted hull sections, which are not consistent with the possible submarine chaser found at the main site (Figure 5.18).
This site contained no munitions or engine components of any type. There was no distinct shape to this site and it was not organized in such a manner to represent a ship. It is impossible to determine if these pieces were part of the main site due to the damaged state.

**Site Formation**

While historical data can not be confirmed regarding the fate of this vessel, several significant findings were made that will aid in determining what factors contributed to the overall state of the site. Of paramount importance was the overwhelming evidence that destructive forces were applied. These could be either natural or cultural forces or a combination of both. Essentially, the 30 meters aft of the bow section serve as a massive example of destructive
forces. The long dent on the bow section may be evidence of destructive forces, but it may have been caused by the action of the ship settling on the bottom.

At 15 meters on the baseline, there is an abrupt tear which separates the bow and midship sections. The tear begins on the deck level and continues through the keel. It appears as if the bow was cut from the rest of the wreck, but the sheer jagged appearance of the tear would infer that it was separated by more destructive means. There is a second tear near the keel on the port side where the outer hull pieces have folded in. This crack is parallel to where an intact keel should be and runs the entire length of the ship. It is located 7 meters west of the baseline, extending from 17 meters to 46 meters on the baseline (Figure 5.19).

Figure 5.19: Tear between bow and mid-ship section showing west (left) and east (right) sides - 1m scale  
(>Flinders University, photos by Matt Hanks, June 2010)<

At 21 meters on the baseline, is a large and jagged 5.8 meter hole in the port side of the hull, and at 23 meters a second large hole is visible. Further aft at 32 meters there are twisted and jagged pieces of hull sections and other indeterminate metal pieces not attached to any
structure (Figure 5.20). The mangled pieces could not be identified as to function, but are likely sections of the hull plating.

There are also several examples of bent cross beams. It should be noted that the majority of the wreck site is mangled nearly beyond recognition. More evidence of destructive forces is the crack that runs the length of the vessel on the port side near what appears to be the keel (Figure 5.21). This would indicate where the hull broke away from the vessel and formed the odd shape it exhibits now. This formation does not follow the norm as to how a ship degrades (to be discussed in detail in the next chapter) and is indicative of some sort of destructive or catastrophic event.
The stern or end of the ship appears to be torn, ripped or blown away by force. Crucial missing elements include engine components, rudder(s), propeller(s), and drive shaft. It looks as if it was actually blown away and obliterated, as opposed to broken in half (Figure 5.22). There is the possibility that the vessel was salvaged prior to sinking.
At the very end of the site, there is an abundance of wreckage which may be the superstructure, but it so badly damaged that it is unrecognizable as a feature. There is a bend in the hull sheathing that looks like the flattened port side which abruptly curves toward the surface. The highest points at the east and west ends drop dramatically in the centre to the sea bed. This may indicate an explosion that compromised the structural integrity (Figure 5.23).
This ship has suffered from catastrophic events. Whether the events were cultural or natural or a combination of the two will be discussed in next chapter.
Chapter 6: Discussion and Conclusion

Introduction

The vessel located in Tanapag Lagoon appears to have been subjected to destructive site formation processes. This chapter will examine the causes of the decrepit state of this previously reported WWII Japanese submarine chaser through an examination of cultural and natural site formation processes. A discussion on whether these events were cultural, natural, post-sinking or pre-sinking follows.

It also attempts to determine if the vessel is in fact a Japanese submarine chaser and to provide a positive identification. A combination of archaeological and historical research of the site and vessel type is used to gather pertinent information to answer the research questions.

Evidence of Natural Site Formation Events

The wreck site sits in the northern quadrant of Tanapag Lagoon, and is sheltered by not only the surrounding barrier reef, but by Managaha Island as well. Because of this protection, it is highly unlikely that the ship sank due to weather related factors, but this is not outside the realm of possibility. Even in the event of a catastrophic storm, a ship overcome by water normally sinks as a whole with a tight scatter pattern unless it is scattered across a reef. This is not the case for the possible submarine chaser wreck site. The layout of this site is more indicative of human interference. For comparison, the Japanese cargo ship Shoan Maru, was grounded and sunk in close proximity to the possible submarine chaser in Tanapag Lagoon in early 1943 (Cressman 2000: 144), and remains remarkably intact. If a catastrophic storm was the natural event that crushed the possible submarine chaser, it should have a similar layout as the nearby Shoan Maru.
To test this idea of human interference further, a look at natural degradation patterns of a metal wreck site should be made. Riley, in his assessment of metal ship degradation (1988), derived that the bow and stern of iron vessels deteriorate at a slower and more constant rate than the rest of the vessel. If the stern is actually present in the debris field, it has deteriorated at an accelerated rate not in concert with the bow. This could indicate that the site was formed by cultural processes rather than natural.

As previously reported, scouring may be a natural occurrence having a substantial impact on shipwreck sites. Parts of the site are submerged under sediment, which indicates sediment movement and scouring. It should be noted that, because of its geographical location, Saipan has experienced numerous large storms and typhoons which, according to Muckelroy (1978) and Ward et al. (1999), may have an effect on the movement of sand and the subsequent burial of large portions of vessels. Storms may also be part of the reason for the present scatter pattern, as well as for the small pieces of debris found just off the main structure. The missing stern should not be categorized as a victim of scouring or sediment movement as the sheer volume of sediment that would be required to bury such a huge section of the ship is not feasible. The fact that some sections of the vessel appear to be buried should not be confused with determining the rationale behind the missing stern.

The necessary equipment was not available to complete a full degradation survey of the vessel, so evidence of corrosion was only visually observed. It is doubtful that corrosion is a major factor in the formation of the scatter pattern of the site, since corrosion cannot physically cause metal to become twisted or shattered (Macleod & North 1987: 68-74). As previously mentioned, after the first 15 meters, the metal is in twisted heap. Corrosion will most likely be
responsible in years to come for the eventual break-down of the site since the larger portions will likely never be buried by a protective layer of sediment (Figure 6.1).

A few small schools of fish were noticed within the debris field, but not recorded because impact appeared to be minimal. Colonies of coral were present in limited numbers, but were not impacting the integrity of the seams of the hull or degrading the ship in any manner (Figure 6.2). The biota present did not seem to have a great affect on the site but according to the biological model by Ward et al. (1999: 7), it may have an impact in the future. Constant sediment movement combined with a never-ending supply of biological waste and influx of oxygen will greatly affect the supply of micro-organisms present in the sediment (Ward et al. 1999 :).

Figure 6.1: Image of the bow near the keel showing what little corrosion is present on the site - 1m scale (Flinders University, photo by Sarah Nahabedian, June 2010)
Evidence of Cultural Site Formation Events

The probable impact of cultural site formation events on this site is not based on hard and irrefutable evidence, but on possibilities dictated by archaeological data and a review of available historical sources. However, site specific historical information is not available. The overall decrepit state of the vessel is the first indication of destructive events leading up to and possibly after the sinking. Immediately behind the bow section, the keel is broken, which may indicate direct hits by bombardment that compromised the vessel. The lack of a stern may possibly be attributed to a direct hit to the stern, which may have obliterated these sections, scattering pieces over a larger area. Further, the possibility exists that the vessel could have been bombed at another location and towed to this location and dumped. Finally, the stern section of the hull could have been salvaged.
Four 6-inch shells were found on the hull structure just aft of the bow on the port side. The potential for explosion and the need to maintain the safety of the dive crew prohibited a close examination of the ordinance. The visual survey did indicate severe corrosion of these UXOs. Due to the size of the shells and location in Tanapag Lagoon, it is believed these shells may have been fired from a U.S. vessel or shore but did not explode upon impact and sank to the bottom. Six-inch shells were used by both the U.S. Navy and the Imperial Japanese Navy (IJN), so there is no definitive evidence of origin (Spennemann 2006: 12-20). An alternative is that they were used in a makeshift demolition procedure but failed to explode.

The Pacific Basin Environmental Consultants, Inc. (PBEC) report (1984) surmised that this vessel was carrying a large number of shells, but the feasibility of this conjecture is questionable. There are four UXOs within the site on the port side of the hull (Figure 6.3). The hold, where the PBEC purported the shells were located, is not evident because of the overall decrepit state of the site. The cargo hold may have been mangled beyond recognition or may have vanished due to cultural events. In either case it stands to reason that any ordinances originally in the cargo hold would also be missing or destroyed. The inline positioning of the shells may be evidence of later cultural processes.
Instances of damage viewed on this vessel may be consistent with the effects of depth charges and other underwater explosions. Immediately following the initial attack during the Battle of Saipan, U.S. naval underwater demolition teams (UTD) were tasked with clearing any and all obstacles that were construed as dangerous to supply ships entering the lagoon (Holland 2000: 127). UTDs were active throughout Operation Forager, but documentation regarding specific actions is not available at this time. Oral accounts from UTD members are available but accuracy is not definite (Cunningham 2005:232-321). What does point to UTD activities is the crack which runs down the length of the port side near the keel (Figure 5.14: 63). The chance that this crack was formed by a storm or other natural events is not likely. Other ships sharing this same environment at equal or shallower depth do not share the same distinctive characteristics and are mostly intact. An additional indicator of underwater explosion or depth
charge usage is the location of the unattached starboard hull section sitting 3 meters east of the rest of the vessel. This appears to have been separated from the hull through possible explosion. It is too far away to be caused by a natural occurrence.

The break in the keel and the separation of the mid-section from the bow may be additional evidence of underwater demolition. If this ship was attacked on the surface the separation could have occurred as it sank to the lagoon floor. The damage is more consistent, however, with other ships sunk by underwater explosions. An example of this is the damage inflicted on German submarine *U-166*, sunk in the Gulf of Mexico by a U.S. PT-boat in 1942. It was sunk by a depth charger and the damage sustained is similar to that of the possible submarine chaser (Warren 2004: 2-7). The similarities are mangled metal, large dents in the hull, and separation of ship segments (Figure 6.4).

This wreckage could also have been the result of underwater demolition training sponsored by the U.S. Central Intelligence Agency (CIA) and the Naval Technical Training Unit (NTTU) during their brief stay on the island during the 1950s and 1960s. The activities of the CIA and the NTTU on Saipan remain classified and requests for information have gone unanswered (Lansdale 1961: 643-649).
The possibility of salvage having an impact on the site must also be considered. There is some evidence that this vessel may have been salvaged before it sank. Actually, the evidence is not what is present, but what is not present. On wrecks found in Truk Lagoon (Jeffery 2007), several small items, such as cutlery and plates, representing daily life on a ship, were found on Japanese vessels. There were no such items at the Tanapag Lagoon site, nor were there any skeletal remains. The lack of skeletal remains could have several explanations. The crew may have evacuated the ship successfully before or after the ship began sinking, or there may not have been a crew because the vessel was purposefully sunk. Salvage would also explain why the engine components and most of the stern section are missing. If the vessel was sunk by bombardment, there should be a wreck trail following the scatter pattern, but this area is comprised of sand only. Salvage may also elucidate the probable correlation between the two submarine chaser sites in the lagoon. Once all useable pieces of the vessel were removed and the vessel sunk, any refuse from the salvage efforts may have been deposited at the time or possibly at a later date at the second site. It stands to reason that salvage operation would include the removal of defensive and offensive weaponry.

There is also the possibility that this vessel was demolished during the many dredging activities that have taken place within Tanapag Lagoon. The first dredging activity following the Battle of Saipan took place in 1945. The ship channel which is between possible Japanese submarine chaser sites 1 and 2 was dredged to 10 meters (Carrell 2009: 387). Evidence of additional dredging operation prior to the 1984 discovery of the site by PBEC was not located.
Ongoing Cultural Impacts

The PBEC (1984: 10-11) report claimed that this site had been called the “submarine,” indicating that the local population knew about this site long before archaeologists began surveying Tanapag Lagoon. It is possible that local salvage may be responsible for the lack of small items. This could also explain the missing sections of the wreck site, though this is somewhat unlikely due to the size and weight and machinery necessary for removal. The anchor found on the site is far too small for a vessel of this size and more than likely came from a small diving or fishing vessel. Several car batteries litter the bow section. This may be suggestive of a location system, but could also be the result of refuse dumping by locals. A large fish hook was found on the site, which is possible evidence of recent fishing activities by locals. This still requires some further research.

Identification

The identification process for the Tanapag Lagoon vessel has been hindered from the onset by many factors. First, there were very few Japanese submarine chasers built and the final fates of most are known. Lack of any markings of origin further impedes positive identification. Available information regarding the fate of all vessels in the IJN is available, but from U.S. sources only. Finally, the Japanese government may have a more thorough listing of the fate of its naval vessels, however this is unavailable.

Unfortunately, the available information is often inconsistent or contradictory. The fate of the IJN cargo ship Shoan Maru is an example of these inconsistencies. Cressman (2000: 144) reported Shoan Maru was damaged by U.S. submarine Whale on January 27th and towed to Saipan where it was scuttled. Both the patrol report (Naval History and Heritage Command n.d.B: accessed 21 October 2010) of the U.S. Whale and the Joint Army-Navy Assessment
Committee Report (King 1947: 38) state the ship was sunk on January 27, 1943 near Truk, with no mention of being towed. The location of engagement in each source is the same.

Historical records indicate three vessels were actually sunk within Tanapag Lagoon (Table 2). Special minelayer Ma-101 was a Japanese vessel that had a boom on its broad bow. This vessel was originally a British Barricade Class boom defence vessel called HMS Barlight, captured by the Japanese and refitted as a minelayer. The shape of the bow of a mine-layer does not correlate to the narrow bow found at the site, because the narrow bow could not have support the boom (Figure 6.5). Other than information regarding location of sinking, no other data was found for the second wreck, a cargo ship called Mutsuyo Maru. While this ship can not be ruled, lack of information prohibits any definitive identification and this vessel from being a candidate. Keiyo Maru, which was either a cargo ship or aircraft transport, possessed a bow with a similar shape as the bow of the sunken ship (Figure 6.6). The Keiyo Maru was apparently attacked and beached in the lagoon and two days later was bombed during an air raid attack (Cressman 2000: 217). Because this ship fell victim to multiple attacks, it is possible that what is on the seafloor of the lagoon may be the remains of the Keiyo Maru. The level of damage to the site is such that identifiable features are now unrecognizable. As no original ship plan is currently available, this is merely a possibility.
Table 2: Ships that may have sunk near the possible submarine chaser 1 site

<table>
<thead>
<tr>
<th>Ship</th>
<th>Type</th>
<th>Latitude/Longitude</th>
<th>Fate/Date</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mutuyo Maru</td>
<td>Cargo</td>
<td>15°14’N 145°44’E</td>
<td>12/06/44 sunk</td>
<td>Unknown</td>
</tr>
<tr>
<td>Keiyo Maru</td>
<td>Passenger Cargo</td>
<td>15°14’N 145°44’E</td>
<td>12/06/44 Beached in Tanapag Lagoon</td>
<td>133m length 17.8m beam</td>
</tr>
<tr>
<td>Ma-101</td>
<td>Special Minelayer</td>
<td>15°15’N 145°45’E</td>
<td>15/06/44 Sunk in Tanapag Lagoon. May have been refloated, repaired and ceded to China.</td>
<td>45.7m length 9.63m beam 2.84m draft</td>
</tr>
</tbody>
</table>

Figure 6.5: Image of a Barricade class net layer used by the Royal Navy; note the bulbous stern and boom on bow (combinedfleet.com)
One additional ship that should be considered is submarine chaser CH-4. This is the only Type Four submarine chaser with an unknown final fate. It should be mentioned that the overall bow shape of the Type Four is similar to the bow of the vessel in Tanapag Lagoon (Jung 1977: 214-218). A second submarine chaser, CH-9, was ceded to China in 1945 and retired in 1960. While the final fate is not mentioned, it would appear probable that it was either scuttled or salvaged in China (Figure 6.7).

Table 3: List of all IJN submarine chasers, including final fate

<table>
<thead>
<tr>
<th>Class</th>
<th>Submarine Chaser</th>
<th>Final Fate/Date</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH-1</td>
<td>CH 1</td>
<td>Sank 19/7/45</td>
<td>5°07’S 110°E</td>
</tr>
<tr>
<td></td>
<td>CH 2</td>
<td>Sank 27/6/45</td>
<td>7°25’S 116°E</td>
</tr>
<tr>
<td></td>
<td>CH 3</td>
<td>Scuttled 11/7/46</td>
<td>Singapore</td>
</tr>
<tr>
<td>CH-4</td>
<td>CH 4</td>
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<td>Sank 26/3/45</td>
<td>10°35'N, 95°45'E</td>
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The ultimate fates of these four vessels are questionable (Cressman 2000; Jentschura et al. 1977; King 1947; Hackett et al. 2010). While Cressman lists IJN special minelayer *Ma-101* as sunk in the lagoon, further research indicates the mine layer was refloated, repaired and ceded to China (Hackett et al. 2010). Using the *Shoan Maru* as an example, the location of the sinking may not indicate the final disposition. The *Shoan Maru* was reported damaged outside Tanapag Lagoon at 14°15′N, 153°43′E, but possibly rests within the lagoon at 15°15′N, 145°43′E.
The historical record of *Mutsuyo Maru* and *Keiyo Maru* provides additional inconsistencies. Cressman (2000) lists cargo ship *Keiyo Maru* as damaged on the 11th of June 1944, and bombed and sunk by airplanes from Task Force 58 two days later at 15°15’N, 145°42’E. No mention is made of *Mutsuyo Maru*. According to the Joint Army-Navy Assessment Committee Report (King 1947: 60), the *Mutsuyo Maru* was sunk on June 12, 1944 at the exact coordinates listed for the *Keiyo Maru*. This report does not list *Keiyo Maru* on any date. The problem is that the *Keiyo* and *Mutsuyo* may be the same ship. However, evidence is not available to support or oppose this claim. These types of inconsistencies are present throughout the literature.

Based on the site survey and historical research, it is possible to begin defining this vessel. The sharp bow points to a fast moving patrol vessel, such as a submarine chaser or escort vessel (Figure 6.8). The lack of a boom limits the possibility of it being a minelayer or netlayer. It is doubtful this is a submarine, as there are no forward fins or torpedo hatches.
If this is a submarine chaser, the lack of a clipper bow limits origin to one of the first 12 units created. The angle of the stem in relation to the keel is nearly 90 degrees, similar to that of one of the earlier types of submarine chasers (Jentschura et al., 1977:215). Size and shape of the bow eliminates the possibility of it being any large warship such as a destroyer, aircraft carrier or cruiser, as well as a cargo ship (Jentschura 1978: 10-70). Evidence points toward a type 4 submarine chaser design or some other type of patrol or anti-submarine style vessel. In order to make an unequivocal identification of the vessel in Tanapag Lagoon, original design plans are necessary, and to date, these have not been located.

There is also a strong possibility that this vessel may be the remains of an auxiliary submarine chaser. The only purpose built Japanese auxiliary submarine chaser, class 1, does not match the design or composition of the wreck in Tanapag Lagoon. This class was only 26
meters long, made of wood, with a bulbous bow. This does not, however, exclude the possibility that it is an auxiliary submarine chaser. The auxiliary fleet consisted not only of the type 1 vessel, but a variety of whalers, trollers, merchant or captured vessels, modified for anti-submarine warfare (Jentschura 1977: 221-225). There are two auxiliary submarine chasers documented as having been sunk in Tanapag Lagoon (Carrell 2009:383), however these vessels do not match the design of the possible submarine chaser in Tanapag Lagoon. It should be noted that the sinking location of these two vessels is questionable as there are two separate locations listed (Carrell 2009: 387).

Additions to Existing Theories on Site Formation Processes

While reviewing the site formation process, it becomes clear that the actual sinking, as in the moment the ship leaves the surface until it hits the sea bed, has received insignificant and insufficient attention. There appears to be two main and distinct types of incidents causing a boat to sink: passive and destructive. Passive sinking occurs when a vessel is simply overcome by water, either due to weather, wear and tear, or a combination of both. Specific causation aside, vessels sunk by passive means all share some common characteristics. In a passive situation, the vessel normally sink as a whole unit, meaning the scatter pattern on the sea bottom is relatively small, with the original shape of the ship remaining constant over an extended period of time. Eventually, the shape of the vessel will begin to distort due to environmental or cultural effects. The USS Monitor is an excellent example of passive sinking, as inclement weather and a design not seaworthy in rough water combined to cause this ship to flounder. Once located by archaeologists after sitting on the Atlantic Ocean floor for 111 years, the Monitor was found to be mostly intact (Watts 1996: 210). Other examples include the Mary Rose (Rodger1997:153-
156) and the *Vasa* (Kvarning, 2002: 25-32), both of which filled with water and sank without much damage to the hull.

Destructive sinking occurs when a vessel sinks due to some type of destructive action. This can include but is not exclusive to hitting an obstruction, a naval attack, or large wave action. As with passive sinkings, ships falling in the category of destructive sinkings share different characteristics. Scatter patterns found on the sea bed are much larger than those resulting from a passive sinking. The reason for this is that vessels experiencing destructive sinking are sometimes torn apart in the process, resulting in a large scatter pattern. Warships are more often the victim of destructive sinkings due to the very nature of their purpose and the subsequent potentiality of enemy attack. These vessels will show evident damage resulting from their catastrophic event. It should be noted that this theory does not take into account size of vessel, construction, bottom composition, pressure and time on the bottom.

One example of a destructive sinking is the *U-166* which was sunk by depth charges. The submarine broke into two sections when it sank, with a debris field in between. Another example of a destructive, but not war related, sinking is the *Batavia* shipwreck. The *Batavia* was a Dutch ship and part of the VOC merchant fleet. On its maiden voyage in 1629, the *Batavia* struck a shallow reef just off Beacon Island near the western coast of Australia (Balkan, 2008: 68-72). The vessel hit the reef with enough force to lodge it on top of the reef, where over the next several days it slowly broke up due to wave impact. The debris field covered an area 50m long by 15m wide with timbers and artefacts scattered about (Henderson, 1975:45).

This is simply a proposed elaboration on the sinking event, and further research and study may add to the archaeological understanding of the site formation process.
**Research Questions**

*Primary Research Question: What type of site formation processes impacted the current state of the possible submarine chaser in Tanapag Lagoon; cultural or natural events or a combination of both?*

Natural site formation processes are present, but impact is minimal. Low levels of corrosion are evident throughout the ship, but the layer is so thin that fine details such as welded seams can be clearly seen. While coral is present, the quantity is minimal and it is not compromising the structure in any way. If the state of the wreck was due to natural events such as storms, then other nearby sites would show similar characteristics, but they do not. The possibility of a natural occurrence having sufficient destructive force to compromise the structural integrity of the ship to such a degree is unrealistic in a protected lagoon such as Tanapag.

If the impact of natural site formation processes on the site is minimal, the only other explanation for the decrepit state of the wreck is cultural site formation processes. Consider the state of the wreck: possible missing stern section; mangled metal hull segments; scattered support beams; severed hull sections; caved in hull segments; and lack of recognizable structures aft of the bow. All of these examples in some way point more to cultural site formation processes, such as underwater explosives, bombardment, salvage, or a combination of two or three.

Cultural site formation processes are also evident when considering the apparent lack of superstructure, engine components, armament, daily use items such as cutlery, and human remains. This may indicate U.S. naval salvage in support of the war, but it may also indicate local members of the community salvaging recyclable material for personal use. The lack of
human remains may be evidence that this vessel was intentionally sunk at this location and used as target practice at a later date.

One last piece of evidence to consider is the positioning of the UXOs. Placement is peculiar as the three shells are in-line top to bottom, facing east to west. It is unlikely that this is random and maybe the result of human interference. Divers have been known to move objects on at least two other known aircraft wreck sites in the lagoon and it is possible they did this here.

It is possible that the current state of the site is a result of both cultural and natural events; however, cultural site formation processes have had more impact on this site. Unfortunately, while it appears cultural events have had more impact; there are no records to substantiate this theory.

Subsidiary Research Question: Is the vessel a Japanese submarine chaser and if so, can a positive identification be made to which vessel it is?

Positive identification of the vessel located in Tanapag Lagoon has not been accomplished. During the identification process, consideration was given to several factors in an attempt to determine if the vessel in Tanapag Lagoon is in fact a submarine chaser or another type of ship. These factors included: historical record of sinking location and ship dimensions and structure.

Before and during WWII, the Japanese government built a total of 61 submarine chasers. Of these vessels, final fate was determined in all but one, CH-4. Submarine chaser CH-4 was sold to an unidentified party at the end of the war. With this transaction, recordation ends, which make it a viable candidate. Cargo ship Keiyo Maru was sunk in close proximity to the possible submarine chaser site, as was net layer Ma-101. Mutsuyo Maru is questionable as it is listed by only one source, sinking at the exact location of Keiyo Maru (King, 1947: 60). This same source does not mention Keiyo Maru. No additional information or descriptions regarding Mutsuyo
Maru has been located to this day. Table 2 provides a visual comparison of the coordinates of all three ships.

The narrow bow of the vessel located in Tanapag Lagoon very closely resembles the bow of a Type 4 submarine chaser, as well as the cargo ship Keiyo Maru. Ma-101, which is a re-fitted British Barricade class boom defence net layer, would originally have had steel horns projecting beyond the bow for net laying operations. The stern was unique on this ship (round and bulbous) but unfortunately this cannot be used for comparison as the wreck’s stern appears to be missing. Due to the lack of exact structural plans of each vessel, positive identification cannot be made at this time, nor can any of these vessels be eliminated.

The length of the site in Tanapag Lagoon measures 46 meters, but the original length of the wreck is unknown. The reported length of Keiyo Maru is 133 meters, while CH-4 measured 56 meters. The length of these two vessels makes both potential candidates. Ma-101 is reported to have a length of 45.7 meters, which makes it shorter than the wreck without a stern. Since there is no information at this time regarding the dimensions of Mutsuyo Maru, a comparison is not possible.

It is possible to speculate on the identification based on available information. The size of the wreck site as compared to the length of special minelayer Ma-101 diminishes the possibility of this vessel being the unidentified ship in Tanapag Lagoon. The lack of any substantial information regarding Mutsuyo Maru makes it ineffective for comparison. The historical record and the dimensions and structure of Keiyo Maru make this vessel a viable candidate. However, it would be surprising if it is Keiyo Maru based on the length of this ship compared to the sunken vessel. This would mean approximately 90 meters of the original vessel are missing. Because the final fate of submarine chaser CH-4 is unknown, and it shares several
structural characteristics with the sunken vessel, including the overall shape of bow section, this
ship is also a viable candidate. Original plans are necessary to make a positive identification of
any ship if no markings are obvious. Since exact ship plans for each of these vessels could not
be obtained, an irrefutable identification cannot be made as yet, nor can any be eliminated.

Consideration for Future Research

“…although modern navigation charts mark numerous wrecks and obstructions, there has
been no archaeological investigation to correlate underwater remains with the historical record”
(Bass 2005: 242). While this statement was referring to the aftermath of the WWII battle at
Omaha Beach Normandy, it also applies to underwater sites in the Pacific. In terms of the
archaeological record, underwater sites resulting from WWII are not considered “historic” under
many legislative systems and their significance is only just beginning to be realized. It is
important to record these sites now before they are lost to neglect, misuse and the ravages of
time.

These WWI sites provide a unique opportunity to test current survey techniques and gain
an understanding of site formation processes. This testing may lead to the development and
introduction of new theories on site formation processes. Based on the published works in this
field, it is evident that more focus should be given to the actual pre- and post-sinking event as
opposed to the current framework which tends to focus on the moment of catastrophe and
wrecking.

When considering additional research, there is much to be accomplished. The location of
original plans for submarine chasers is essential for comparison purposes and would entail
additional historical research particularly in Japanese sources. Since the stern of this vessel
seems to end so abruptly, it stands to reason that the debris field extends to some degree around
the site. An extensive survey of the surrounding areas of the lagoon may turn up additional debris such as the stern.

A thorough investigation of the designs of the Japanese auxiliary submarine chasers and their use in WWII would broaden the scope of this study and possibly provide addition avenues for comparison to and possibly identification of the Tanapag Lagoon site. Additional historical research into the post-war cleanup of the Tanapag Lagoon should be undertaken to better explain the processes involved in the possible submarine chaser. This research should include any salvage, clean up or dredging activity conducted before 1984.

A comparison of this site to the Japanese submarine chaser wreck sites in Rota may also aid with identification and a determination of the type of site formation processes causing the state of the possible submarine chaser site.

A study in maritime archaeology should be developed and dedicated solely to understanding the formation of wartime sites. The battlefield archaeology should include methodology for experimentation with different types of explosives at different levels in the water column to determine how explosives can affect a site. Similar testing could also be applied through removal and dredging processes to foster an understanding of what happens to a wreck site once it is deposited and subjected to these factors. Results of such studies may actually provide a deviation from Muckelroy's original models (1978) showing war has a major impact on site formation.

To ensure the accuracy of profile views of complex sites, baseline offsets used in conjunction with digital imagery techniques should become the standard. Baseline offsets should not be abandoned as they provide accurate detail on basic dimensions, scatter patterns and parameters of sites. Further study into enhancing existing archaeological techniques should be
considered. The advancement of maritime archaeology should be one of the many initiatives that everyone in this field should share.
References


Balkan, E 2008, Shipwrecked! Deadly Adventures and Disasters at Sea, Menasha Ridge Press, Birmingham, AL


Bass, G (ed.) 2005, Beneath the Seven Seas, Thames and Hudson Ltd, London England

Burns, J.M. 2008, Archaeological Survey of Tanapag Lagoon Saipan, prepared for Commonwealth of the Northern Mariana Islands Department of Community and Cultural Affairs Division of Historic Preservation, South-eastern Archaeological Research, Inc.

Campbell, J 1985, Naval Weapons of World War II, Naval Institute Press, Annapolis, MD

Carrell, T 1991, ‘Submerged Cultural Resources Assessment of Micronesia’, Southwestern Cultural Resources Center Professional Papers 36, Southwestern Cultural Resources Center, Santa Fe, NM.

Carrell, T 2009, ‘Maritime History and Archaeology of the Commonwealth of the Northern Mariana Islands’, Prepared under contract 487910-OC for the Commonwealth of the Northern Mariana Islands


Crowl, P 1960, Campaign in the Marianas, Department of the Army, Washington, D.C.


Galantin, I 1987, *Take Her Deep: A Submarine Against Japan in WWII*, Naval Institute Press, Annapolis, MD


Gibbs, M 2006, ‘Cultural site formation in Maritime Archaeology: Disaster response, salvage and Muckelroy 30 years on’, *The International Journal of Nautical Archaeology* Vol. 35.


Jeffery, W 2007, ‘War Graves, Munition Dumps and Pleasure Grounds: A Post-Colonial Perspective of Chuuk Lagoon’s Submerged World War II Sites’, PhD thesis, James Cook University, Queensland, Australia

King, E 1947, *Japanese Naval and Merchant Shipping Losses During World War II by all Causes*, Joint Army-Navy Assessment Committee, NAVEXOS P-468,


Muckelroy, M 1976, ‘A systematic approach to the interpretation of scattered wreck sites’, *International Journal of Nautical Archaeology*


Olson, M 2007, Tales From a Tin Can, MBI Publishing, Minneapolis MN, USA


Sajima, N & Tachikawa, K Japanese Sea Power: A Maritime Nation's Struggle for Identity, Commonwealth of Australia


Warren, D 2004, ‘ROV Investigations of the DKMU U-166 Shipwreck Site to Document the Archaeological and Biological Aspects of the Wreck Site’, prepared by CC Survey services, Lafayette, LA


