

Analysis on Anchor Stones Recovered from the West and South Coasts of Korea

Park Seungmin (Researcher, Underwater Excavation Division, National Research Institute of Maritime Cultural Heritage NRMCH)

ABSTRACT

In this study, the types of 228 anchor stones collected from the west and south coasts in Korea were classified, the way of connection was assumed by type and the routes and anchorages were estimated based on the location where they were collected. Before classifying types, the weight, thickness, width and length of anchor stones were measured and the weight, which has the biggest effect on anchors, was classified from I to V groups and the shape of anchor stones was classified from type 1 to 6. Based on the correlation between weight and shape, the anchor stones were classified into 17 types. The way of connection by type was classified based on the reference value of the anchor stone collected and shape. If the anchor stone weight is 180kg or less and which belongs to type 1 or 2, it was assumed to be the anchor that is connected to anchor stock and if the weight is 180kg and over and type belongs to 3 to 6, it was assumed to be connected to shank. In addition, the routes and anchorages were identified based on past records and testimonies of local residents and comparison with actual data was made. The location of route was matched with past records, but some new routes were identified near islands or adjacent waters. For anchorage, the trend of collecting small and large anchor stones in Taean Mado waters and Byeokpajin waters, was matched with the testimony that anchorage was done in both waters.

Key words: anchor stone, underwater archaeology, underwater excavation, anchorage

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INTRODUCTION

An anchor stone is an accessory of a ship and used for anchorage of a ship by connecting it to the anchor (fixing the ship in a certain sea area by putting the anchor into the sea) as shown in Figure 1. It performs the role of anchor shank that induces the anchor to be placed on the floor area well and weight control to increase the anchor weight. For this reason, it is also called ‘stone anchor stock’ (Kim Soon-gap 2012, 17). An anchor stone comes in various shapes such as long from side to side, wide like a plate or no specific shape. In this study, weight, shape and aspect ratio of 228 anchor stones collected from the western and southern sea areas¹ are examined to classify them in details and types will be classified based on correlation between weight and shape. In addition, route and anchorage will be estimated based on the assumption of connection method by type and location where anchor stones were collected. It is expected that this study will lead to the systematic classification and assumption of functions of anchor stones to be collected in the future and estimation of the ship size.

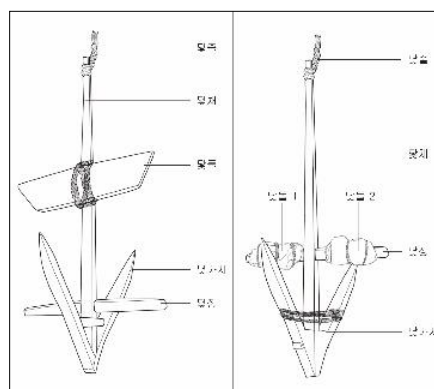


Figure 1. Diagram of connection method of large anchor (left) and small anchor (right) (NRMCH 2021, 190)

¹ As the depth of eastern coast is more than 70-80 m which makes diving survey impossible, underwater cultural heritage cannot be identified in the waters.

CLASSIFICATION OF ANCHOER STONES

In this chapter, anchor stones collected from the western and southern seas are classified. It is tried to overcome the limitations of precedent studies by setting the criteria for anchor stone classification in more details than precedent studies. There are three criteria for classifying anchor stones presented in this study.

Classification by weight

The first criterion is weight. The weight of anchor is directly related to the function of anchor and is an important factor in estimating the weight of a ship. In this study, weight was classified into five groups. The mean weight of all anchor stones was 147.9 kg with the lowest weight at 5.3 kg and highest weight at 1,086 kg. Except for five Chinese anchor stones, the weight frequency graph of 223 anchor stones was created and anchor stones were divided into five groups.

Those weighted between 0 kg and 95 kg were classified as Group I, those weighed between 95 kg to 180 kg were classified as Group II, those weighed between 180 kg to 330 kg were classified as Group III, those weighed between 330 kg to 495 kg were classified as Group IV and those weighed over 495 kg were classified as Group V. For the number of anchor stones by weight group, the number of stones in each group was the highest at 114 stones (51.1 per cent) for Group I, which means more than half of anchor stones collected belong to Group I. In addition, 48 anchor stones (21.5 per cent) belong to Group II followed by 29 anchor stones (13 per cent) in Group III, 25 anchor stones (11.2 per cent) in group IV and 7 anchor stones (3.2 per cent) in group V.

Classification by shape

The second criterion is plane shape of an anchor stone. The shape of an anchor stone influences the use and purpose of the anchor stone. 223 anchor stones are classified into six types.

Type 1 is a stone that is not altered. Natural stones or stones with minimum processing were used. In case of minimizing the processing, a groove was made in the middle to hang an anchor line. A total of 25 anchor stones (11.21 per cent) belong to this category. Type 2 is a stone with a long side to side length and end of one side whether it is left or right narrows diagonally as it goes down from the top to the bottom. A total of 29 anchor stones (13 per cent) belong to this type.

Type 3 is a half-moon shape, which is close to a flat triangle like a blade at the bottom. A total of 35 anchor stones (15.7 per cent) belong to this type. Type 4 has a shape of rhombus and mostly both ends are sharp. A total of 35 anchor stones (15.7 per cent) belong to this type. Type 5 and 6 are square shape and they are subdivided depending on the aspect ratio. Those with aspect ratio of 3 or higher² belongs to type 5, which is square type, in particular rectangle with long length and wide width. Some of them are close to trapezoid. A total of 81 anchor stones belong to the group (36.32 per cent). Type 6 whose aspect ratio is less than 3³ is a slender rectangular type with thin and long shape. A total of 18 anchor

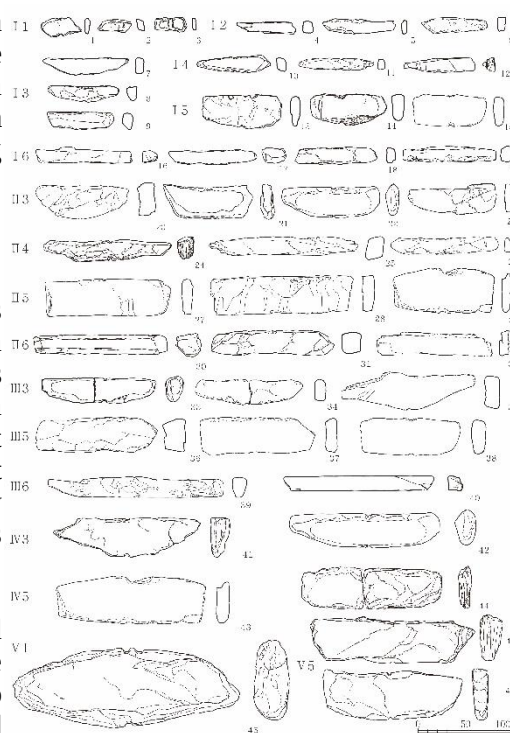


Figure 2. Types of anchor stones by type
(Taeon Mado 1-5. 7-10. 12-14. 16-17. 21-22. 24. 27-29. 31-36. 38-43. 45-47, Jindo 6. 18. 20. 23. 26. 30. 37. 44, Taeon Dangampo 11. Gunsan Sibidongpado 15, Incheon Yeongheung 19. 25)

² It has width that is close to the length from side to side.

³ Width is smaller than the length from side to side

stones belong to this group (8.07 per cent). Third one is aspect ratio. With the aspect ratio, it is possible to classify anchor stones with similar shape in more details. It is confirmed that the heavier the weight, the shape was processed to control weight and make it play the role of anchor.

Classification by type

Based on the two classification criteria mentioned above, types are divided into 17 in total. Some of the Chinese anchor stones have crescent shape in addition to the stone itself and it has more angle than crescent type of Korean anchor stone. It has different connection method so Chinese one has different groove where lines are held from crescent type that belongs to type 3. Group I is in combination with type 1 to 6 and to be more specific, 4 (10.8 per cent) belong to I-1 type, 29 (13 per cent) belong to I-2 type, 18 (8.1 per cent) belong to I-3 type, 22 (9.9 per cent) belong to I-4 type, 17 (7.6 per cent) belong to I-5 type and 4 (1.8 per cent) belong to I-6 type. Group II is combined with type 3 to 6. 8 (3.6 per cent) belong to II-3, 13 (5.8 per cent) belong to II-4, 17 (7.6 per cent) belong to II-5 and 10 (4.5 per cent) belong to II-6.

Group III is combined with type 3 to 6 and 7 (3.1 per cent) belong to III-3, 18 (8.1 per cent) belong to III-5 and 4 (1.8 per cent) belong to III-6. Group IV belongs to type 3 and 5 and 2 (0.9 per cent) belong to IV-3 and 23 (10.3 per cent) belong to IV-5. Finally, 2 types are confirmed in Group V. 1 (0.4 per cent) belongs to V-1 and 6 (2.7 per cent) belong to V-5.

Based on the classification above, the correlation between weight and shape can be identified. Upon examining the combination of each weight group and shape, Group I is combined with Type 1 to 6 and Group II is combined with Type 3 to 6. In addition, Group III is combined with Type 3 to 6, Type IV is combined with Type 3 and 5 and Group 5 is combined with Type 1 and 5. What is noted is that Type 1 and 2 are mostly found in group I. Except for one anchor stone in Group V, other weight group was not combined with Type 1 and 2.

Type 1 of Group V is very large weighing more than one ton, which is hard to process and use by tying it to an anchor stock so it seems that it was used by tying it to the shank. It seems to be Type 1 which is tied to the anchor stock but as the weight is about one ton, it may be possible to do anchorage without processing with the weight itself.

Based on the classification criteria above, anchor stones were classified as shown in Figure 2. The drawings presented were 1-5. 7-10. 12-14. 16-17. 21-22. 24. 27-29. 31-36. 38-43. 45-47, collected from the sea of Taean Mado, 6. 18. 20. 23. 26. 30. 37. 44, collected from Jindo Byeongpajin sea, 11 collected from Taean Dangampo sea, 15 collected from Gunsan Sibidongpado sea and 19, 25 collected from Incheon Yeongheungdo sea.

Connection method

The method of connecting anchor stone is divided into two types as shown in Figure 1. First one is to tie two anchor stones to the left and right side of the anchor stock and second one is to use the anchor stone as anchor stock by tying the anchor stone to the shank. The purpose of using anchor stone is to anchor the ship by adjusting the weight of an anchor so depending on the size of a ship, small anchor stones were used for small ships⁴ and large anchor stones were for large ships. The relationship between weight of an anchor stone and connection was estimated by referring to the paintings of old ships that describe the way of connecting anchor stones (Shiga Museum of Art, Japan 1811; Kim Joon-geun the nineteenth century).

⁴ The specifications of small and large ships were not divided. However, according to Gakseondobon, the scale of Tongyeong Merchant Ship was 27 m and that of Gageupjinjeon Ship was 19 m. If the size of ship was classified depending on the modern ship classification, Tongyeong Merchant Ship is classified as large ship and Gageupjinjeon Ship is classified as medium-sized ship. The dimension of small ships is not recorded but given the fact that the length of Raphael Ship (Dangdori Ship) that Father Kim Dae-geon and Father Daveluy took is 9 m, it seems safe to regard Dangdori Ship as the criteria for small ship according to the author's classification based on ships whose dimension is confirmed.

Ships in *Gisanpungsokdocheop*⁵ are small ships and anchor stones were tied to anchor stock. Those ships might use small anchor stones as the weight of the ship to be held by anchor was light and they navigated coastal areas and shallow sea. On the other hand, ships in *Joseon Tongshinsado* tied the anchor stones to the shank. Tongshinsa Ship was a large ship that accommodated many people and voyaged a long distance so they might use large anchor stones to support the heavy weight of the hull.

Previously, the relationship between the weight and shape of anchor stone was mentioned. Upon examining the combination of the weight group and type, Type 1 to 6 were confirmed in Group I while Type 1 and 2 were not combined with Group II to V except for one stone of Type 1 in Group V. In these groups, only Type 3 to 6 are observed. Based on this, the group can be divided broadly into Group I and Group II~V and it is possible to assume that these are the way of connecting the small anchor and large anchor respectively.

Presumption of the anchorage location

In this chapter, the specific location of anchorage and size of ship are estimated by analyzing the data of waters off Mado, Taeon in Figure 3 and waters off Byeongpajin, Jindo in Figure 4 where most of the anchor stones were collected. The anchorage is a place where ships drop the anchors and are anchored temporarily for urgent reasons. Waters off Mado, Taeon and Byeongpajin, Jindo are considered to be a kind of place for anchorage. These two waters did not have facilities like warehouse and ships waited for the right time for navigation as there were challenging route such as Gwangjangmok

and Uldolmok. These are the locations with the suitable water depth⁶ for anchorage as well as strong current can be blocked geologically as they are located inside of the inland. In addition, the location where anchor stones were collected was colored differently depending on five weight groups as classified earlier in order to identify the size of the ships that entered to and left from the waters and anchorage location more specifically. As mentioned earlier, analysis was conducted based on weight as it was possible to estimate the weight of the ship based on the weight of anchor stone. It should be noted, however, that as subjected waters were reclaimed, there was limitation to estimate the location of anchorage based on the current water depth. In waters off Mado, Taeon, it was testified that large

ships were anchored at point B and a number of small and medium sized anchor stones in Group IV or higher were collected. In addition, all weight groups were identified in point A with shallow water depth but the number of anchor stones that belong to group I and II was small. In summary, the pattern of anchor stone collection from the two waters show that unlike the shallow area where large ships cannot be anchored, they are the anchorage location where all kinds of ships regardless of size could be anchored.



Figure 3. Pattern of distribution of anchor stones by weight in waters off Mado, Taeon



Figure 4. Pattern of distribution of anchor stones by weight in waters off Byeongpajin, Jindo

CONCLUSIONS

As shown above, 228 anchor stones collected were classified based on weight, type and aspect ratio,

⁵ The vessel was a two-masted Dangdori ship and according to the record of Father Daveluy, its length was 30 pied (9.74 m), width was 13 pied (4.22 m) and depth was 8 pied (2.59m). In this study, it was classified as small ship because it was smaller compared to Joseon Tongshinsa ship where many people were accommodated with heavy cargo weight and long navigation distance and Dangdori Ship (Marie Daveluy 1862, 11).

⁶ Waters off Taeon Mado and Uldolmok maintain the water depth of about 10 m at high tide. Water depth of 10 m is the depth that allows about 10-ton ships to navigate based on current standard.

way of connection by type was assumed and location of anchorage was estimated based on the locations of collecting anchor stones based on actual data. Based on weight groups, shape and aspect ratio, they were divided into 17 types in detail. It was found that the heavier the weight of anchor stone, the role of anchor stone was shifted from supporting anchor stock to anchoring the anchor stone itself and if the anchor stone was light, it was connected to the anchor stock. The location of anchorage by ship in a certain sea area was estimated based on the weight of anchor stones.

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Despite the lack of research, I would like to thank many researchers for reading until the end. The anchor stone, which was the subject of my study, was a ship accessory used in Korea, Japan, Russia, China, India, and European countries. Its form and meaning also vary depending on the country and environment. If given the opportunity, I would like to study anchor stones from around the world to conduct more systematic research and try to share them. Finally, I would like to thank many researchers and officials who helped me publish this paper.

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