

# The Iron Grapnel Supposed to Belong to the Sinan Shipwreck and Other Anchors in East Asia

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## Abstract

*In 2016 an iron grapnel was shown in some special exhibitions marking the 40th anniversary of the Sinan shipwreck excavation in Korea. The grapnel 2.3m length has four arms, and it had been raised by a fisherman's net in 1972 before the wreck was discovered. Around the Song Dynasty of China, stone anchor stocks composed of wooden shanks were generally used; their distributions ranged from the Primorsky region of Russia in the north to the south in Vietnam and the Philippines. In Korea and in Japan, crude stone anchor stocks modelled after Chinese anchors were widely used at that time. From the Takashima underwater site associated with the Mongolian invasion of Japan in the 13th century or during the early Yuan Dynasty, stone anchor stocks of separate type were frequently discovered. After the Ming Dynasty, iron grapnels started to be used in large, but at the same time wooden anchors were also kept in use on different styles from region to region. In Japan, iron four-armed grapnels were appeared in some art pictures after the Muromachi Period, and then during the Edo Period those grapnels became popular as the mainstream of Japanese anchors. The iron four-armed grapnel, which is considered to have belonged to the Sinan shipwreck, seems to have equipped on a Japanese vessel dated from the Edo period to early modern times as its characters are found among Japanese grapnels. However, the possibility that it still belonged to the Sinan shipwreck could not be denied completely, because the actual origin of Japanese grapnels is unknown; Chinese manufacturing technology of grapnels, which is known for the time being, was different from Japanese one, but another technology, which would have an impact upon both Japanese and the Sinan shipwreck's grapnels, might have existed in China.*

**Key words:** Sinan shipwreck, Korea, grapnel, anchor

## **Introduction: The Iron Grapnel Believed to belong to the Sinan Shipwreck**

In 2016, an iron grapnel was displayed along with the reconstruction/restoration model of Sinan Shipwreck in a special exhibition that commemorate the 40th year anniversary of the Excavation of the Sinan Shipwreck in Korea. This iron grapnel displayed along with the restoration model was stated that it was a Chinese steel anchor from the Yuan Dynasty, and it belongs to 'the Sinan shipwreck' (National Research Institute of Maritime Cultural Heritage, 2016). The grapnel is 2.3m in length and has four arms. It was raised by a fisherman's net in 1972, before the wreck was discovered (National Research Institute of Maritime Cultural Heritage, Korea, 2016).

The author has observed iron grapnels at museums in China; these anchors were dated later than the Ming Dynasty. Also in Japan, iron grapnels were used from the Edo Period to modern era. The author only had a brief knowledge of iron grapnels that were widely used in China and Japan, and he never had conducted a research on it. Moreover, the author could not find any researches focused on iron grapnels conducted by other scholars. The author has observed an interesting point on these anchors that, about morphology-wise, the iron grapnel found near the Sinan Shipwreck site was very similar to Japanese type. In this paper, the author shares his comparative studies on iron grapnels that was believed to belong to the Sinan Shipwreck and other ones which were widely used in China and Japan.

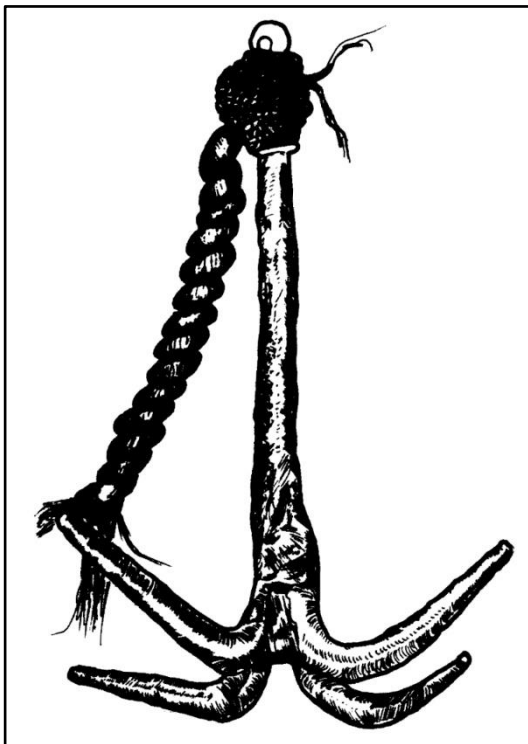
### ***Chinese Iron Grapnels***

*Tiangong Kaiwu*, a Chinese technical document at the end of the Ming Dynasty, described methods to manufacture 'Iron anchor anchors' (Song, 1639). To build an iron grapnel, individually made four arms were joined to a shank one after another at the end. For forging, materials from an old earth wall sieve were sprinkled on the forging areas. On the iconography that explain the forging processes, total 15 people were displayed, including who supported shanks and arms and who forging. From these iconographies, peculiar rectangle sectional shapes of the grapnel were not yet confirmed. Around this time, a ship carries 5 to 6 Iron anchors; the largest one is about 500 loaves, and it is used in emergency. In addition, it was described/instructed that Iron grapnels could not be used on the stone bottom area; it had to be used on sandy and mud seabed. Also, there is a description that a ship applied sudden stop by dropping a stern anchor to avoid collisions to ships in front.

According to Guanzhuo Wang, a historian who studies ships in China, it is said that 'stone anchor', 'wooden anchor' and 'Iron anchor' coexisted simultaneously in the Song and Yuan Dynasties, while primarily 'wood-stone anchor' was widely used (Wang, 2000). In *Chiming Uekgo Picture* of the Northern Song Dynasty, a 'small iron anchor' was depicted near the bow of the river ship. In Jilin City, Jilin Province in 1975, a small three-arm iron grapnel (22.5cm in length) dated the early in the Kim Dynasty was found. In historical written sources from the Song and Yuan Dynasties, these were descriptions on different types of anchors: 'iron anchor' and 'iron anchor with four nails' were widely used; in the Ming and Qing Dynasties, 'iron anchor' was used in the northern sea area of hard mud bottom; 'wooden anchor' was used in the southern deep sea of soft mud bottom, both are respectively used depending on the types of sediments; and for river ships 'iron anchor' was widely used. Regarding

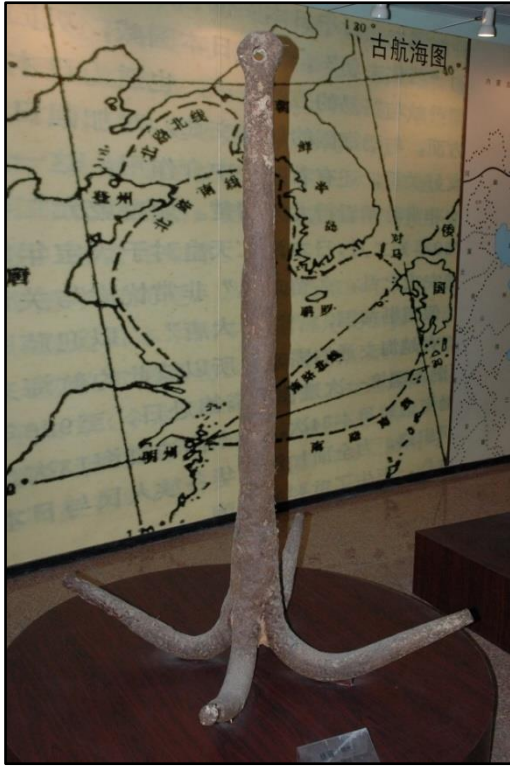
archaeological examples of 'iron anchors', an iron grapnel was found on the Ming dynasty shipwreck during its excavation in the Songji River, Liangshan, Shandong Province, in 1956. This anchor was 1.36m long and had inscriptions on the surface, and it said 'Hongwe 5th made' and '85 loaves of heaviness'. Another archaeological example was found from Quanzhou, Fujian, in 1981; it was an iron grapnel which was 2.68m long and 758.3kg.

The author also visited and observed a few iron grapnels; he visited the sea castle in Penglai City in Shandong Province, the Quanzhou Bay Old Ship Museum in Quanzhou City, Fujian Province, the Guangzhou Museum in Guangzhou City in Guangdong Province. Additionally, there are reported documents about iron grapnels excavated from the Penglai Sea castle (Chen,1989) (Fig. 1). The author analysed and studied characteristics of those iron grapnels from these materials, but since the amount of information is too big to share in this paper; therefore, detailed descriptions of individual materials shall be reported in another occasion.



*Fig. 1 (left): Iron Grapnel Excavated from Penglai Sea Castle. (Chen, 1989)*

Chinese iron grapnels were built by forging individually forged arms to the shank; in many cases, the joint points between arms and the shank displayed peculiar shapes of remnants created by the forging (Fig. 2). Additionally, there were examples that used/forged steel sheets on the joinery points as a reinforcement. The cross-sectional shapes of the shank and arms have irregular circular shape or irregular square shape; there are no examples of clear rectangle shapes that can be seen on iron grapnels found in Japan. The anchor ring had a small circular shape, and its inner diameter was relatively small. It indicates that the end of the shank was molded to make a hole. In many cases, those forging marks were conspicuous. Also, there were examples that wood leaf-shaped fluke were attached at the tip of arms. The shape of four arms formed a '+' shape when it was seen from the crown side (Fig. 3).



*Fig. 2 (left): Iron Grapnel of the Ming Dynasty at the Dengzhou Museum. Fig. 3 (right): Iron Grapnel of the Qing Dynasty at the Dengzhou Museum.*

### ***Japanese Iron Grapnels***

Ishii Kenji, a scholar who studied history of ships in Japan, explained weights of the ‘the first anchor’ of the *Bezai* ship. He also studied transition/evolution of Japanese anchors (Ishii, 1983). His studies on history of Japanese anchors started with ancient simple stone anchors that composed of a rope tied to a natural stone. On the ships traveled to Tang (China), as well as on ships used between Heian Period and the Medieval Era in Japan, wooden anchors were commonly used. The wooden anchors used on these ships composed of a flat stone sandwiched by two branches of hook-shaped trees. Based on iconography that ‘iron grapnel’ and ‘wooden anchor’ were depicted in the Scroll ‘Jinguu Kougou Engi Emaki’ in 1443, he believed that iron grapnels

might be used on Daimyo's warships and other large ships around the 15th century.

Yet, Ishii indicated that there must be technical difficulties to forge iron grapnels if Japan tried to build it domestically around that time; and the its cost for mass-production must be another problem. Therefore, he suspects that the iron grapnels in the 15th century were imported from China. In the 16th century, use of iron anchors become popular among warships. Yet, wooden anchors were often depicted with merchant ships in the first half of the 17th century; the beginning of wide spread uses of iron grapnels might need to wait until the middle of the 17th century.

Other Japanese scholars agree with Ishii 's theory about date of its beginning and wide distribution of iron grapnels. Matsui analyzed 49 iron grapnels found mainly northern area (Hokuriku) in the main island of Japan, and he concluded that the transition to iron grapnels occurred sometime in the 18th to the 20th centuries based on morphological analysis on anchor rings and attached rings (Matsui, 2013). Ishihara re-studied researches on wooden anchors conducted by Wang, Ishii, Tamura, and several other researches, and he concluded that transition from wooden anchors to iron grapnels were caused/triggered by shipworms which ate wooden products in the sea (Ishihara, 2015). Ninomiya examined the maritime traffic in Tokyo Bay and the Sodegaura fishery industry based on literature/historical sources; also, he described the perspectives of trading and distribution of iron grapnels in the Edo Period in Japan (Ninomiya, 2017). Tamura, a folklore scholar, conducted folklore investigations on 'anchor blacksmith' in Fukuyama City, Hiroshima Prefecture. Tamura noted that iron grapnel was forged by superimposing plate-like steel called 'Yao' (Tamura, 1978). He also described the



manufacturing process of the iron grapnels: each part, such as four parts of arms, a shank, an anchor ring and an attached ring were individually prepared first, and then the arms and anchor rings were forged onto the shank, and arms were spread into form 4 arms, then the loop of anchor ring was expanded. His investigation was very important to conduct a comparative study of manufacturing methodology of different anchors; therefore, his research is especially important for the author's researches

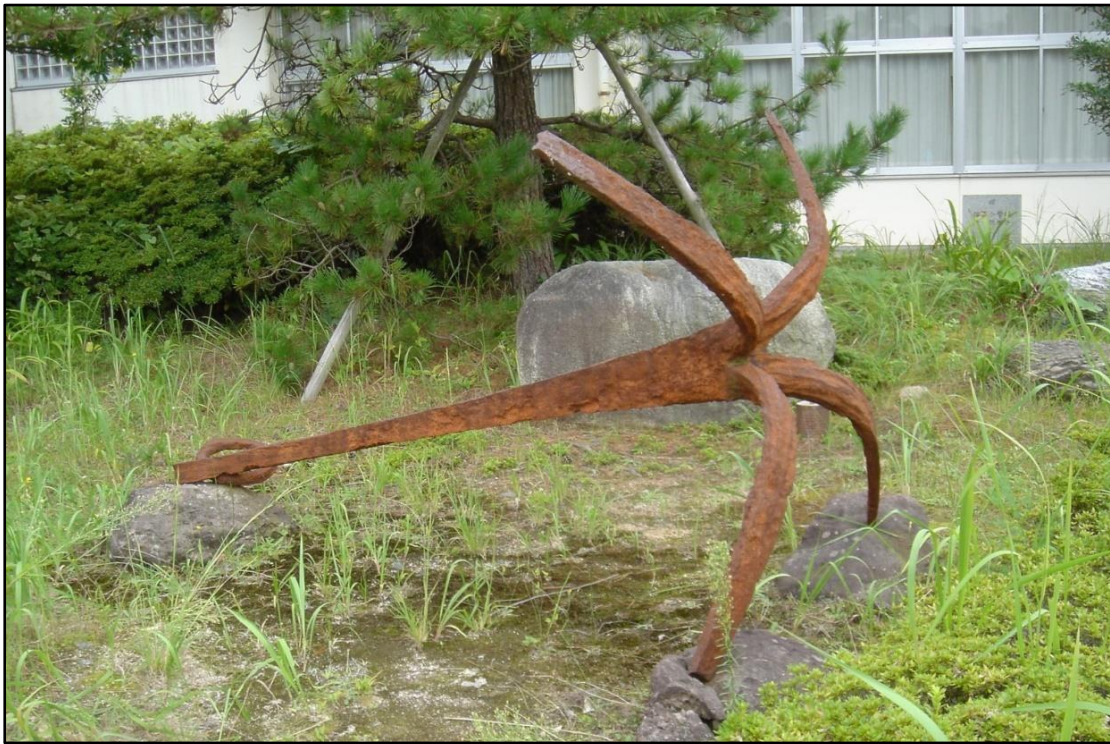
In Japan, at least 50 iron grapnels are known to be exist. The author studied characteristics of these anchors; however, its information may be too detailed to share in this paper, so that he has to wait to share such detailed information until other opportunities. In general, Japanese iron grapnels were composed/welded of separately built plate-shaped steels, so that the cross-section of the shank and arms display a clear-cut rectangular shape (Fig. 4).



*Fig. 4: Iron Grapnel Raised up off Suzu City, Ishikawa Prefecture.* Although sometimes it displays slight lamellar traces and forge contact traces due to forge weld, surfaces of Japanese iron grapnel are flat.



Nonetheless, there are no examples in Japanese grapnels that shows wrapped steel sheets reinforcements on arms alike Chinese grapnels. The arms of Japanese grapnels were forged into the shank, and then the arms were expanded after; henceforward, many of the (side-profile) shapes of anchors showed a gentle 'J' shape (Fig. 5). And the shape of the four arms from the crown exhibited a 'X' shape (Fig. 6). Although the anchor ring displayed a large almond shape; the introduction of the electric hammer in the modern period has made it smaller and the cross-sectional shape tends to be circular.



*Fig. 5: Iron Grapnel at Fukuura Shika Town, Ishikawa Prefecture.*



*Fig. 6: Iron Grapnel at Fukuura Shika Town, Ishikawa Prefecture, from its Crown Side.*

### ***Anchor of the Era before and after the Yuan Dynasty***

Regarding the small iron grapnels, the first evidence appeared in the North Song and Kim Dynasties. Although, the word/noun of 'iron anchor' and 'iron anchor four nails' appeared in literatures of the Song Dynasty, the first archaeological evidence of iron grapnel had to wait until the beginning of the Ming Dynasty (Wang, 2000). Anchors that widely used in the Song Dynasty were 'wood-stone anchor' with 'mono style stone anchor stock.' Regarding Yuan Dynasty, wood-stone anchors with 'separate style stone anchor stock' were main archaeological evidence found from the underwater site at Takashima Island, Nagasaki Prefecture, Japan; this site is also known for the Mongolia Attack to Japan in 1281. Contrarily, mono style stone anchor stocks were rarely found in this site (Takashima Town Board of Education, 1996). In the Takashima Island site, however, a mono-style stone anchor stock was cut in half and

converted as 'separate style stone anchor stock'. This may indicate that the both types had been coexisted, or it was at their transition period (Ogawa, 2008a and 2008b). Those wood stone anchors with this 'separate style stone anchor stocks' was also used at Penglai Sea Castle in Shandong Province and Quanzhou Bay in Fujian Province (Li, 1998). Afterwards, 'wood-stone anchor' with 'mono style stone anchor stock' had shifted into 'wooden anchor' with wooden stock. Iron grapnels appeared at the beginning of the Ming Dynasty, yet it did not mean that wooden anchors disappeared due to the appearance of iron grapnels. An iconography from Qing dynasty displayed sea boats using both wooden anchor and iron grapnels. Therefore, for the Sinan Ship dated the middle of the Yuan Dynasty, there is a possibility that Sinan Ship used wood stone anchors (or wooden anchors) and iron grapnels at the same time.

### ***Conclusion***

The cross-section of the shank likely belonging to the Sinan shipwreck is rectangular in shape, and a part where the arms as well as the anchor ring are attached to the shank is pounded to connect by a flat piece of iron. The arms curve gradually inward and make a figure of 'J'. The cross-section of the arm is flat rectangular. The anchor ring is large, narrowly long and almond like shape. Moreover, the cross-section is flat rectangular. These features obviously resemble the features of Japanese iron grapnel; based on those reasons, the author believed that the grapnels that believed to belong to the Sinan shipwreck was most likely belonged to the iron grapnels of the Japanese vessels dated from the early modern period to the modern period.



In the current state, however, it is difficult to establish precise dating of the Japanese style iron grapnels due to lack of the data and information for establishment of manufacturing. On the other hand, there is another possibility for the iron grapnel from the Sinan shipwreck to seek its origin in China. There might be some manufacturing techniques in China that would become the origin of Japanese grapnel manufacture later. This possible original manufacture technique has not been found/confirmed yet in China; however, it could be possible that Sinan shipwreck had carried Chinese iron grapnel that produced by Chinese manufacturing techniques that would be taught to Japanese later was onboard the Sinan shipwreck of the Yuan Dynasty. Nonetheless, the author concludes that, under these circumstances, it was most likely that the iron grapnels that is believed to belong to the Sinan shipwreck was a Japanese iron grapnel from the early modern period to the modern period.

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## Biography



Mitsuhiro Ogawa was born in Ishikawa Prefecture in 1968. He received MA degree in Archaeology from the University of Kanazawa in 2005. He is majoring in underwater archaeology, especially, in anchors and stone anchor stocks as well as in Chinese ceramics. He became a member of the Kyushu Okinawa Society for Underwater Archaeology in 1992 and has been a senior research associate of the Asian Research Institute of Underwater Archaeology since 2011. He has excavated many underwater archaeological sites such as Takashima Island, the Maegata Bay or Ojika Island (Yamami), and has also involved in the survey of underwater cultural heritage around the Japan Sea. He has published many papers related to underwater archaeology in East Asia.