Excavated ships are valuable resources for our understanding of the seafaring past, early human life and behavior on board, and traditional shipbuilding, as well as providing insight into the development of society, technology, ideology, and material culture (Maarleveld 1995; Adams 2001; Gibbins and Adams 2001; Staniforth 2002). The field of archaeology with a specific focus on hull remains has lagged behind in East Asia, compared to the growing body of studies in Europe and the United States in recent decades (Basch 1972; Greenhill 1976; McGrail 1985; Steffy 1994; McGrail 2001). Few attempts have been made by local experts to use information on excavated ships in the region as a data set for thematic research. The chronological framework regarding the development of hull construction techniques and structure is insufficiently understood in regional maritime history. This book is primarily aimed at filling that gap by qualitatively presenting the suite of available data on the excavated hulls of East Asian ships. A further objective is to achieve a more comprehensive understanding of the structural characteristics of ships that once sailed along the coasts of China, Korea, and Japan and those vessels that crossed the waters between these nations. The archaeological data are derived from excavated ships in the regions embraced by the Yellow Sea, the East China Sea, and the South China Sea (map 1.1), ranging from the eleventh to the fifteenth century. Using these data, I explore the long-term dynamics of East Asian shipbuilding traditions with a focus on technological innovations that are relevant to the individual seas.

Historiography of the East Asian Shipbuilding Traditions

Historical study of traditional shipbuilding in East Asia has been contributed by researchers from different fields (e.g., Wade 2003; Van Tilburg...
This allows for a multidisciplinary approach to the theme, referring to historical texts, iconographic resources, and ethnographic material as well as archaeological evidence. Nautical study in East Asia was recognized as an academic discipline by researchers from Europe and the United States having a perception of the shipbuilding tradition outside the Eurocentric tradition. Their interests mainly lay with indigenous boats and ships in China, from primitive watercraft to seagoing ships they termed junks, as well as the chronological development of
these vessels (Donnelly 1923, 1924, 1925, 1926, 1930, 1936; Waters 1938, 1939, 1947). George R. G. Worcester (1890–1969), a British officer in the Chinese Maritime Customs Service in the early to mid-twentieth century, made a remarkable record of wooden sailing ships in China, influencing later studies (Sigaut 1960; Needham 1971; Sokoloff 1982). His boat ethno-logical study provides insight on variations in construction methods for Chinese ships, including the order of construction (Worcester 1941, 1966). His monograph, which records more than 250 watercraft on the Yangtze River, is comprehensive in terms of a detailed study of propulsion, with classification of rigs and sails, different types of rudders and anchors, fastening methods, caulking techniques, cargo capacity, and even sailors’ traditional customs and beliefs (Worcester 1971).

Compared to the study of watercraft in China, there are not many studies by non-Asian researchers on the same topics in other East Asian countries. Joseph Needham’s work provides descriptive information from a historical document on an early twelfth-century voyage of a Chinese envoy to the Goryeo dynasty of Korea (AD 918–1392), based on the Xuanhe Fengshi Gaoli Tujing (Illustrated record of an envoy to Goryeo in the Xuanhe reign-period, 宣和奉使高麗圖經). It deals with the structure of Korean ships in comparison to Chinese ships dating to the same period (Needham 1971). Horace H. Underwood, who lived in Korea as a missionary, conducted an extensive study of boat ethnology of traditional Korean ships (Underwood 1979). His work covers the construction method for local ships, the shipbuilding and transportation industries, and ship carpenters’ customs.

More archaeological findings about coastal traders and seagoing ships in East Asia have emerged since the 1970s. Ship remains in China have been extensively reviewed as part of an inclusive study of archaeological remains of watercraft in the world (Steffy 1994; McGrail 2001). This resulted from the locating of ship remains and shipwrecks in East Asia during the last quarter of the twentieth century. Beginning in the 1970s, researchers from the Western Australian Museum directly assessed the sites and introduced underwater and nautical archaeological approaches based on Western perspectives into the region (Green 1983a, 1986; Kenderdine 1995; Burningham and Green 1997; Kenderdine 1997; Green et al. 1998; Green 2006).

In the 1980s, the site investigations began to be led by national institutes in China and Korea. The Chinese government established the Underwater
Archaeological Research Center (UARC) under the National Museum of Chinese History (currently the National Museum of China) in 1986, followed by the enactment of the Regulation on the Protection and Administration of Underwater Cultural Relics in 1989 (Zhao 1992; Hoagland 1997, 1999; Zhang 2011; Adams 2013). Numerous surveys have been carried out by UARC in cooperation with overseas organizations, such as the Western Australian Museum and the Institute of Underwater Archaeology in Japan (Atkinson 1990; Green and Clark 1993; Green et al. 1993; Kenderdine 1995). The work of UARC and the newly established National Conservation Center for Underwater Cultural Heritage, however, focuses mainly on the cargoes of shipwrecks, rather than hull structures, even though more than seventy wreck sites have been found and some of the ships, including the Nanhai shipwreck no. 1 and Huaguang Reef shipwreck no. 1, are remarkably well preserved (Zhang 2006a; Shan 2011). A paucity of research on maritime cultural heritage—such as ports, shipwrecks, coastal settlements, and ethnological resources—has been pointed out (Wu 2011). Under the circumstances, over the past few decades, Chinese shipbuilding traditions have been reviewed via excavated ships at terrestrial sites, not by maritime archaeologists but by maritime historians, naval engineers and architects, and a few terrestrial archaeologists (Xi 1989; Wang 2000; Xi 2000; Cultural Relics and Archaeological Institute of Shandong Province et al. 2006).

In Korea, interest in the native watercraft has risen in relatively recent times (Kim 1994; Choi 2006). Remarkable progress has occurred in exploring shipwrecks since the late 1970s, following the discovery of a thirteenth-century Chinese trader known as the Shinan ship. A conservation center at Mokpo city, initially established for conservation of the Shinan shipwreck and later developed as the National Maritime Museum, has been a focal point for underwater archaeological research in Korea. Its researchers have been active in locating previously unknown shipwrecks in the waters off the west coast of the Korean Peninsula. By 2011 they had identified nine, ranging in date from the end of the eleventh century to the fourteenth century (National Maritime Museum of Korea 2005a; Kim 2006; National Research Institute of Maritime Cultural Heritage 2010, 2011b). These ships were local coastal traders of the Goryeo dynasty and have a flat bottom structure, exhibiting similarity in construction.

I examine their structural characteristics in detail later in this book to address the historical interactions between shipbuilding traditions in
the Korean Peninsula and Japanese shipbuilding, which has to date been considered a distinctive technology. Researchers in Japan have agreed that the long-term use of dugout canoes was the basis for the emergence of ships endemic to Japan; the types of dugout canoes that developed can even be linked to the traditional Japanese coastal traders commonly used between the seventeenth and nineteenth centuries (Ishii 1957; Shimizu 1968, 1975; Okita 2000b). I reexamine this perspective in light of what has been identified in the archaeological remains in the Korean Peninsula.

It is worth referring to Japanese maritime historians’ achievements involving not only ships of Japanese origin but also ships from overseas visiting the country. The topics of previous studies are diverse, but most highlight the heyday of maritime activities by Chinese traders (Oba 1980; Tanaka and Matsuura 1986; Oba 2001; Matsuura 2003; Oba 2003; Matsuura 2008a, 2008b). Among the iconographic sources introduced in these studies, perhaps the most important is the early eighteenth-century picture scroll Tosen no Zu (Drawings of Chinese ships, 唐船の図), depicting Chinese traders at the time (Oba 1974, 1991). This scroll complements the archaeological data.

Archaeologically, investigation of underwater sites under the auspices of Japanese government has been less extensive than that of the other two East Asian nations (Hayashida 2006). Indeed, shipwreck archaeology has yet to be recognized in Japan as a subdiscipline of archaeology, similar to most of the other East and Southeast Asian countries (Kimura 2009, 2015). Yet information derived from archaeological work at sites in Japan has proved critical to this book. A representative case is a naval battlefield site related to Kublai Khan’s thirteenth-century attempted invasion, which was countered by fleets from the Chinese mainland and the Korean Peninsula. The remnants of the disarticulated ship timbers from the site make up an assemblage of clues for addressing shipbuilding around the site, as I demonstrate later.

**Elements and Definition of Seagoing Ships**

Of the various types of ships, the historical ships capable of venturing out to sea are of most interest to me. A structural characteristic such as hull shape and the presence of distinctive transverse structures is specifically used here for the definition of such ships and serves as a parameter to orient the discussion of the development of the shipbuilding tradition.
Coastal ships from the Korean Peninsula with a flat bottom arose early in East Asian maritime history. Later, China started to serve the region with various sailing ships designed for long-distance voyages, and their bulkhead structure has been credited as a significant and remarkable Chinese innovation (Needham 1971: 389–92; Basch 1972; Keith and Buys 1981; Green 1998; McGrail 2001: 347–84). Focusing on the bulkhead structure is critical to understanding the seagoing ships that played a major role in maritime activities in East Asian waters.

Development of the bulkhead structure is arguably associated with the evolution of different functions, including partitioning, creating watertight components, and enhancing transverse strength. The installation of partitions or walls inside the hull is common not only in Chinese ships but also in watercraft in other parts of the world throughout the ancient and modern eras (Burningham 1989; Steffy 1994: 52). Small semicircular partitions in the bottom of ancient dugout canoes have been identified as the ancestral form, as evidenced in parts of Eurasia, including Russia, Vietnam, and Japan (Okorokov 1995; Ishii 1995a; Bellwood et al. 2007; Caira 2008). Yet whether the partition boards of these primitive dugout canoes would come under the modern criteria of bulkheads (as vertical components separating spaces in the hull bottom from one another) is disputable. In a dugout canoe, dividing the interior space of the hull is less necessary, which suggests that this kind of semicircular board in primitive watercraft can be distinguished from the underlying idea of a bulkhead used for partition purposes. One can, however, recognize the usefulness of having partition boards to secure private property and space inside later ships, such as those of thirteenth-century China (Needham 1971: 470).

Chinese researchers have proposed, based on historical accounts, that watertight bulkheads began to be used in China as early as the fifth century (Xi et al. 2004; Cai et al. 2010). The introduction of watertight bulkheads in China earlier than in Europe has been considered one of numerous important innovations in naval architecture (Bernard 1844: 8; Young 1867: 31; Yule 1993: 250). However, the time period and the detailed background of the introduction of watertight bulkhead structures and construction methods must be carefully examined with further concrete evidence.

In terms of both function and East Asian shipbuilding traditions, the use of bulkheads as transverse structures for the hull was an important
technological innovation in the construction of truly seaworthy traders. Chinese researchers have agreed that bulkhead construction became widespread at least by the Tang dynasty (AD 618–907), given that a few riverine boats dating to that period demonstrate the presence of bulkheads (Xi et al. 2004). Those riverine ships could have been seaworthy enough to sail on the shallow Yellow Sea. The appearance of bulkheads in combination with a keel and hull planking in ships built in the East China Sea region occurred during a later period as a well-established technology for seagoing purposes. Adoption of this shipbuilding technology is evidenced in the remains of seagoing vessels found in China, Korea, and Japan. In later chapters I describe the details of hull remains of seagoing traders, including the Quanzhou ship (dated to the second half of the twelfth century) found in China and the Shinan shipwreck (dated to the first quarter of the fourteenth century) in Korea. These ships are representative cases for detailed structural study, including a fuller assessment of how bulkheads were used in the seagoing ships plying the East China Sea at the time. Disarticulated ship timbers from the Takashima underwater site, where Kublai Khan's fleets were lost, provide comparable data for the examination of shipbuilding technology at a regional perspective. The dominance of bulkhead construction became apparent in the fifteenth century, as seen in the common technology prevalent in ships in the South China Sea from that period (Manguin 1984), such as the seagoing traders excavated in Southeast Asia. My focus on structural elements allows discussion of the broad linkage of the shipbuilding traditions of East Asia and Southeast Asia.

Hybridity in Shipbuilding Traditions

The question arises as to whether a theory in shipwreck archaeology focused on the sequence of construction is fully applicable for East Asia. The existent theory has been widely accepted and is one of the normative approaches for interpreting the development of shipbuilding (Steffy 1994; Hocker 2004). Yet the validity of the approach to shipbuilding traditions outside the Western norm is controversial (Basch 1972; Reinders and Paul 1991). In the current situation in which a relevant theoretical approach to understanding ship construction practices in East Asian traditions remains relatively undeveloped, I pursue a theoretical framework through detailed descriptions of the structural characteristics of multiple