

# Packaging and Loading Methods of Goryeo Dynasty

## Ceramics Excavated Underwater

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### Abstract

A total of 17 underwater excavations have taken place in Korea. Out of these 14 of them yielded Goryeo Dynasty (AD918~1392) artefacts and in 8 cases remains of the shipwreck itself was also discovered. These are clear examples showing the active maritime exchange of the Goryeo Dynasty. These ships are conjectured to have been travelling to Gaegyeong (the capital city of Goryeo) with private and/or public purposes. Similar to underwater excavations in other countries, most of the excavated artefacts are ceramics. This paper focuses on the packaging and loading methods of the Goryeo period ships that have been excavated.

Taeanseon was discovered at Daeseom Island, Taean, Chungcheongnam-do Province, and was loaded with a large number of ceramics. Taeanseon was buried in an east-west axis and the shipwreck was tilted 95° to the south. 4 columns were found which are conjectured to be the outer plates of the ship. The ceramics were loaded at the bow and stern of the ship and the central part was the living compartment of the sailors. Due to the impact made whilst the ship was sinking, ceramics were found scattered in the central part. However the ceramics loaded in the bow and stern sections of the ship were preserved intact. Also the ceramics were packed in a way to prevent shattering utilizing wooden sticks and glue.

Similarities and differences in packaging and loading methods to Taeanseon can be found in other ships such as the Shibidongpadoseon, Wandoseon, and Madoseon No. 1. Also the methods are different from the ones found on the Chinese shipwreck of Sinanseon. This article aims to analyze and compare the packaging and loading methods of the ships.

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## 1. Introduction

A total of 18 cases of underwater excavations have been completed in Korea up to the end of 2010. Artifacts concerning the Goryeo period (918 ~ 1392) were salvaged at 14 of the sites. At 8 of these sites artifacts within the vessels were excavated. Through such excavations, the prevalent maritime transport procedures during the Goryeo period have been more fully understood. These vessels had either a private or public purpose sailing towards Gyegyeong, the capital of the Goryeo kingdom. In some of these vessels (Taeon Daeseom, Taeon Mado 1) wooden tablets that kept a record of the shipment were also excavated. The tablets included important information such as the date of the shipment, consignor, recipient, contents, and quantities.

This research primarily considers the cargo loading methods on the ancient vessels of the Goryeo period, but also considers to a lesser degree, 1) a possible sea route and, 2) speculation on what life might have been like for seamen during the Goryeo period.

## 2. The present state of underwater excavation investigation

<Table 1> Excavated sites and the present state of excavated relics

A serial number	Excavation year	Excavated artifacts	Excavated remains
1	1976~1984	<b>Shinan Bangchug-ri, Shinan-vessel excavated</b> (Junnam Shian-gun Jeungdomyeon Bangchung-ri)	A 14th Century Chinese merchant vessel, 28 tons of coins and ceramic, approximately 22,000 artifacts.

2	1980,1983, 1996	<b>Jeju Shinchangri underwater excavation</b> (Jejudo north Jeju-gun Hangyung-myeon Shinchang-ri)	12th~13th Century golden jewellery, and Chinese potteries
3	1981~1987	<b>Taeon peninsula underwater excavation</b> (Near Chungnam Boryeong- gun Taeon peninsula)	14th~17th Century artifacts including 40 Goryeo celadons and Chosun white porcelains
4	1983~1984	<b>Wando Odu-ri, Wando- vessel excavated</b> (Junnam Yaksan-myeon Odu-ri)	A 12th Century vessel, 30,000 ceramics and crewmen's living facilities
5	1991~1992	<b>Jindo Byeokpa-ri, Jindo- vessel excavated</b> (Junnam Jindo-gun Gogun- myeon Byeokpa-ri)	A 13th~14th Century Chinese dugout canoe
6	1995~1996	<b>Muan Doripo underwater excavation</b> (Junnam Muan-gun Haeje- myeon Songsuk-ri)	1,638 pieces of 13th Century Goryeo inlaid celadons
7	1995	<b>Mokpo Dalido-vessel excavated</b> (Junnam Mokpo-si Chungmu-dong Dali-do)	A 13th~14th Century Goryeo vessel
8	2002~2003	<b>Gunsan Bian-do underwater excavation</b> (Junbuk Gunsan-si Okdo- myeon Biando)	2,939 artifacts including 12th~13th Century Goryeo celadon
9	2003~2004	<b>Gunsan Sibidongpado- vessel underwater excavation</b> (Junbuk Gunsan-si Okdo- myeon Sibidongpado)	A 12th Century Goryeo vessel and Goryeo celadon, 8,122 artifacts

10	2004~2005	<b>Boryeong Wonsan-do underwater excavation</b> (Chungnam Boryeong-si Ochun-myeon Wonsan-do)	An early 13th Century incense burner of celadon porcelain
11	2005	<b>Shinan Anjwado-vessel excavated</b> (Junnam Sinan-gun Anjwado Geumsan-ri)	4 artifacts including a 14th century vessel of the Goryeo period, and Goryeo inlaid celadons
12	2006~2009	<b>Gunsan-si Yami-do underwater excavation</b> (JunbukGunsan-siOkdo-myeon Yamido-ri)	4,547 pieces of 12th Century Goryeo celadons
13	2006	<b>Ansan-si Daebudo-vessel excavated</b> (Kyeongki-do Ansan-si Daebudo western coast)	12th~13th Century hull collected, not intact
14	2007~2008	<b>Taeon Daeseom Taeon-vessel excavated</b> (Near Chungnam Taeon-gun Geunheung-myeon Daeseom)	A mid-12th century Goryeo vessel, 24,887 artifacts including Goryeo celadons
15	2008~2010	<b>Taeon Mado-1 excavated</b> (Near Chungnam Taeon-gun Geunheung-myeon Mado)	A 13th century Goryeo vessel, 940 artifacts including Goryeo celadons
16	2009~2010	<b>Taeon Mado-2 excavated</b> (Near Chungnam Taeon-gun Geunheung-myeon Mado)	A 13th century Goryeo vessel, 974 artifacts including Goryeo celadons
17	2010	<b>Taeon Wonan sea area excavated</b> (Near Chungnam Taeon-gun Wonan beach)	106 artifacts including Goryeo celadons
18	2011	<b>Taeon Mado-3 excavated</b> (Near Chungnam Taeon-gun Geunheung-myeon Mado)	9 artifacts including Goryeo celadons, (excavated: may-october 2011)

### **3. Cargo loading methods in underwater excavations completed after 2000**

#### ***3.1 Artifacts at Gunsan Biando Island***

The existing sea route of Gunsan Biando Island site has been affected by the Saemangeum reclamation project. The site where the artifacts were found is situated 1km east of Biando, 2km southwest from the sea wall. 3,000 pieces of 12th~13th century Goryeo celadons were salvaged at this site. Most of the artifacts were found in a trough formed by the drift of a strong and constantly changing current, which spread these artifacts widely throughout. 1,932 pieces were salvaged west-east for 30m, and south-north for 13m over the main excavation site. Although the hull was not discovered, cargo loading methods were still ascertained because the same ceramic styles had been packed in a similar fashion at other excavated sites.

#### ***3.2 Gunsan Sibidongpado underwater remains***

Gunsan Sibidongpado is an uninhabited region 30km west of Gunsan harbor, and 26km from Maldo located at the south end of Gogunsangundo. The area from which the artifacts were pulled is called "Anpum", meaning the safe area. Because the excavation site is surrounded by 12 islands, it is not affected by the severe southern tidal current. Therefore, the investigative environment has remained relatively intact.

On this excavation, 8100 artifacts, such as bowls, plates, bowl, cauldrons made of cast iron, and anchor stocks were salvaged.

The excavated artifacts, which were produced in Junnam Haenam-Gun Sanimyoen Jinsan-ri and Sinduck-ri Dojajo, appear to have been sunk while being transported to Gaekyeong.

The main findings were pieces of the hull and ceramics, however bronze spoons, cast iron cauldrons, and some equal sized stones were also found. This indicated that food preparation may possibly have been done in the midsection of the lower part of the ship.

The cargo loading methods were such that the ceramics were stacked in a row according to different types. The loaded ceramics were secured in packing wood on all 4 sides along the row and then secured with a rope at the end. The end of the packing wood was drilled and tied with string. The ceramic's arrangement in the ship was classified in two ways, 1) arranged side by side with hoengkangryeogje(ship's timber) for an outer board and garyongmok(ship's timber), and 2) parallel to the outer board's direction. This would indicate that the ceramics were either loaded widthwise or lengthwise on the same level. Straw and reeds were thickly laid underneath the ceramics to absorb shock and prevent damage. The advantage of this cargo loading method, rather than loading goods in boxes, was that the ceramics could be packed by different types in larger amounts.

Most likely the excavated vessel at Sibidongpado was intended to sail in open water, thereby avoiding any hidden reefs. However, the ship would have sunk while being adrift during deteriorating weather conditions and storms.

### ***3.3 Gunsan Yamido underwater remains***

Gunsan Yamido underwater remains were situated at the Saemangeum seawall, approximately 15km from Biando Island. The excavation took place from 2006 to 2009. 4,500 artifacts were found. The investigation site was transformed into an inland sea after completion of the Cofferdam. In this case, the current's speed was weak with new tidal mud being continuously accumulated up to 20~50cm. The stratum in which artifacts were buried was at 30~90cm depth between shell strata of mixed sand under the firmed mud stratum. During the

process of removing the mud, one or two artifacts were moved and 30~40 artifacts were found overlapped.

Similar to the Biando Island remains, the cargo loading methods could not be ascertained, but excavation revealed that the artifacts were overlapped and packed according to same types.

### ***3.4 Taeon Daeseom Island remains***

In May, 2007, a fisherman reported to authorities that a Goryeo celadon had been found in his net while he was fishing for octopus ocellatus. Accordingly, excavation began at Chungnam Taeon Daeseom Island, The vessel located at this site was loaded with ceramics made in Jeollanam-do Kangjin. 25,000 ceramics (including fragments) had remained in the same condition as when they were loaded.

The vessel was buried in an east-west direction and leaned at about 95°. The ceramics were loaded on 4 levels presumed to be a topside plating but was barely existent. The ceramics were stored in the stem and stern of the vessel. The midsection (D6) was used as a kitchen. The midsection was in disarray because some of the loaded cargo had collapsed on impact with the ocean floor after sinking. However, the stem and stern were excavated intact without any displacement of cargo.

The ceramics were loaded using the same method as the Gunsan sibidongpado and Wando vessels. They were packed in straw, contained in packing wood, and secured with reed rope. Some of these artifacts (jar, celadon plates) were packed using logs on which the bark had not yet been peeled off. celadon bottle had packing wood in the middle, which allowed the mouth of a bottle to face each other. The two loads were then secured to each other with rope attached around the neck of the jars. In the case of the superior quality of celadon pitcher, the jars were packed with straw to prevent breakage while being loaded.

Celadon bowls were not loaded according to different sizes but according to sets. Shock-absorbing straw was packed between them as precaution against any damage. Straw was then settled into the gaps between all the ceramics in a row.

Cast iron cauldrons, bronze bowl, and pottery apparently used by the crewmen were also found. Seasoned fish bones (salted fish) were discovered in some of pottery. A pottery jar was found which had 2 bronze bowls and a basket inside it. Markings on the necks of some pottery indicated the pieces had been bound by kinds of grass(reeds) to reduce vibration while the vessel was at sail.

The most crucial find at the Taeon excavation were the wooden tablet shipping manifests. This was the first of two instances of wooden tablets being discovered at an underwater excavation. The Shinan vessel is the second instance of wooden tablets being discovered. The wooden tablets were discovered mainly in the same region as that of the celadon bowl and the superior quality of Goryeo celadon. They were buried in the same direction as that of the ceramic's loading direction. They are classified into two types, 1) the name of the shipping port, and 2) the label on the ceramic's packing wood. The perfectly preserved sentence “耽津縣在京隊正仁守戶” or “在京安永戶付沙器一裹” “崔大卿宅上” indicated the details of the transaction.

### ***3.5 Taeon Mado 1 underwater artifacts***

Taeon Mado underwater excavation began as a result of the fisherman's report when artifacts were found in his fishing nets. In 2008 artifacts were excavated at 4 sites where the previously mentioned packed ceramics had been uncovered, but the hull wasn't discovered. The hull was eventually found in 2009, and excavated from 2009 to 2010. Various artifacts such as ceramics, pottery,

wooden tablets, bronze spoons, combs, cast iron cauldrons, bamboo 반, bamboo baskets, paddies, millet, buckwheat, bean pods, and fish bones were salvaged from the excavated vessel.

In the resulting decoding of the wooden tablet, it was learned that the cargo was loaded in 丁亥 from October to 戊辰 November, 19<sup>th</sup>. It was also revealed that the cargo had been dispatched from not one, but 3 locations, Juksanhyun(Haenam), Huijinhyun(Naju), and Jangheonghyun. The shippers were presumed to be mostly provincial officials, with the recipients being officials in Gaegyeong. Names of these officials and the name of the government office are clearly evident on the tablet. In 丁亥-year and 戊辰-year ‘大將軍金純永’ were written on some of the tablets, which was speculated to be in 1207 and 1208, referring to the period of Kimsunyoung's activity.

In 2008, approximately 150 salvaged ceramics were found arranged in 3 lines. The specific amount and arrangement of packed artifacts was presumed to be the weight that one person was able to carry. When they were loaded into the vessel, they appear to have been arranged in triangles and as inverted triangles. These aspects were seen in Gunsan Mado and Taeon Mado.

In 2009, loaded artifacts such as grains and artisan craftwork were the main findings in the excavated vessel. Unlike the discovered ceramics, these artifacts were extremely cluttered by the impact when the vessel sunk. The sacks of rice were loaded on logs of the same size as the bottom of the ship, laid on it, and would have been arranged across it at a right angle. This method would allow the grains and the bottom of the ship to be separated, and carried safely, even when water leaked in, as it often did in ancient sailing vessels.

The kitchen and dining facilities were located in the midsection of the vessel. The stove was constructed with stones, roof tiles and clay. Around this area, fish bones and large potteries as well as 13 bronze spoons were found, .

## 4. Cargo loading methods and features

The excavated area included a total of 11 sites in which 7 vessels were found after the year 2000. Among those, Mado 1 and 2 are still in excavation with a report pending. The remaining 5 vessels are from the Goryeo period and include, 1 grain freighter, 2 ceramic freighters, and 3 empty freighters, The procedure for loading ceramics onto the vessels began first by spreading shock-absorbing rice straw or reeds on the bottom of ship. Next, the ceramics were placed in 3 rows both perpendicular and horizontal to the vessel and then finally secured in packing wood.

The ceramics were packed differently and according to type. Celadon pitcher, 甕(bowls) were filled with rice straw which was then packed around it.

Celadon bowl for which the packing wood was laid in the middle, allowed the cargo to face each other, and was then secured around the neck with rope. In many cases superior and inferior quality of celadons was all loaded together in the vessels, This packing method and amount of shock-absorbing material for inferior quality of celadons seemed insufficient. Inferior quality of jars were packed separately, without lids for the sets, but the superior quality of celadon cup with lid of the same size as the inferior quality of jars were packed with lids. The living quarters on the vessel were located mainly around the central mast. When the crew needed a fire, a stove made of stones, roof tiles and clay was used. Cast iron cauldrons (with has three legs), dishes, spoons, and large jars for drinking water were situated around the stove. In addition, fish and other salted sea foods that partially depict the life of the sailors were discovered there as well.

## Conclusion

A total of 18 cases of underwater excavation have been completed in Korea. Artifacts from the Goryeo period (918 ~ 1392) were salvaged in 14 of the sites. 8 sites contained artifacts excavated from within the vessels. Not a single vessel manufactured before the Goryeo period, or during the Chosun period has been found yet. Whether this is because of historical factors, or due to a change in the maritime environment has not been determined yet.

Underwater investigation differs from that of terra firma investigation by the limitations of the physical environment at the sites. These limitations are compensated for and reduced with specialized investigative equipment. Continued advancements in underwater investigative equipment and the associated research methods will open up many more areas to underwater investigative research in the future. These advancements will also mean improved opportunities for locating vessels and loading methods from other as yet undiscovered eras.

As the above research has indicated, we have briefly considered the cargo loading methods as well as the sailor's life based on the results these investigations. However, the results are limited in findings until such time that advancement in research equipment and associated methods will allow a greater in-depth study.

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