Boats and Ironwood in the Spermonde Archipelago

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Abstract

The Spermonde Archipelago located off the west coast of South Sulawesi in the Makassar Strait is an area where boats have been richly diversified as a result of the variety of fishing method used and other usage of boats for transporting people and goods during the last one hundred years. A considerable volume of ironwood, which is a major material for house construction in South Sulawesi, and recently for boat building, comes from Kalimantan through some islands of this archipelago. The report contains two subject matters as a result of the research activities conducted during October 2004 to March 2007. The report discusses the transformation and thus diversification of boats and the recent development, such as the introduction of engine and technological adaptations. The typology of the boats in the Pabbiring Islands is categorized in three ways; based on technique of construction, i.e. semi-structure boat and structure boat, on hull shape and size, i.e. outrigger, *jolloroq*, *motoroq* and *kappalaq*, and based on function, i.e. fishing, cargo and passenger boat. Trade of Borneo ironwood (*Eusideroxylon zwageri*) which involves Kalimantan and Sulawesi has continued for more than a century. Intensive ironwood trading began in the 1950s, reached its peak in the 1970s, and has shown a constant decline in the last five years. Ironwood is shipped by the Bugis people living along the west coast of southwest Sulawesi and on islands of the Spermonde Archipelago.

I. Boats of the Spermonde Archipelago

1. Introduction

Pabbiring Islands refers to a group of islands in the vicinity of the west coast of South Sulawesi also known as the Spermonde Archipelago. The Pabbiring Islands consists of 52 islands among which 37 islands are inhabited by about 35 thousands population [Statistic of Pangkep District 2004/2005]. It is situated upon a shelf rich with reefs, shoals and sandbanks. The depth commonly ranges from 10 to 50 meters and at its extremities of 3 to 77m. Beyond the edges of the shelf the depth drops to 200m and leads to the bed of the Makassar Strait. The islands occupy a square area of about 37x37 nautical miles (Hydro-Oceanography Services, TNI AL, 2005), comprising islands of two administrative regions, the Makassar City and Pangkep District.

Boats have been vital to the Pabbiring Islands since its waters sailed by natives and foreign hulls in the 16th century [Reid 2000]. Trade and fishery have been the main activities of its inhabitant. Boats that we perceive today are results of developments evolve through progressive achievements, such as innovations, modification and

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technological adaptations. The archipelago has a diversity of boat types where rapid developments of the boats can be observed within a quarter of a century.

The study on boats in the Pabbiring Islands was initiated in 2004. With collaborations, field surveys were conducted by ways of observations, measurements and interviews. Teams of survey were deployed to the islands in July 2005 to undertake measurements of more than one hundred boats of almost all types.

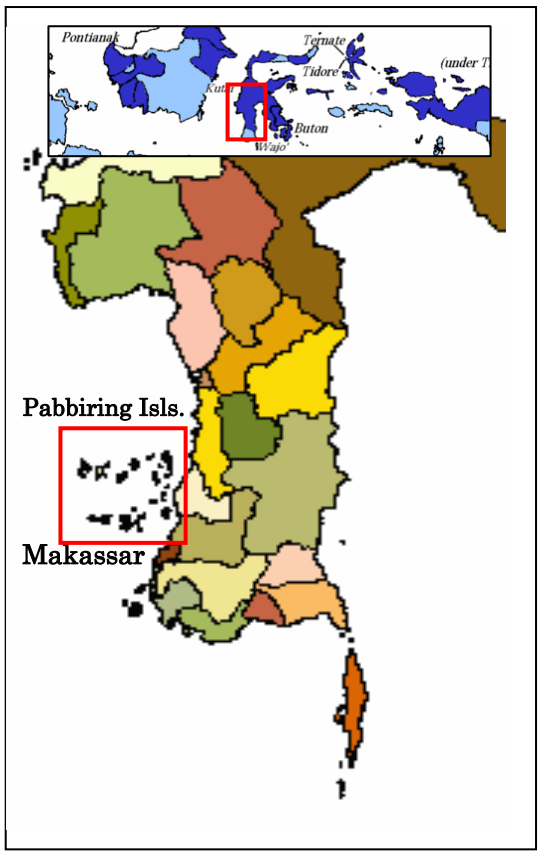


Fig. 1 Location of the Pabbiring Islands

A literature study combines with interviews to elders summarizes a brief history of boat transformation. Recent developments of the existing boats, such as the introduction of engine and technological adaptations, were traced through oral stories or memories of the people, miniature models, photographs and observations upon different stages of development coexist at a time. Boats in the Pabbiring Islands are categorized in three ways, based on technique of building, i.e. semi-structure and structure technique, based on hull shape and size, i.e. outrigger, *jolloroq*, *motoroq* and *kappalaq*, and based on function, i.e. fishing, cargo and passenger boats.

Boats for fishery are of various fishing methods: *papekang* (hook fishing), *paddenreng* (small scale dragnet), *pabu* (fish trap), *papuka* (seine), *pete-pete*(fish carrier, logistic boat, etc.), *pagae* (purse seine), *pacantrang* (mid-scale trawl), *paselang* (*trepang* collector or reef fish catcher), *paes* (cold storage boat) and *bagang* (lift net). Trading boats are called by its legal status, the *PLM (Perahu Layar Motor/*Motorized Sailing Boat*)*, are the biggest among others (10~50GT or 50~250tons of load capacity), used for inter-island shipping. Boats for transportation, the *pappalimbang* (ferry), are used to commute to the main land.

2. A brief history of boat transformation

Types of boat had been extinct and flourished. The old and obsoletes were vanished, the new and compatibles are emerging. Trading and fishing boats in service of the islands' armada in the last three decades of the 19th century and the first half of the 20th century were the so called '*bugis perahu*' in the literatures [Horridge 1979; Collins 1992; Pelly 1975], those were the indigenous types used by the South Sulawesian (known commonly as Bugis, inclusively Makassarese and Mandarese) every where in the Indonesian seas. The second half of the 20th century marked a remarkable down-turn after reaching the peak of sailing ship technology, i.e. the withdrawal of the *phinisi* from the Pabbiring Islands. Boats of smaller types emerged, gradually develop and experienced rapid developments in the last three decades of the century when engine

was introduced.

From stories of the elders we surely know that old types of trading boat such as *padewakang* and *palari* were in service before the invention of the *phinisi*.. Rice was the main commodity of the trade, carried to ports in Borneo, Java, and Malacca Strait and up north to the Philippines. In return traders carry timber, agricultural tools, cloth, porcelain and other luxuries.

The prosperous trading in the archipelago halted at the end of the World War II, when in August 1945 Salemo Island was taken an air-strike target by the Allies. The island was flattened to the ground by fire and many of the *phinisi* were also bombed at sea. Many *phinisi* owners immediately flew to Surabaya and Jakarta with their capitals and some stayed until 50's when finally they flew too because of the rebel groups (*gerombolan*) frequently robbed the islands.

After the independence new ships of *lambo* type were built to replace the lost ones, the type was generated from the old model of *baggo*, which is of Mandar type. The vessel is typically *pajala* hull with *kurung*, a superstructure built upon the hull. The flat top of the *kurung* is as deck. The sails are of Sumatran *nade*, consist of a triangle main sail and a jib sail. The *lambo mandar* was then made larger and partly adopt the *phinisi* sail, instead of having seven sails this *lambo phinisi* has only three sails with top, main and jib sails.

The features of fishing boats were remained unchanged until the introduction of the engine and the western hull, such types were the *pajala, pagae* and *paddilau/patorani*, constructed with 'structure technique' noticed by western literature as having the *pajala* hull type [Horridge 1979], i.e., the very basic plank pattern of the structure boat. The other type was the 'semi-structure' boat, i.e. the outrigger-canoes. The hull is made of dug-out with additional planks structured on its sides.

(1)Introduction of engine and western hull

The most important leap in the development of boats was the introduction of engine in the 70's. It brought a principal transformation to the hull, propulsion and steering systems and finally to the whole design. Outboard engine with long propeller shaft, familiar to the islanders as *katinting* or *masina bulo-bulo*, was first introduced to the outrigger-canoes in early 70's. The outrigger types easily accommodated the engine installation. The engine sits upon a foundation built on the platform of the outrigger beams slightly outside the hull. The shaft protrudes down at the hull's side to the stern exceeding the quarter rudder on the other side. Likewise, the outboard engines were also installed on *pajala* and *pagae*. The *pagae,* in need of speed to chase fish, in some cases install two to three engines on its sides.

Introduction of inboard engine in the last part of 70's answered the need of the *pagae*. More powerful diesel engine may produce velocity and at the same time a simple installation of single engine. The propeller shaft goes through the hull plank near the stern-post. This way the *pagae* need to install a center rudder which is more compatible to the new system. For this, a rudder shoe is required to be attached to the curving keel of the traditional hull. Cargo boats likewise applied the same way. Necessity of center rudder then stimulated the users, i.e. fishermen and entrepreneurs, to adopt the western hull for their subsequent buildings in early 80's. Installation of inboard engine to outrigger canoes is impossible due to breadth restriction, therefore it still use outboard engines until today.

The *jolloro* type once was a product of advanced semi-structure technique, for its

need of speed adopts the inboard engine to combine it with its slim body. The hull of a *jolloro* has sharp double-ends with just enough breadth to accommodate the diesel engine, and with this it can reach the speed of 35 knots. The semi-structure technique is becoming obsolete in building *jolloro*, though it is still used for outrigger canoe, due to the scarcity of big logs for the lower body part. Today, all *jolloro*s are made with structure technique.

Another type that originated from the semi-structure technique and now is also built with structure-technique is the *bagang*. Initially *bagang*s were catamarans whereupon square platforms of beams and cross beams for the lift net are built. Ever since the *bagang* were made self-propelled it was then turned to single hull wherein engines for propulsion and electric generation are installed.

New types of fishing boats, cargo and passenger with engine and western hull, have been emerging for new functions. The introduction of engine and the western hull type is a 'renaissance' for boat building technology in South Sulawesi and particularly in the Pabbiring Islands. Hulls of traditional type are no longer produced in the islands although still can be seen sailed by Mandarese or Galesongers.

3. Typology of the existing boats

Undoubtedly, boats are important for the islanders, it is the backbone of social and economy activities. The importance of boat is confirmed by the ratio of boat number to population, which is estimated to be 1 : 10. In other words, there is one boat available for every ten persons or out of two families a family possesses a boat if five persons is the average number of a family member [Statistic of Pangkep District 2004/2005].

In the book of boat register in Biringkassi Port Administration in Pangkep District, registered 1.085 boats within the period of 2003 to 2006. The register records the name of owner, name of boat, origin, length (L), breadth (B), height (H) and brand and power of engine but not the boat type. Boats that are registered are of 1 ~ 120 GT divided into two categories. Boats up to 7 GT are numbering 1.001 with total gross tonnage of 2.003 GT. According to a field surveyor in-charge of registration, this number is only about one third of the whole number estimated. Boats more than 7 GT are numbering 84 with total gross tonnage of 2.482 GT [Boat Register of Pangkep District 2006]. This number is also not the whole number because many boats are registered at other ports.

Table 1 Number of boats of major fishing methods and propulsion in Pangkep District (1997-2003)

Table 1 shows another statistic of boat in the Pangkep District. The data, obtained

Year	Fishing methods			Propulsion methods		
	Purse seine (*pagae*)	Shrimp gill net (*papuka*)	Set gill net (*papuka*)	Non-powered medium plank boat	Out-board engine outrigger	In-board engine 0 – 5 GT (*jolloro+motoro*)
1997	268	208	547	297	239	413
1998	264	190	649	274	347	349
1999	224	192	837	277	347	314
2000	167	-	940	277	347	547
2001	222	-	941	281	474	526
2002	222	-	923	251	401	475
2003	134	-	989	-	-	-

from the Fishery and Marine Services of South Sulawesi Province, present some major fishing and propulsion methods of certain periods of time, from which number of fishing boats of small and medium sizes can be figured out [Statistics of Fishery in South Sulawesi, 1997-2003]. The table is extracted from a more complicated table; only categories with rather complete and continual data entry have been picked.

Boats of the Pabbiring Islands are made of wood, other material such as fiberglass is not yet widely known. Only in some islands at the southern part of the archipelago, people build outrigger canoe and speed boat from fiberglass and the number is less significant.

Types of boat in the Pabbiring Islands can be determined in three different ways. Firstly, based on the method or technique applied for construction, secondly, on the shape and size of the hull and thirdly, on the boat's function. Typology based on construction technique, which divides the boats into two categories of 'semi-structure boat' and 'structure boat', has been mentioned in the previous chapter. The typology is useful in explaining the origin of the *jolloro*'s hull shape. The other two typologies are discussed in the next sub-chapters.

(1) Typology based on shape and size of hull

From the viewpoint of shape and size of the hull, boats can be categorized into four hull types namely outrigger-canoe type, *jolloroq* type, *motoroq* type and *kappalaq* type. This typology yields clear distinctions between the types therefore should be very useful in the science of boat building theory.

Outrigger-canoe is the smallest, most of them are single-outrigger with out-board engine and sail, used for hook fishing and small gill-net (refer to Table 1 for some statistic). The hull is double ended dug-out with additional side planks. Its breadth is not more than 50 centimeters and its length is rarely exceeding 5 meters.

Jolloroq type is remarkable with its extreme slim body and sharp-double-ended stem and stern. (See its dimension characteristic in Table 2). The type is multipurpose, it is good for hook fishing, gill-net, dive-fishing, fish (catch) carrier and as logistic supply boat for away fishing activities (see Table 3). *Jolloroq* also can be used as private means of transportation. Its slim body aims to gain speed although it should lost some stability. Its open hold without deck and low hull sides make it at risk of water inlet from rough seas. Judging from the ratio of L/B in the register book, the *jolloroq* is estimated to be 740 in number. This signifies the role of the *jolloroq* in the daily live of the islanders as important.

Table 2 Dimension characteristics of boat in the Pabbiring Islands [8]

Dimension	Jolloroq	Motoroq	Kappalaq
L	6 – 15 m	5 – 13,5 m	7 – 23,8 m
B	0,7 – 1,55 m	1 – 2 m	2,1 – 7,75 m
H	0,65 – 1,15 m	0,65 – 1,65 m	0,65 – 3,8 m
L/B	6,9 – 13	3,5 – 6,87	2,4 – 6,84
B/H	0,9 – 2,1	0,6 – 2,85	1,35 – 5
L/H	7,8 – 18,75	3,6 – 17,4	6,2 – 20

Motoroq type is moderate in term of dimension; it is used for fishing and passenger transport (see Table 2 and 3). The hull type is of western style, stressing the design not on speed but on function. This way it differs so much with the *jolloroq*.

Kappalaq type is also of western hull style, only it is bigger in dimension. It is used for fishing; passenger and cargo (see Table 2 and 3). The cargo is of two kinds, the small cargoes of 10 to 20 GT are for local shipping within the archipelago and between it and the main land, the big ones up to 250 GT are used for inter-island shipping (between big islands of Indonesia).

(2) Typology based on function

Based on its functions, the boats of the Pabbiring Islands are categorized into three types, the fishing, the passenger and the cargo boats. The fishing boat type has a diverse sub-type according to the fishing methods. It start with hook fishing (*papekang*), small scale dragnet (*paddenreng*), fish trap (*pabu*), gill-net (*papuka*), fish carrier, logistic boat, etc. (*pete-pete*), purse seine (*pagae*), mid-scale trawl (*pacantrang*), dive fishing; trepang collector or reef fish catcher(*paselang*), cold storage boat (*paes*) and lift net (*bagang*).

Cargo boats are called by its legal status, the *PLM (Perahu Layar Motor/*Motorized Sailing Boat*)*, used for inter-island shipping. The commodity of the inter-island shipping are cement, flour, rice and salt for South and East Kalimantan and timber, mainly ironwood, for the return.

Table 3 Overlaps of boat categories in the Pabbiring Islands

Typology based on function		**Typology based on hull shape, size and (technique)**			
Type	Sub-type	Outrigger (semi-plank)	*Jolloroq* (plank)	*Motoroq* (plank)	*Kappalaq* (plank)
Fishing boat	*papekang* (hook fishing)	○	○	○	
	paddenreng (small scale dragnet)			○	
	pabu (fish trap)		○	○	
	papuka (gill net)	○	○	○	
	pete-pete(fish carrier, logistic, etc.)		○		
	pagae (purse seine)				○
	pacantrang (mid-scale trawl)				○
	paselang (trepang& reef fish diver)		○	○	
	paes (cold storage boat)				○
	bagang (lift net)	○			
Cargo boat	*PLM* (Motorized Sailing Boat)				○
Passenger boat	*pappalimbang* (ferry)			○	○

Passenger boats are known as *pappalimbang* (ferry), used by the inhabitants of the islands to commute from their respective islands to ports in the main land. Each island has a certain port of relation where people purchase their logistic supplies and use the port as access to other destination in the main land. The hull is categorized as *motoroq* type for the small ones and *kappalaq* for the medium ones.

4. Recent technological adaptations

Transformation of boat has been resulting in the presence of the existing boats of

many types and functions. It has been creative interactions of the users with the boat that stimulate a number of innovations, modifications and also technological adaptations. There are some examples that we may observe closely to reveal how did actually the transformations occur. In this paper we are presenting two examples of technological adaptation executed by boat builders recently.

(1)Fishbone plank-fastening system

Fastening plank to keel and then plank to plank in traditional way are done by wooden dowels with stopper system called '*bunga*'. The 'bunga' is applied at the sealing end of the dowels. The protruding ends of the dowels are cut with chisel on its two opposite sides in a way that the middle part of it forms a wedge-like device. The wedge is then forced to enter the hole by breaking the dowel already inside and tighten the grip at the hole edge, as can be seen in Fig.2. The strength, and weakness, of this system lies on the grip of the dowel to the hole, however the problem is that only one end can be treated so. Compare with bolt fastening (Fig.3), where edges of two adjoining planks are fixed with nuts and rings.

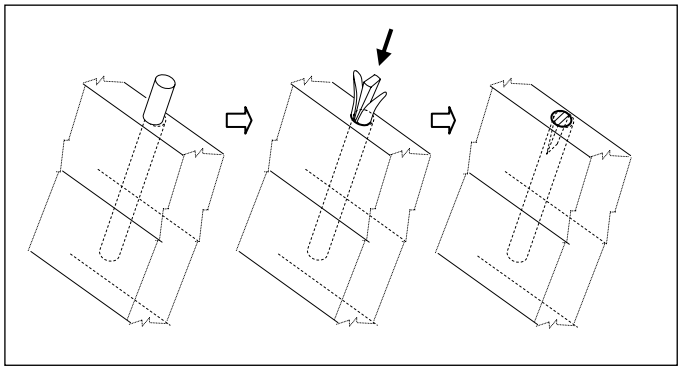


Fig. 2 Dowel fastening with '*bunga*'

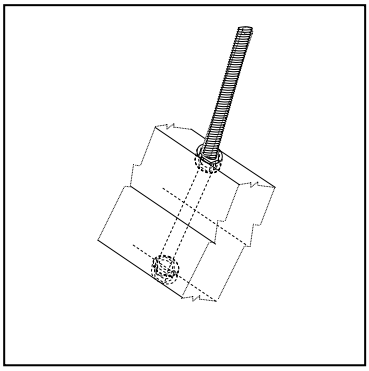


Fig. 3 Bolt fastening

A new system invented by the boat builder in the Pabbiring Island using bolts and nuts for plank-fastening. Series of bolts run transversal through the planks from the keel to the edges of the shell at the entire shell from aft to fore in a certain interval. We name this system as 'fishbone plank-fastening' as the keel and the series of bolts resembles the bone of a fish if seen from above. Figure 4 shows a hull construction enforced with the fishbone plank-fastening system, the interval of the 'bones' is 1 meter.

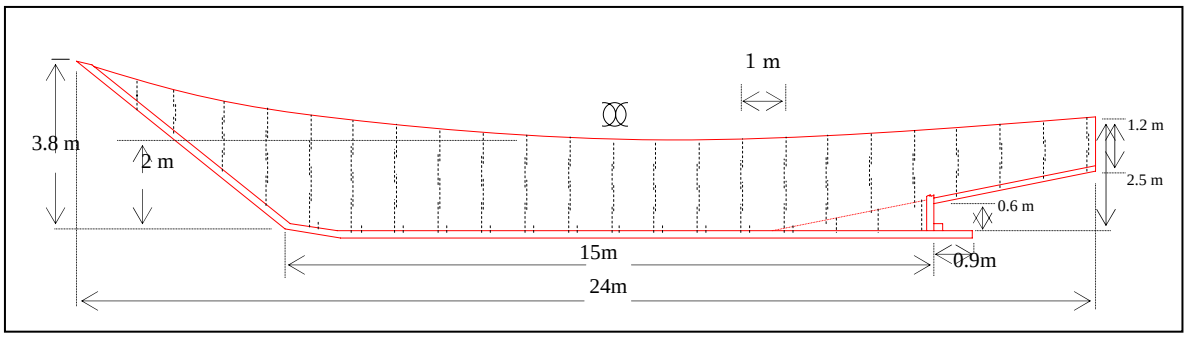


Fig. 4 A hull construction enforced with the new system

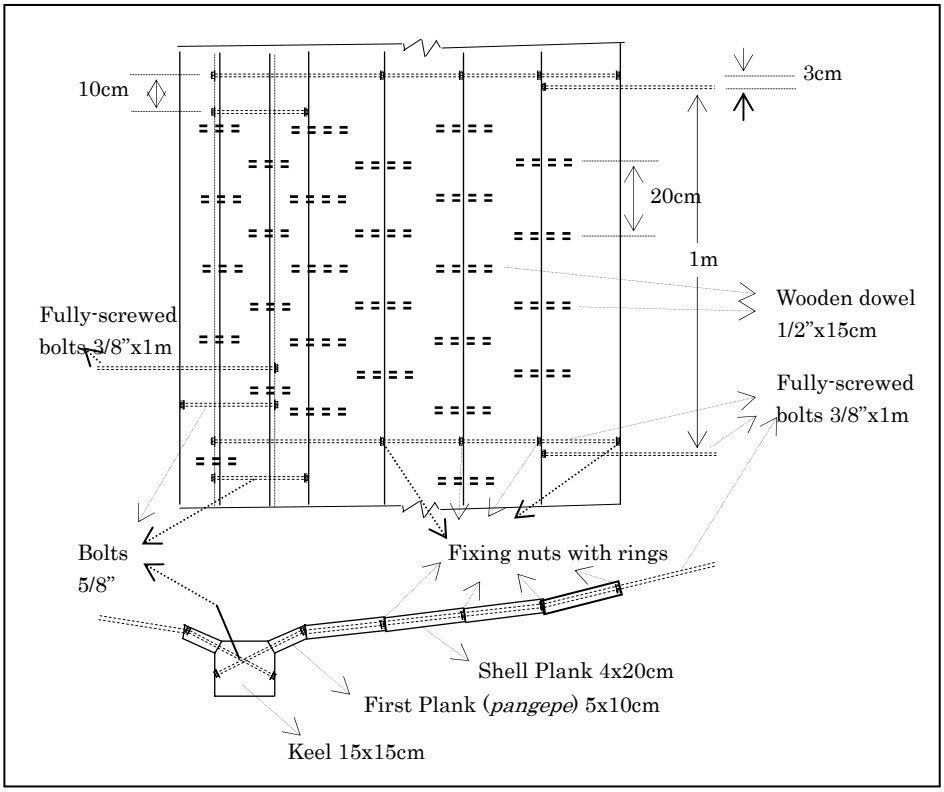


Fig. 5 The fishbone plank-fastening system

As can be seen in Fig. 5, to fasten the keel with the first plank (the *pangepe*) bolts of 5/8 inches are used and then from the keel to the planks, fully-screwed bolts of 3/8 inches are used. Length of each bolt is 1 meter and the next bolts begin with the last plank of the first. Bolts overlap each other and this way the 'bones' are continued to shell edges. Nuts and rings are fastened at each plank joint necessarily. By this new system, the function of wooden dowels are shifted to internal dowels that stitch the planks edge to edge and the function of the *bunga* is replaced by the nuts.

The technique was in use for the first time in Kulambing Island about two years ago. Restricted by the high price of the timber for building material, the contracting builder asks the craftsmen to lessen the thickness of the shell plank. To compensate the possible loss of the shell strength the fishbone plank-fastening system was applied.

No attempt has been done to calculate the strength of the construction system. However the builder and the craftsmen believe that by the new system the plank join is much stronger than the old way. Both are confident to fix the shell plank with thickness of one centimeter less than usual for the same dimension of hull.

A ship, with length over all of 24 meters, length of keel 15 meters, breadth 4.8 meters. height 2 meters at mid-ship and with load capacity estimated 90 tons, needs 200 sticks of 1 meter with diameter of 3/8" bolts, 30 sticks of 5/8" and 15 kilograms of nuts and rings.

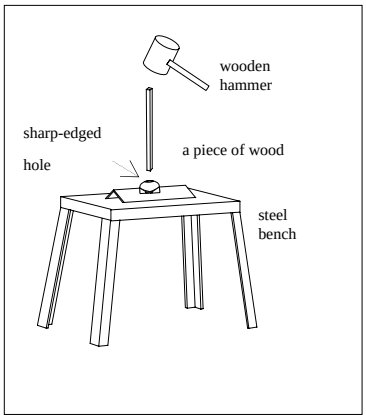
After calculating the spread of shell plank and with 1 cm of thickness reduction, the new system can save 1,5 m^3 timber material equal to 5,25 million rupiahs when the price of the ironwood (*Eusideroxylon zwageri*), the timber used in the construction, is 3,5 million rupiahs per cubic meter. The total price of bolts and nuts for the construction

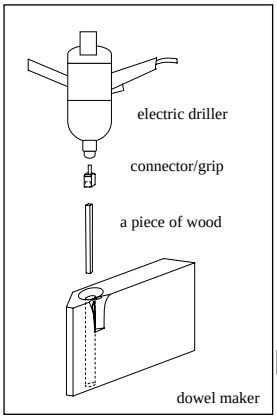
is 1,05 million rupiahs, so that the saving gained is 4,2 million rupiahs equal to half of the craftsmen's wage.

3. Wooden dowel maker

Dowels are joining devices very important in wooden boat building. There are several kinds of dowel in use in a boat construction, such as temporary dowel, internal dowel, thorough dowel and frame dowel. Dowels usually made of strong and durable timber such as, in the Pabbiring Islands, the ironwood.

The technique of dowel making from the past until today goes through advancement. The primitive way is to split the timber into 1x1 or 1.5x1.5 cm square sticks of 10 – 20 cm length depend on the size required. Its edges then smoothed with a machete to form a cylindrical dowel. Within the last five years a new technique, easier and faster, was found. A hole of certain diameter (3/8, 1/2 or 5/8 inches) made of steel is set on a bench. The edge of the hole is made sharp. The square wood sticks are struck to the hole by force of a hammer, producing a more homogenous cylindrical dowel, as seen in fig 7.





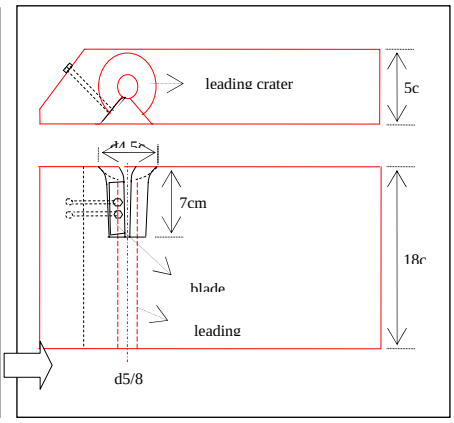


Fig. 6 Sharp-hole dowel maker **Fig. 7 and 8** Pencil-sharpener dowel maker and details

Only about 6 month ago a craftsmen leader made a new tool for dowel making, a tool that he once saw used by boat craftsmen in other place. The idea comes from the pencil sharpener and tool itself resemble it except the dimension. The timber stick is rolled through the blade with electric driller by help of a connector (Fig. 7 and 8). The dowel product of this tool has a square 'head' at its end where the connector grips it, and a 'neck' where its diameter is growing big gradually to the square profile of the head. The cylindrical part of the dowel is homogenous, very smooth and precise. These characters are most suitable for frame dowel, when the precision of size and fulfillment of the hole is highly required to guarantee water tightness and strong grip. This kind of dowel needs no *bunga* treatment anymore to assure its grip to the hole.

II. Ironwood Trade in the Spermonde Archipelago

1. Brief history of trade in the Spermonde Archipelago

The Spermonde Archipelago is a scattering of 52 islands occupying an area of about 1400 km^2 extending from the west coast South Sulawesi into the Makassar Strait (Figure 1). Along the west coast of Sulawesi, the ports of Mamuju, Majene, Pare-pare,

Awerange, and Sabutung and Kulambing islands in the Spermonde Archipelago serve as centers of ironwood distribution for southwest Sulawesi. Sabutung and Kulambing Islands are important distribution centers; both islands serve the southern part of the peninsula which is half the area of South Sulawesi Province, and distribute approximately 1/3 share of the total volume of ironwood trade in the peninsula.

Trade between the two sides of Makassar Strait has been determined by the presence of the Buginese on both sides. The Wajorese (Bugis) have been in Pasir, Samarinda (Kutai), and Banjarmasin since 1668, a year after the signing of the Bongaya Treaty which marked the defeat of their ally Gowa-Tallo in the Makassar War (1666-1669) by the Dutch-Bone allies. Forced by famine and disease brought by a war in their country, which was in the wake of the Makassar War, many Wajorese fled to safer places within the peninsula and overseas. Some of them later returned to Makassar, where they used to reside, after the Dutch and Bone authorities succeeded in pacifying the whole peninsula [Zainal Abidin 1999; Andaya 1981; Noorduyn 2000; Tobing 1961].

The Wajorese also settled on Laiya Island, and the Malays lived on Sabutung Island, and they most likely mixed with the natives on each of the islands. Soon, the Spermonde Archipelago became a part of the black-market against the Dutch trading company (Verenigde Oost-Indische Compagnie – VOC) controlled commerce. The black market was established by the Mandarese, the Buginese, the Malays, the Bajaus, and the Makassarese along the west coast of Sulawesi and across the Makassar Strait in early the 18th century [Knaap and Sutherland 2004].

The Buginese, Malays, and Makassarese settled in the islands when the era of colonial commerce began. Salemo was one of the earliest settlements.

Trade prospered in Salemo Island with two major commodities, i.e. ironwood and rice. South Sulawesi was already well-known as a high quality producer of rice since the Portuguese pioneers in the 16th century [Villiers 1990]. After conquering the lands, the Dutch VOC demanded a 1/10 portion of all produce and was able to receive from Maros, Barru, Siang, Bungoro, Labbakkang, and Segeri the amount of 92,148 *gantang* (about 322.5 tons) of rice [Andaya 1981:265]. Thus, rice production in those places, which were suppliers to Salemo trade, was no less than 3,225 tons in one particular year. On the other hand, demand for rice in south and east Borneo increased with the increase of population. Cities along the coast were growing and the Bugis from South Sulawesi contributed to this growth in terms of both trading and population [Abidin 2003]. Shipping in Salemo Island experienced ups and downs, and ultimately the shipping activities died out at the end of the 1980s. Since then Salemo had to purchase its ironwood from other islands.

Merchants of Laiya Island were the first ones to take over the Salemo trade at the end of the 1950s. Some of the ships formerly owned by Salemo merchants were now in their hands and ironwood trade became their occupation. Sabutung Island and Kulambing Island, previously dealt with petty trade only, but they began to develop ironwood trade in the 1970s. At present time only these two islands are actively involved in ironwood trade.

During the second half of the 17th century the Amanna Gappa's code of trade and shipping was developed by the *matoa* or captain of the Wajorese people in Makassar after the war [Noorduyn 2000]. In the trade and shipping code, a list of fares mention ship fares from places where Wajorese people may have already settled, namely Bugis (the middle part of South Sulawesi), Makassar, Kaili (Central Sulawesi), Pasir (East

Kalimantan), Sambas (West Kalimantan), Banjarmasin (South Kalimantan), and Sumbawa, to many places where Wajorese merchant ships called, from Timor to Cambodia.

The trade and shipping code also mentions names of commodities such as rice, salt, cotton, rattan, tobacco, gambier, sea-weeds and timber [Tobing 1961]. Although timber was mentioned in the shipping code, there were no accounts of the kind of wood, its origin or the destination of the timber commodity.

At least until the end of the 18th century, the use of ironwood was not known in Makassar, when around 1772 the wood structures of a mosque built by the Wajorese rotted due to rainwater and weather. Given that ironwood is water and weather resistant, the wooden structures were most likely constructed from some other timber. The mosque was later restored by replacing the wooden poles with brick columns. In 1812, a record shows that a group of Wajorese sought refugee from a conflict in a building made of teak [Noorduyn 2000]. These two stories indicate that the Wajorese in Makassar at that time did not use ironwood.

Oral stories heard in the Spermonde Archipelago indicate that ironwood was already used for housing structures in some of the islands in the latter decades of the 19th century. In 1960, an informant saw a house of ironwood construction in Labbakkang. The heir of the house told him that, considering the ages of his father and grandfather, it was built approximately a hundred years previously. He also said that the material was once purchased in Salemo Island from the traders who frequented Borneo.

2. Usages of ironwood

Ironwood is used locally in house construction and for water butts. Its commercial uses are for heavy construction, marine work, boat building, printing blocks, industrial flooring, roofing and furniture. It has been esteemed by the Chinese as a coffin wood [UNEP-WCMC 2006]. The Dayaks, native people of Kalimantan (Borneo), know well the valuable qualities of ironwood. They recognize its strength and durability especially when exposed to water and weather. They used it for poles, beams, and chips for roofing of their houses, the pole of their spears, and ritual and household utensils. Also, ironwood charcoal is the best ink for the Dayak tattoo and its young leaves when boiled and the liquid extract smeared on the skull is good for hair blackness and health. In Java, ironwood has been used for railway ties and poles for electrical wire since colonial times.

In southwest Sulawesi, ironwood is in great demand for house construction, but the highly prized wood must be imported from Kalimantan. Most of the lowland areas of southwest Sulawesi are densely populated wetlands that experience frequent flooding. Traditional houses, which stand on poles, are preferably constructed on strong and water resistant wood, for which the ironwood is well suited. Houses with an ironwood structure are easily found in any corner of southwest Sulawesi and in the archipelago. In addition to being used for housing structures, it is also used for wharves, and in boatbuilding.

Islands with trade and shipping activities have good reason to import ironwood. They have no self-sufficient timber source and their trade relationship with Kalimantan has been an easy way to purchase ironwood, initially for private use, and eventually as a commercial commodity. As ironwood uses expand, it spreads to other islands and the mainland.

The various islands have gone through similar stages in the quality of housing materials. They all started with bamboo huts, shifted to wooden structures made of driftwood, and then shifted to ironwood. However, the rate of change in housing material was not uniform across the islands. Salemo Island, for example, has enjoyed the luxury of ironwood since the early time of its trade, whereas ironwood was only introduced to other islands in the 1950s.

Ironwood has been used for boatbuilding in the Spermonde Archipelago since the 1970s. It was initially only used for specific components, such as the keel, side stringers, and engine foundation. Since the 1990s, ironwood has been used for construction of the whole ship, with only a small degree of non-ironwood substitution. The various and broad range of uses of the wood have stimulated a high demand, thus increasing the volume of trade. The demand was at the highest peak during the 1970s until about 1997 when an economic crisis kick-started its decline to the present day.

3. Regulation on domestic inter-island wood trading

Inter-island wood trading in Indonesia is regulated by a decree jointly issued by the Ministers of Transportation, Forestry, and Trade and Industry (numbered by each ministry respectively as: No.KM 3 Tahun 2003, No.22/KPTS-II/2003 and No.33/MPP/Kep/I/2003. The decree is issued for the control and tackling of illegal logging, distribution of illegal wood, and preservation of raw material resources for the wood industry. The decree deals with either log wood or primarily processed timber being transported through ports for domestic inter-island trading.

According to the regulations, domestic inter-island transportation of timber can be done only by ships sailing under the Indonesian flag and operated by licensed national shipping or the so-called people's shipping enterprise (*usaha pelayaran rakyat*). The monitoring and checking of timber transportation through ports covers the timber's flow vice-versa, i.e. the flows of timber entering the port until it is loaded to a ship and timber being un-loaded from a ship until it is trucked out of the port. The checks include examination of the document of SKSHH and the physical appearance of the timber, i.e. kind of wood, dimension, volume, and amount. SKSHH (*Surat Keterangan Sahnya Hasil Hutan* or Certificate of Legality of Forest Products), is an official document issued by the authorities to be used in the transport, holding, and ownership of forest products as proves of its legality. The issuing authority is the Department of Forestry of the district or town where the forest products are sourced.

An SKSHH essentially contains the name and registration number of the PKAPT which owns the products, and the physical data (kind, dimension, volume, and amount) of the products. PKAPT (Registered Inter-Island Timber Trader) is a person or a firm authorized for the inter-island trading of timber or forest products. The authorization is acquired from the General Directorate of Domestic Trading under the Ministry of Trade and Industry. The PKAPT is obligated to submit monthly reports to the General Directorate of Domestic Trading through the Market and Distribution Section on the record of its trade, and also to send copies of SKSHH to the offices of trade affairs in the districts or towns of origin and destination.

The regulation provides no specific rule for any certain wood species; it covers all forest products, timber or non-timber. Therefore, the inter-island trade of ironwood is considered legal as long as the shipment is equipped with SKSHH. In South Kalimantan, inter-island shipping of ironwood was once forbidden by provincial regulation, but then

allowed, acknowledging the need of the timber necessary for boatbuilding. In East Kalimantan such restrictions to ironwood trade have never been applied [Kaltim Post 21st November 2003]. On the contrary, a governor decree (No. 522.21/3820/Proda 2.1/EK) was once issued in July 2002 which gave special permission to a firm to cut 50 thousand cubic meters of ironwood within a one year period by land clearing for an industrial tree plantation.

4. The Trading Ships of the Spermonde Archipelago

The trade of ironwood in the Spermonde Archipelago today is served by about 80 ships, operating from the Sabutung and Kulambing Islands, with a total carrying capacity of about 2,541 m^3. The ship's capacity varied from 20~100 m^3 (35~175 tons), (Table 4). All ships are destined for carrying ironwood from Kalimantan with a frequency of 2~4 times annually. Ships from 20~30 m^3 are also used for distribution of timber within the archipelago and to ports of distribution on the mainland South Sulawesi.

Table 4 Number of Ships and capacity in Sabutung and Kulambing Islands

	Number of Ships	Carrying Capacity (m^3)
Sabutung Island	28	1,010
Kulambing Island	54	1,531
Total:	82	2,541

The ships are designed specially to carry timber in long and slim loads, and to carry sacked cargo like cement, rice, and salt. The design actually is a modification of the older type of ships used in the archipelago until the end of the 1980s. The traditional ships have their main hold opening at the rear end of the poop deck and, at their sterns, a quarter platform structures with a back-sealing board releasable to open an access to the hold opening. The ships today, with a modified hull and deck house to accommodate the engine installation, maintain the same loading and un-loading method. The back-opening hold is really compatible to load and un-load timber which is sometimes 2/3 the length of the ship. There is also a hatch on the deck to load and un-load sacked cargo (Figure 4).

5. Network of ironwood trading across the Makassar Strait

We observed ironwood production sites in the hills behind the coastal lowlands and in the middle reaches of rivers, along which the villages of Sangkulirang, Sangata, Bontang, Samarinda, Balikpapan, Tanjung Aru、and Batulicin in East and South Kalimantan.(Figure1). Trading sites have periodically shifted among the villages mentioned above. Although ironwood trade can still be observed at all of the sites, the most active production and trade area is currently around Sangata and Sangkulirang

The ironwood trade from South and East Kalimantan across the Makassar Strait is closely related to the development of trading enterprises of people in the Spermonde Archipelago. The main actors of the trade are those Bugenese who migrated to Kalimantan centuries ago and those who live in the Bugis frontiers on the west coast of their homeland, as well as on the islands of the archipelago. They pioneered the felling of wood for the inter-island trade and they have been operating its transportation and distribution on both sides of the strait.

UNEP-WCMC [2006] summarizes after Peluso [1992], Partomihardjo [1987], and Kartawinata *et al.* [1981], that the concession holders are not licensed to log ironwood according to the Indonesian law that forbids its export (out of country) and restricts cutting to trees over 60 cm diameter at breast height. In southern Kalimantan this timber is felled by the owners of concession rights and also by local people coordinated by traders. Kartawinata *et al.* [1981] note that transmigration settlers in East Kalimantan cut ironwood for sale to supplement their income from farming. The ironwood felled either by professional wood fellers/chainsaw operators or peasant villagers is collected by middlemen who in turn sell it to timber dealers in the port towns. In some cases, dealers collect the timber directly by employing teams of wood fellers or they buy it from independent fellers. A certain dealer supplies a number of shippers or buyers from Sulawesi who send ships to load the timber and transport it across the strait.

Ironwood is distributed in southwest Sulawesi from several places. Sabutung and Kulambing Islands are the distribution points in the Spermonde Archipelago. The two islands supply the southern part of South Sulawesi Province, the port of Awerange serves districts in the middle part, and the port of Pare-pare serves the northern part of the province. The ports of Majene and Mamuju provide ironwood to the Mandar area which is entirely in the West Sulawesi Province. Distribution overlaps over the areas may occur due to a number of reasons, such as (un-)availability, stock piles, and business relationships.

Sabutung and Kulambing are two islands in the Spermonde Archipelago which have a well established network in Kalimantan. Until the end of the 1970s ships from Sabutung Island generally sailed to Kota Baru, Batu Licin, and Balikpapan only. In the early 1980s Sangata, for the first time, was open for ironwood trade and about five or six ships from Sabutung frequented the port of Haji Bolli, a private Buginese owned river port, in the Sangata River behind the town. At that time no ships from any other places in South Sulawesi called at Sangata when the town was only a village. In the early 1990s, ships from Laiya and Kulambing Islands also begin to come to Sangata, and today we can also find ships from Awerrange calling at Kampung Kajang, another port on the same river.

Merchants of Sabutung Island follow their traditional route which was established by their predecessor. They take the north course to the Mandar area, particularly Mamuju port, bringing cement, rice, or salt. From Mamuju, the ships usually carry agricultural products, such as beans and fruits, to many destinations on the Kalimantan side. A particular ship carried soybeans to Bontang, and from Bontang sailed ballast, i.e. empty load, to Sangata, and from Sangata carried back the ironwood to Sabutung Island.

Kulambing Island is the most active in ironwood trade today. Like Sabutung Island their trade to the west started in the early 1950s. Their first contact was Tanjung Aru, to where they brought rice and salt, and brought back timber, including ironwood, until the mid-1970s. At the end of the 1960s they also called at Batulicin, Kotabaru, Balikpapan, and Samarinda, ports that provide timber for their trade. In the beginning of the 1990s Kulambing ships started to favor a call for ironwood at Sangata, because the town provided the most reliable timber supply in terms of volume and a shorter waiting time required for loading compared to other ports which were declining.

Ports usually visited by Kulambing ships in the period of 2002~2006 are Kotabaru, Simpang (Batu Licin), Tanjung Aru, Tanjung Samalantakan, Tanah Grogot, Penajam

(Balikpapan), Samarinda, Bontang, Sangata, Bengalon, Sangkulirang, and Tarakan. However, only three ports are, significantly, the most frequented by the ships, namely the ports of Kotabaru, Simpang and Sangata. The dominant cargo carried by the Kulambing's ships to Kalimantan is cement, followed by rice. This practice of carrying cement or rice to Kalimantan is to compensate the fuel cost from the freight rate. The cement factory with a special loading port at the shore facing the islands and the rice producing wetland of South Sulawesi Province provide these cargoes.

The ironwood trade network in South Sulawesi comprises the consumer, as the final destination of the timber, and some distribution layers. Ship-owners or shippers in Sabutung and Kulambing Islands are usually also traders, but a shipper is not necessarily the owner of all timber carried by his ship, other traders in his island of origin, who own no ships, may share the load by paying the freight fare. These traders, who purchase the timber directly from Kalimantan, are at the top of ironwood distribution, especially in the southern part of South Sulawesi.

A secondary layer of distribution is formed by those who have contact with the shippers, they usually open a timber shop in a nearby town accessible to the water. Segeri, Pangkajene, Maros, and Makassar are the nearby towns that are accessible by river, except Labbakkang which has a port on the sea. Takalar and Jeneponto are a little far on the south coast, but they have ports on the sea and an established business relations with the two islands. As observed, water way is an important factor in the relationship between the shippers and the timber shop. Shippers provide a delivery service by means of sea transportation for their client.

Distributors who run their business in the interior districts and on the east coast, where land transport is more beneficial than the sea transport, they purchase their trade from the timber shops who provide delivery services by means of land transportation.

Consumers may purchase timber at the nearest distributor, or skip it and directly go to a timber shop or a shipper in order to benefit from the lower price they offer, depending on the purchase volume. Distributors only give discount and provide deliveries to the client buying a certain minimum purchasing volume.

6. Distribution of ironwood in South Sulawesi

The volume of ironwood trade has never been sufficiently recorded. Data on importation of ironwood at the forestry related offices in South Sulawesi Province are nearly non-existent while data on timber other than ironwood are sufficiently available. For the year 2004, only 16 m^3 of ironwood was recorded among 30 thousand cubic meters of other kinds, which were mostly *meranti* (*Shorea spp*.) and mixed kinds (*rampa campuran*-IND), entered the province from East Kalimantan, and for 2005 there was no ironwood recorded at all of the 13 thousand cubic meters of other timber. In fact, there is a large volume of ironwood movement in South Sulawesi Province during the said years. In the Pangkep District alone in the year 2005, the Forest Office recorded only 877.32 m^3 of ironwood transported within the district and to nearby districts such as Maros, Makassar, Takalar, and Jeneponto. While for the same year, according to the estimation made from the Kulambing village office records, approximately 4,000 m^3 of ironwood was shipped from Kalimatan to the district.

The office of forestry in the Pangkep District, based on the SKSHH it issued, recorded only the movement of timber going out of, but not the timber coming into the district. Table 5 and Table 6, which are extracted from the monthly recorded Register of

issued SKSHH, show the movement of timber, i.e., ironwood, other Borneo wood {Bayam (*Intsia bijuga*), Meranti (*Shorea Spp.*), and Kapur (*Dryobalanops spp.*)}, and the local forest product {mostly Teak (Tectona grandis)} being transported from certain places in Pangkep District to other places within and outside the district.

Table 5 Movement of timber from places in the Pangkep District in 2005

Origin	Ironwood (m^3)	Other Bornean wood (m^3)	Local wood (m^3)
Laiya Island	0	70.14	0
Sabutung Island	487.23	110.16	0
Kulambing Island	292.39	431.87	0
Pangkajene	68.25	218.66	799.71
Labbakang	29.45	38.46	211.82
Segeri	0	0	109.05
Total movement:	877.32	869.29	1,120.58

Source: Register of issued SKSHH (*Surat Keterangan Sahnya Hasil Hutan* / Certificate of Legality of Forest Product), Pangkep District Office of Forestry.

Table 6 Timber received by the Maros District from the Pangkep District in 2005

Destinations	Ironwood (m^3)	Other Bornean wood (m^3)	Local timber (m^3)
Maros	433.77 (49%)	525.52 (60%)	439.77 (39%)
Jeneponto	216.90 (25%)	15.12 (2%)	(0%)
Takalar	121.03 (14%)	1.55 (0.2%)	(0%)
Makassar	46.13 (5%)	159.57 (18%)	148.56 (13%)
Others*	59.49 (7%)	167.53 (19.8%)	532.25 (48%)
Total movement:	877.32 (100%)	869.29 (100%)	1,120.58 (100%)

*) other destination places: within the district, Pinrang, Bone, Malili (Central Sulawesi), etc.

Laiya, Sabutung, and Kulambing are the three islands now actively trading Bornean woods in the Spermonde Archipelago. However, Laiya Island has been cutting back on its trade in ironwood since 2003, leaving Sabutung and Kulambing Islands as the primary ironwood distributors. The total volume of ironwood movement which is figured in Table 5 and Table 6 all originated from the two islands.

Unlike the sailing practice in Sabutung Island, Kulambing Island is recording departures of its ships in detail. Every ship departing from the island, according to the village rule, should declare its departure to the village head, informing the latter of the name of the ship, the captain, destination, and name and quantity of its cargo. So, the village office of Kulambing Island has a record of ship departures called the 'register book' but the village office of Sabutung Island lacks such recording. Every departing ship in Kulambing Island has a 'daily pass', attained from the village, stamped in a book. The stamp is needed to present to the administrator of the destination port.

A returning ship to Kulambing Island bears no obligation to report its arrival, so that information about the kind and quantity of its cargo is not available in the village record. However, from interviews with captains and ship owners, we have ascertained that all ships returning from East Kalimantan carry timber exclusively. We have used the information we get from the interviews to estimate volumes of the ironwood trade. Table 7 is obtained from the village record, and presents the number of departure and

carrying capacity of ships traveling from Kulambing Island to the east coast of Kalimantan between 2002 and 2006. Based on these data and the following assumptions, we estimated the volume of the ironwood trade (Figure 5). The assumptions are that all ships return to Kulambing Island, and all ships carry back timber with a 90% load factor, and 80% of the load is ironwood. From this estimation, we calculated that the volume of ironwood trade may reach 2,400–4,800 m^3yr^{-1}, with a monthly average in the range of 150–400 m^3.

Table 7 Ship loading capacity and number of departures from Kulambing Island to Kalimantan (2002 – 2006)

					Number of ship departures (dep.) and ship capacities (cap., m^3)									
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	Total	Avrg
2002	Dep.									18	25	23	66	22
	Cap.									486	356	796	1,638	546
2003	8	15	26	14	16	11	19	23	25	17	6	9	189	15.8
	178	501	783	410	467	274	494	720	725	440	178	218	5,388	449
2004	5	12	7	14	6	21	20	19	13	14	6	5	142	11.8
	102	398	281	332	319	565	723	583	378	343	253	262	4,539	378,3
2005	2	7	12	4	4	7	14	3	9	9	10	8	89	7.4
	114	372	447	213	145	344	493	104	227	339	348	219	3,365	280.4
2006	3	12	7	8	12	4	8	4					58	4.8
	68	404	192	268	350	88	250	79					1,699	212.4

Source: Kulambing Island's ships departure register

As imagined from Table 7, the volume of timber fluctuates in relation to the monsoonal seasons that affect the number of departures, and thus the carrying capacity of the ships. In the west monsoons (between September and March), ironwood trades decline from October to January with an exception of December 2002. January is always low, marking the peak of the west monsoons when no sailor dares to cross the strait. From February until May the volume of ironwood fluctuates in a declining trend with the exception of March 2003, which shows an extremely high figure. From June to September the figures start to increase and reach its peaks.

In the figures, an overall declining trend of timber trade volume is observable within the past five years. The situation depicted for Kulambing Island seems to indicate the decline in the timber trade on the whole peninsula of southwest Sulawesi, an impression gained from similar sighs and complaints heard from timber traders at other places.

Relying on the carrying capacity and estimation data (Table 7), it can be pointed out that there was approximately 2,400 m^3 of ironwood unloaded at Kulambing Island in 2005. Judging from the carrying capacity of the fleet of both islands, whereas the carrying capacity of Sabutung Island's armada is 2/3 of Kulambing Island's (Table 3), it may be further assumed that another 1,600 m^3 of ironwood unloaded at Sabutung Island could be added to make the estimation volume of ironwood entered in the Pangkep

District become 4,000 m^3 in the year 2005. However, according to Table 6 only 877.32 m^3 was the total movement of ironwood in the district which is only 22% of the estimation. The rest, i.e. the 78% of the ironwood which entered the district, was partly consumed within the Spermonde Archipelago for housing structures, wharves, and boatbuilding. Distribution of timber within the archipelago is not recorded at all, thus it is absent from any records. The largest part, however, goes to the 'off-the-record' shipment which is in all cases more voluminous than the recorded ones and some volume escapes recording due to under-measurement at the issuance of SKSHH.

Table 8 shows the role of Sabutung and Kulambing islands in supplying nearby districts directly by sea. The SKSHH register recorded 487.23 m^3 of ironwood distributed from Sabutung Island (Table 5) with composition as follows: to Maros in the amount of 193.29 m^3 (39%), to Jeneponto 155.18 m^3 (31%), to Takalar 105.64 m^3 (21%), and the rest to Segeri, Pangkajene, Makassar, and Malili (Central Sulawesi) at small percentages and in decreasing order. Sabutung Island distributed 110.16 m^3 of 'other Bornean wood' (Table 5), to Pangkajene 77.59 m^3 (70%), Maros 15.9 m^3 (14%), Jeneponto 15.12 m^3 (13%), and Takalar 1.55 m^3 (13%), (Table 8).

According to Table 5 there were 292.39 m^3 of ironwood distributed from Kulambing Island with a composition as follows: to Maros 186.95 m^3 (63%), to Jeneponto 61.72 m^3 (21%), to Pinrang 25.13 m^3 (8%), to Takalar 15.38 m^3 (5%), and to Makassar 3.21 m^3 (3%). The island distributed a bigger volume of 431.87 m^3 of 'other Bornean wood' to Maros 312.17 m^3 (72%), and to Makassar 119.7 m^3 (28%), (Table 8).

Table 8 Timber sent by Sabutung and Kulambing islands directly to nearby districts in 2005

Origins	**Destinations**							
	Maros		**Makassar**		**Takalar**		**Jeneponto**	
Timbers (m^3)	**I**	**O**	**I**	**O**	**I**	**O**	**I**	**O**
Sabutung Island	193.29	15.90	6.08	0	105.65	1.55	155.18	15.12
Kulambing Island	186.95	312.17	3.21	119.70	15.38	0	61.72	0
	380.24	328.07	9.29	119.7	121.03	1.55	216.90	15.12

I = Ironwood , **O =** Other Bornean timber

Table 9 Timber received by Pangkajene Town from the Spermonde islands in 2005

Origin	**Timbers received by Pangkajene**	
	Ironwood (m^3)	**Other Bornean wood (m^3)**
Sabutung Island	9.86	77.59
Kulambing Island	-	-
Laiya Island	0	52.66
Total timber received by Pangkajene:	9.86	130.25
Timber transported from Pangkajene (Table 1)	68.25	218.66

Table 9 shows the volume of discrepancy of timber that is received and sent by Pangkajene Town, and thus strongly reveals the insufficient recording of the timber trade. It seems that shipment of timber from the islands to Pangkajene, which is the capital town of Pangkep District, was rarely recorded by the issuance of a SKSHH certificate. There were only ten certificates issued for the year of 2005. One was issued

for ironwood (9.86 m^3) and four were issued for the 'other Bornean' (77.59 m^3) shipped from Sabutung Island, and five certificates were issued on the 'other Bornean wood' (52.66 m^3) from Laiya Island. No certificates have been issued for timber shipped from Kulambing Island to Pangkajene despite the fact that Kulambing Island is the primary ironwood supplier for the town.

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