

## Comparative studies on indigenous fishing crafts in selected areas in Sulawesi and Aparri of northern Luzon

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A series of measuremental and cataloguing surveys was undertaken on the indigenous coastal fishing crafts in selected villages of Manado, Ujung Pandang and Kendari around Sulawesi of Indonesia, and Aparri of northern Luzon of the Philippines from July 2-26, 1986.

The beach conditions of the villages surveyed were of gradual sand slope which is ideal for beach landing of small fishing crafts.

The three types of fishing craft surveyed are a) dugout canoe made of whole log, b) semi-dugout crafts constructed with additional plankings above the dugout part, and c) planking craft consisting of keel, stem and stern post, and multiple plankings.

Detailed description of the outrigger canoe is presented with emphasis on construction as this type is most common in the areas surveyed. The outrigger is attached to a dugout canoe or a semi-dugout to improve the stability of the craft. The outrigger is composed of a holding boom made of either bamboo or wood attached to the hull. A craft may have an outrigger on one side (single outrigger) or on both sides (double outrigger).

According to Nooteboom,<sup>1)</sup> the double outrigger canoe was dominant in Indonesia and the Philippines. While, during this survey, the double rigger was dominant in Manado and Aparri, however, it was observed that in Laelae I., Ujung Pandang, the single outrigger canoe was common, while in Bakori, Kendari, only the simple dugout was found. The shift from double outrigger to single outrigger may have been caused by the introduction of the cast net in this area (A. Masengi, personal communication, 1986).

The motion of the single outrigger canoe has been thoroughly investigated by Matsuoka<sup>2)</sup> of Papua New Guinea University.

**Key words :** 沿岸漁船 coastal fishing boat ; 船型 shape of hull ; アウトリガー outrigger canoes

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### 1. Methodology

Standard survey forms<sup>3)</sup> were used for the measurement and cataloguing of fishing crafts in the selected areas as shown in Fig. 1. For each area, a minimum of 10 catalogue data samples and two hull lines were recorded for each type of fishing craft when possible. A measuring guage<sup>3)</sup> was used for the measurement of the hull lines.

The length (L) of the craft is the horizontal distance between the outside of the stem post and the inside of the stern post or transom when present. The width (B) is taken to be the outside measurement of the widest section of the craft. The depth (D) is taken to be the vertical measurement from the level of the hull top down to the bottom at the transverse center on the longitudinal center line.

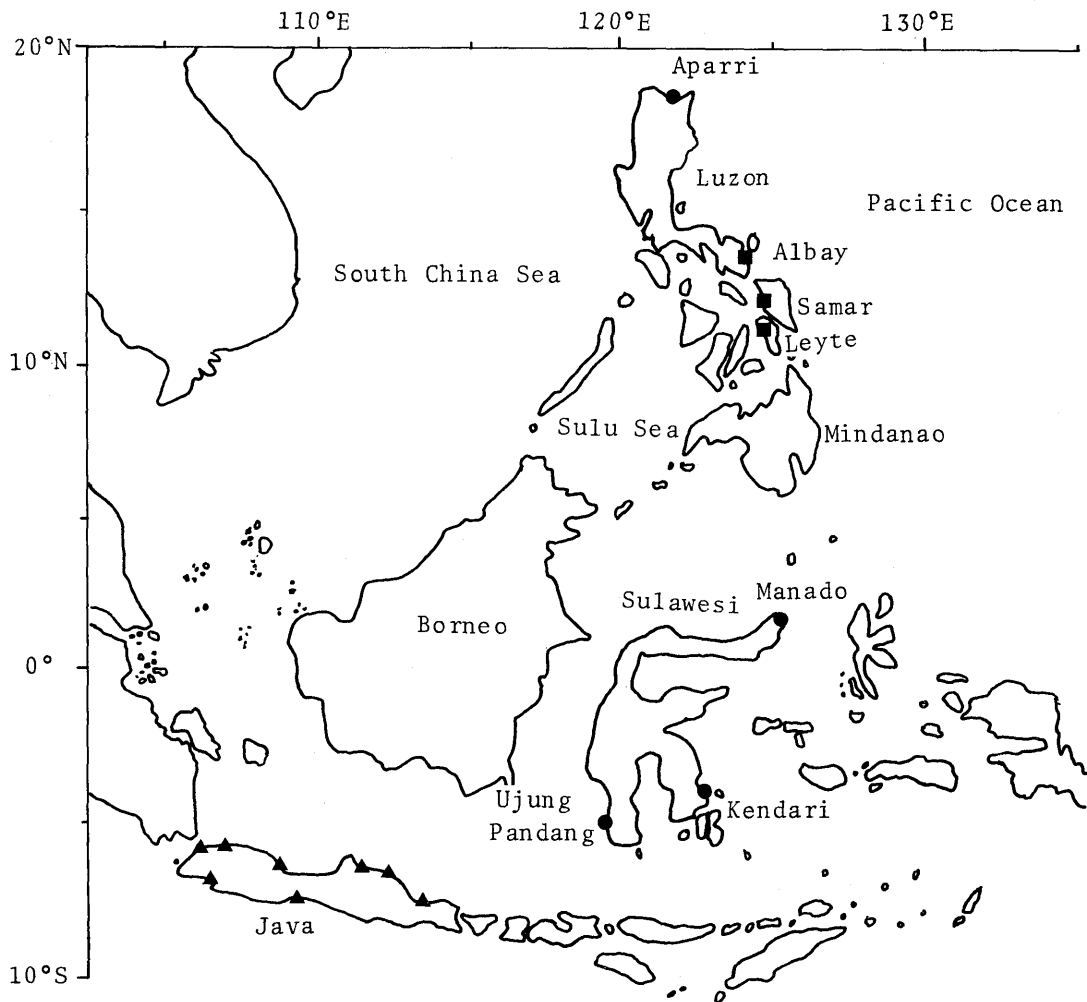


Fig. 1. Location of selected villages surveyed in 1984-1986

● : 1986, ■ : 1984, ▲ : 1984 (3)

## 2. Result and Discussion

### 2. 1 Manado Dugout Canoe with a "Snout"

The double outrigger dugout canoes with the so called snout were mostly found along the Manado beach and in Lembeh I. As shown in Fig. 2 & 3, the snout is present in both ends of the canoe. The canoes with the snout are called "londe" while those without are called "pelang".

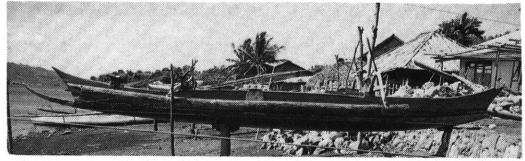


Fig. 2. Manado canoe with typical snouts on the stem and stern ends, "londe", at Batulubang of Lembeh I., July 1986

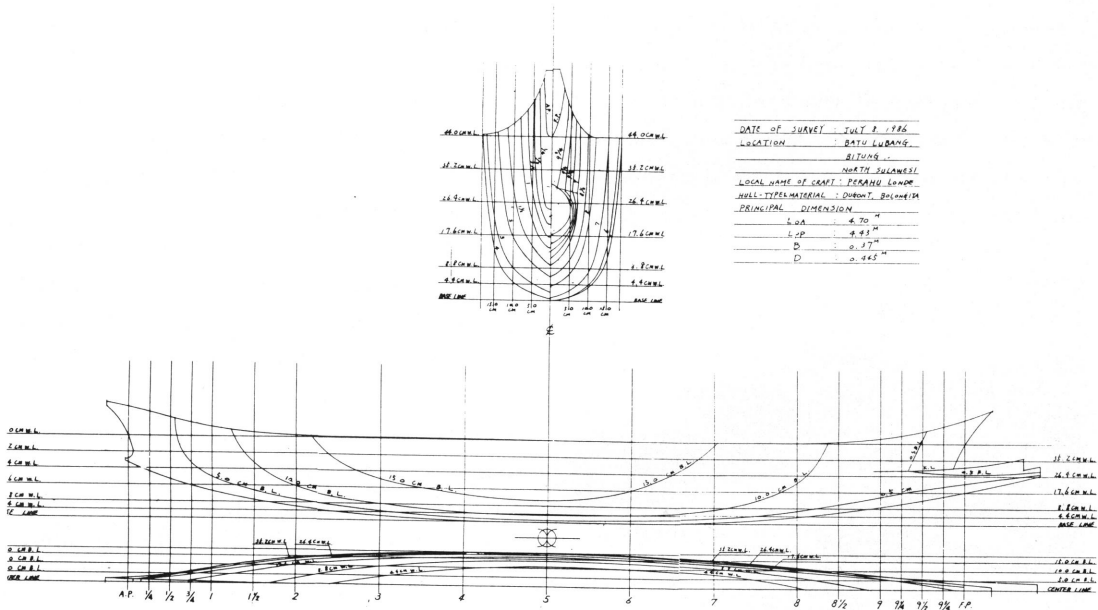


Fig. 3. Hull lines of Manado semi-dugout with snout, "londe", July 1986 from A. Gunawan (unpublished)

Nooteboom<sup>1)</sup> showed six models of canoes with snout and stated the snout is distributed from north Sulawesi to Palawan and Mindanao of the Philippines. According to A. Masengi (personal communication), the appearance of snout is ranged in the eastmost areas of North Sulawesi Province from the Kepulauan and Sangihe Is. to Belang or Amurang and its use is for the fishermen to hold on while searching for fish or seashell underwater and also probably for esthetic reasons.

The size of the snout of the stem is 23 to 74 cm (mean, 48 cm) long, 3 cm anterior diameter and 8 cm base diameter, and has the shape of an elephant tusk. This snout is made of two parts, the base part extends up to the length of the hull and

is a continuous part of the keel while the anterior section is nailed to the free end of the base. The stern snout which is relatively smaller than the bow snout is a remnant of a full size snout. Of the 19 samples 84% measured had stern snout of less than 10 cm long.

While the length of the bow snout is not in correlation with the length overall and the age of the canoe. It is significantly correlated to the width and depth of the canoe ( $\alpha < 2\%$ ).

Tadanoo<sup>4)</sup> made hull-line measurements of a Bali fishing canoe with a snout and Monda<sup>5)</sup> described in detail on a house boat with a snout, "lepa", after his long aboarding on the lepa of Samas (Bajaus?) people in the south Philippines. However, the snout of above two greatly

differ from a snout of the Manado londe.

A snout is also present in a fishing craft near Ranong (at the boarder between Thailand and Burma) which is used for pearl gathering<sup>6)</sup>. The snout size is about 30-50 cm long for both ends and has a wider diameter than those of Manado. In 1979, the senior author observed three Burmese crafts of 3-30 GT as shown in Fig 4. Unlike the Manado snout, the snout of these crafts is formed as a continuous part of the hull without any additional section. The additional planking on the hull which is shorter caused the formation of a snout at stern end. This construction shows the hull distinctly from the additional planking.



Fig. 4. Small cargo boat with big snout on her stern from Burma on a Slip-way at Rayong of Thailand, September 1979

Ikuta<sup>7)</sup> described the snout of North Sulawesi to be a model after a semi-dugout in the early stage of development. During the measurement of a semi-dugout in Lembeh I., the snout was accidentally broken. However, this did not create any problem with the owner of the canoe. Such a non-reaction on the incident leads us to believe that the original value or any religious importance of the snout no longer exist among the fishermen. The Manado snout seems to be mainly for decoration purpose. On the practical side, the snout causes some inconvenience when beaching and may cause some fishing line trouble during operation. The researchers could not

find any practical use of the snout. When paddling, the snout appears just above the water surface, and considering its shape and size it seems to have no effect on the running performance of the craft. The effect of the snout on running resistance on the canoe will soon be proved from tank tests of scale model of the londe. From the test made by a co-author, H. Takayama, the running resistances of the londe of 4.43 m in  $L_{WL}$  are assumed as 0.6 kg in 0.9 m/s of paddling speed and 3.2 kg in 2.2 m/s in sailing speed.

The fishermen of Batu Lubang village of Lembeh who originated from the Sangihe Is. in the northern water of Sulawesi, brought with them the know-how to build their own dugout canoe to the native of the island. When building a new canoe, the owner fisherman selects the best performing canoe in the village and uses this as the model. The principal dimensions of the model canoe is taken as the dimension of the new canoe. For the detailed hull shape, a galvanized wire is used to measure section of the model canoe and match this with that of the new canoe. This procedure allows the fine adjustment on the hull lines.

There are two kinds of holding systems of the outrigger floats; Manado type shown by Nootboom<sup>1)</sup> and Makasar type.

The mean dimensions of the 23 dugouts with double outriggers surveyed at Manado were  $LBD = 6.0 \times 0.42 \times 0.46$  m (for the 19 dugouts with snout,  $5.7 \times 0.4 \times 0.49$  m). Most of the canoes were propelled by a paddle or sail. However, when in route to the fishing grounds these canoes are often towed by an outboard powered planked boat. This is an evidence of a trend towards the motorization of fishing crafts. A semi-dugout, "pambut", in the Manado Bay are already modified with a transom for the mounting of outboard motor of 8-15ps.

The fishing crafts in this area are mainly used for angling, vertical line, long line, squid jigging, bonito trolling, gill net and others includ-

ing spearing around reef area.

There are 13-14 purse seine fishing units based in Aertenbaga of the Lembah Passage. A fishing unit is composed of a planked seiner, "giop" (LBD =  $15 \times 3 \times 0.8$  m, twin outboard motors of 40ps), and two semi-dugout light boats, "pelang besar", (LBD =  $11 \times 0.9 \times 0.7$  m, with a 20-40ps outboard motor each and 8 attraction lights, pressurized lantern of 350 candle power each).

## 2.2 Single Outrigger Canoe in Ujung Pandang

Abundant coral reef areas are found in the waters off Ujung Pandang making the area a rich fishing ground. While in transit on board a double outrigger passenger boat, from Tg. Pandan to the Laelae I. which forms the south end of the break water, two famous sea-going sailing boats of 60 GT class called "pinisi"<sup>5,6,7</sup> in full load condition were sighted. These pinisi are inter-island cargo boats with a long bowsprit and two masts with ketch rig.

The semi-dugouts of Laelae I., called "lepalepa" or "sopek"<sup>4,8</sup> are mostly with single outrigger and a quarter rudder called as Makasar type on port side (Fig. 5). The Makasar outrigger-holding-system described in Manado does not exist in this island.

Of the 221 crafts in this island with a population of 1,500, 57% are fishing boats and the other 43% for the local total are used for transport.



Fig. 5. Single outrigger canoe at Laelae I. off Ujung Pandang July 1986

Among the fishing crafts, 10 canoes are dugouts without outriggers, 108 are semi-dugouts of single outrigger, 10 are large semi-dugouts of double outrigger. For the passenger crafts, all are planked crafts, 35 of which are small with double outriggers while 60 are large of about 5 GT without outrigger. The island ideal or swimming and leisure fishing for people coming from the city proper and thus there are many passenger boats.

For the hull material, according to the senior fishermen of the village, the manggo tree of Borneo cut after harvesting the fruits is the best quality material. It is believed that a good fruit bearing tree as a hull material will bring abundant fish catch.

The length/width ratio, L/B, of the small semi-dugout (LBD =  $4.3 \times 0.5 \times 0.5$  m in mean)

Table 1. Various mean dimensions of outrigger canoes in Sulawesi and Luzon in 1986 (unit in m)

Dimension	Island	Sulawesi		Philippines	
	Location	Manado	Ujung Pandang	Aparri	Albay
Length over all		6.39	4.08	7.55	9.52
Width		0.45	0.52	0.63	0.82
depth		0.49	0.50	0.56	0.81
Height of stem tip		0.60	0.64	0.86	1.13
Height of stern tip		0.60	0.46	0.85	1.18
Length of outrigger float		4.32	3.64	3.93	6.31
Length of outrigger boom		1.64	1.52	1.55	2.94
Interval between boom-boom		2.86	2.18	3.19	4.90

6-12 is comparatively smaller than the Manado canoe of 12-15 L/ B and is of a fair type hull (Table 1). The probable reason for the fair type hull is the use of the single outrigger and the motorization of the craft. However as compared to a modern seagoing fishing boat<sup>9)</sup> (L / B = 6) this type of crafts is slimmer.

The sail of the canoes in Laelae of Ujung Pandang and Manado is made of thin polyethylene film supplied as agricultural use. Judging on the material used, the resistance of the craft must be extremely small in sailing condition.

For the motorized single outriggered semi-dugouts with the engine is mounted on the platform fixed between the outrigger booms as shown in Fig. 4. For 10 m long crafts, the size of motor is 20ps and for those with mean length of 4.3 m the motor size is from 5-8ps. The smaller crafts are used in angling, gill net, long line for catching fish coral and mackerel, and squid jigging.

### 2. 3 Kendari Dugout Canoe and House Boat

From the Kendari port to Bakori I., a long dugout canoe (LBD = 10 × 0.6 × 0.6 m, 20ps out-board motor) was used for transportation to and from the islands. Along the way to the island, "katamaran" type fishing crafts for lift net, "bagan perahu", fishing and a number of bamboo fish corals, "sero" were sighted. Outside of Kendari Bay eastward about 5 nautical miles is the coral line island of Bakori which is surrounded by vast coral,<sup>10)</sup> rock and sand are as making the island good for fishing. Majority of coastal fishing crafts around Sulawesi are with outriggers. However, all the crafts in kendari area do not have outriggers.

In this island, there are 120 households of which 90% are "Bajaus", and the rest are "Bugis", "Makassareses", "Tolakis", "Jawanese" and "Wolios" ethnic origin. The common language is the national language, "Bahasa Indonesia". However within each group, their respective dialects are still being used.

The Bajaus are known boat dwelling people and are widely distributed in the less inhabited areas of the islands around Indonesia and the southern Philippines<sup>11)</sup>. According to the fishery officials with the research group, the Bajaus of Bakori originated from Muna and Buton Islands located south of kendari (Fig. 6, 7). The Bajaus are often called as Butunese<sup>8, 11)</sup>.



Fig. 6. Bajau children sit on torches of palm leaves used for heating the hull bottom to prevent ship-worm infection



Fig. 7. Afternoon in Bakori

During the survey in Bakori I., the wind direction suddenly shifted causing the Bajaus to transfer mooring locations of their house boats to the lee-side of the island. This sight made it prove that the Bajaus are skillful seamen.

When asked why they, the Bajaus, still continue to live in the house boats, the answer was that it has been a tradition of the tribe. On board the house boat, there are no mosquitos and less

contamination with communicable diseases, and from the boat they can easily gather sea-foods.

Except for an engine mechanic, the rest of the menfolks of the island are fishermen. The children after school join the womenfolks in the gathering of seashells and other edible invertebrates in the nearby shallow waters.

The registered crafts of the island is 198 and majority of which are 5-6 m long sampans or sailing dugouts without outrigger (Fig. 8). Running resistances of the dugout of 4.7 m long are assumed as 0.45 kg at a paddling speed of 0.9 m/s and 3.0 kg at a sailing speed of 2.2 m/s from a tank test of a scale model of 2 m long.

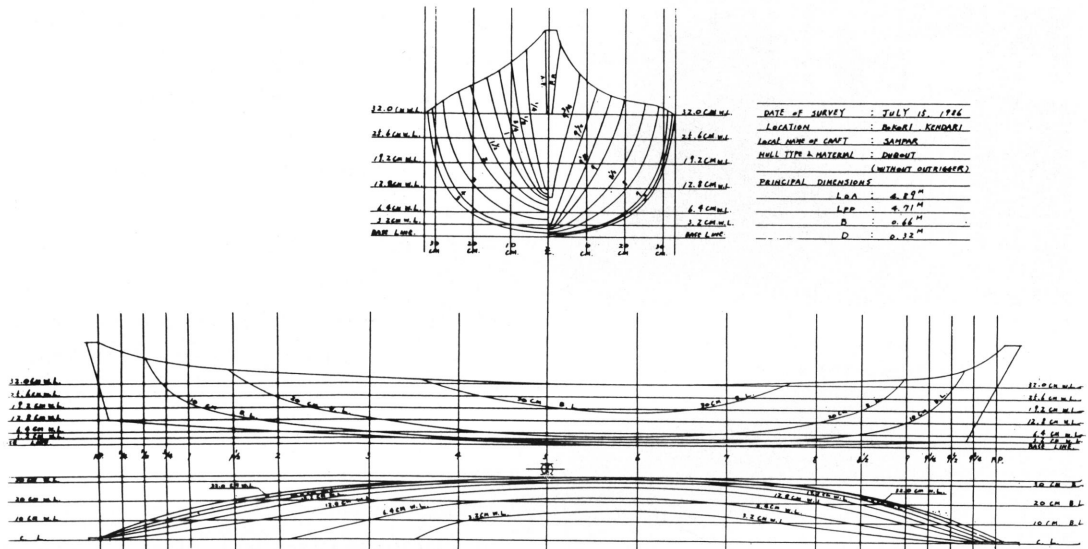


Fig. 8. Hull lines of Kenari dugout without outrigger, "sampan", July 1986 from A. Gunawan (unpublished)

While, the crafts are used for angling (52%), gill netting (30%), bamboo fish corral (13%), bamboo fish pots (5%), long line and other fishing activities such as spearing, seaweed and seashell gathering.

These dugout canoes, "sampans" were bought from other villages and no construction of new crafts are done in Bakori. However, the maintenance of the crafts is done locally. To protect the craft from shipworm the hull is regularly heated using a torch made of coconut fronds as shown in Fig. 6. Repair of the dugout canoe is usually done after around 10 years use by cutting the wornout hull top and relacing this part with a new planking. This maintenance work may have given the fishermen the idea of increasing the free board by adding a planking to

the simple dugout. It can therefore be said that this may be the origin of the development of the semi-dugout.

To attached the planking to the old dugout after removing the wornout section, holes of about 1 cm diameter at regular intervals are drilled to both the hull and the planking. A



Fig. 9. Repairing an old canoe at Bakori I.



cylindrical stick made of hard wood is imbedded in the holes opposite each other to join the plank and the hull edge to edge (Fig. 9).

For the larger 6-10 m sailing house boats, these are constructed by the Bajaus (Fig. 10) and are built locally for their strong seaworthiness. Briefly, the main parts of the house boat are keel, oblique stem and stern post, frame



Fig. 10. House boat being built in a shed at Bakori I.

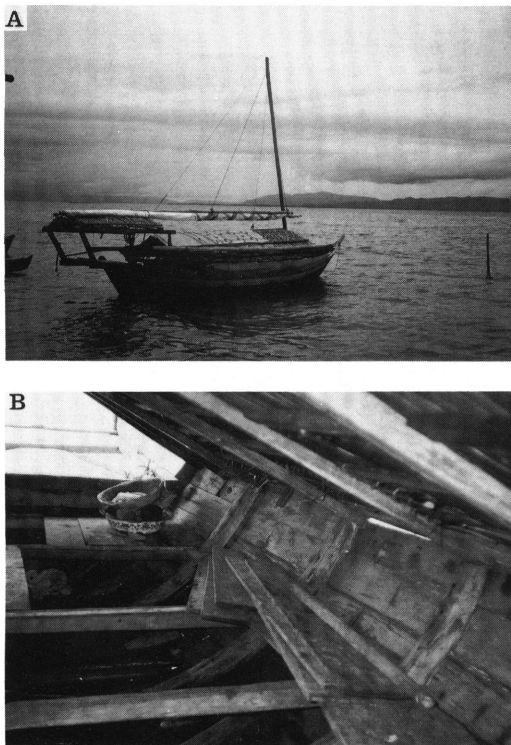


Fig. 11. Bajau house boat at Bakori of Kendari, 1986  
 LBD =  $6.8 \times 2.8 \times 0.8$  m  
 A : projective view, B : inside view showing hull construction and a cooking stove

and beam of about 1 m one intervals, and hull plankings. There are short frames mounted in between the main frames (Fig. 11). This type of craft does not have a bulkhead. The craft is propelled only by a traditional sail of tilted square. This old type of craft may be influenced by Arab-Indian craft design<sup>11)</sup> and well agrees to Butung lambo<sup>12, 13)</sup> in shape and construction. Looking at the total length of the craft, the width is relatively wide and so the shallow depth. This house boat has a different construction and shape from other house boats of Mawkens<sup>11, 14)</sup>, Palembang<sup>1)</sup> and Samas<sup>5)</sup>.

As seen the building yard of a house boat, the sequence of construction similar with that of the Japan type fishing boats. The sequence of construction is that first the keel with the stem post and transom are laid, followed by the attachment of the hull planking, and finally the setting of the frames and beams<sup>15)</sup>. The frames are made from naturally shaped tree branches fitted to the shape of the hull.

During the field survey, a house boat was seen returning to the island with a young couple on board (Fig. 12). Cleanliness is kept in the cabin as seen in the neat arrangement of living articles. On the cabin roof there were dried fish, hand harpoon. The harpoon used are without barbs. This barbless hand harpoon is also used by Mauken people of Phuket, Thailand, fishermen of the Sulu Sea and of Itoman in Okinawa, Japan (S. Egawa, personal communication). The barbless harpoon of traditional type allows the easy removal of the speared fish by the fisherman from the harpoon while underwater. The arrangement of a house boat it shown in Fig. 12, where the living quarter is located at the central section covered with palm leaves held together by bamboo sticks. For this section, the hull planking extends up to the roof. The forward section of the living quarter is provided with a small opening (80 cm wide) which could be covered when there is splashing of seawater



while the rear section is fully opened. The floor of the living quarter is 24 cm lower than the fore and aft water tight deck. The kitchen part of the living quarter is located at the rear section with the forward section as the sleeping area. In the cooking area, a used galvanized wash basin is filled with sand and three big stones to serve as the stove. Just above the stove is a bamboo shelf containing kitchen utensils. The stove is located

at the rear section for good ventilation. Small sticks are used as firewood. There are no dividers in this living quarter. At the stern section of the house boat a roof is installed higher than the living quarter roof. The height of the roof allows easy viewing and ship handling and also protection from sun and rain. This place is provided with a shelter board 35 cm high.

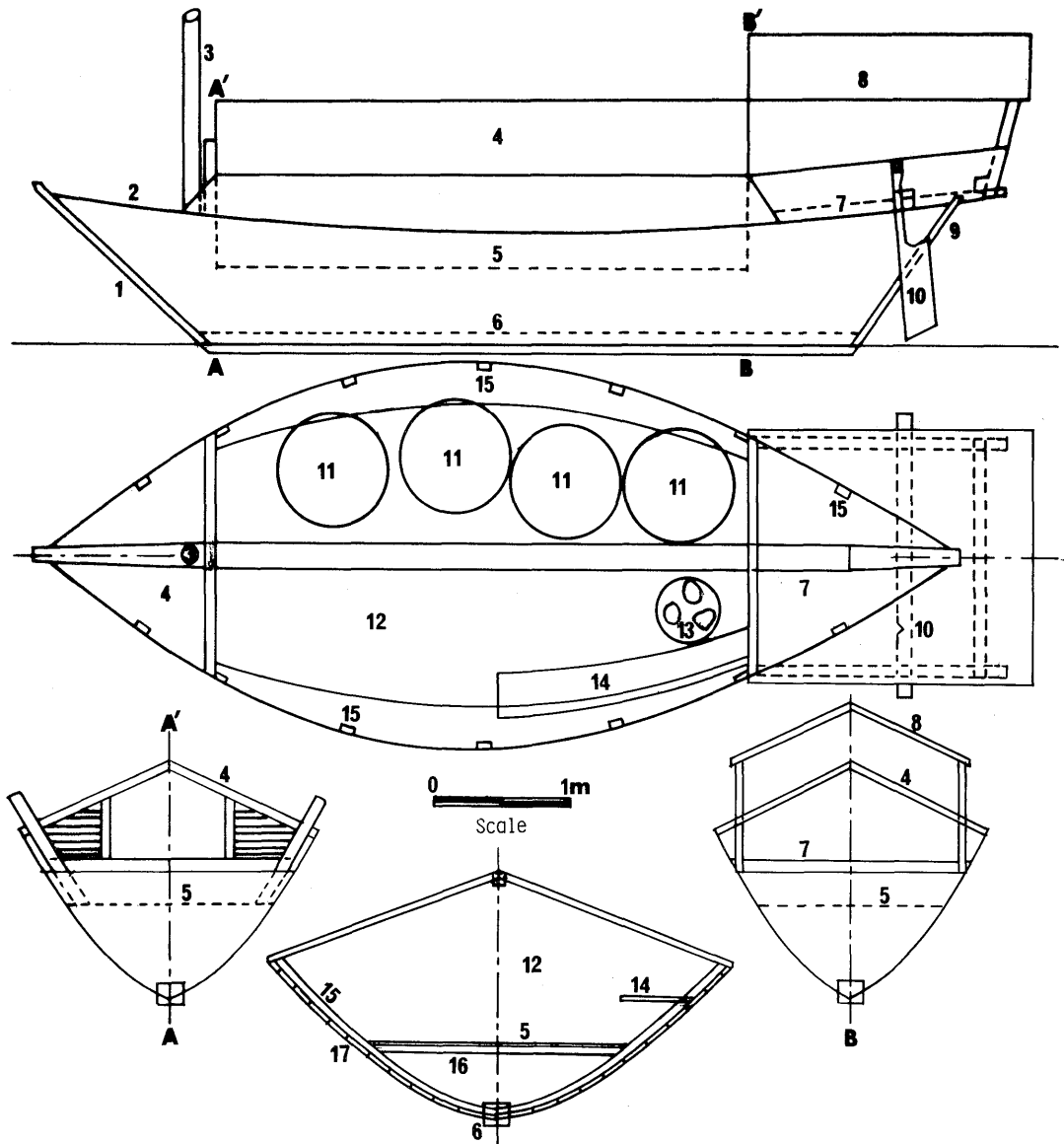


Fig. 12. General arrangement of Bajau house boat in Bakori : 1, stem post, 2, fore deck watertighted, 3, mast, 4, fore roof of palm fronds, 5, floor of living quarter, 6, keel, 7, aft deck watertighted, 8, aft roof, 9, stern post, 10, rudder, 11, sea chest, 12, living quarter, 13, cooking stove, 14, shelf of kitchen utensil, 15, frame, 16, beam, 17, hull planking

The height of the mast is 4 m with a bamboo yard 4.5 m long where a polyethylene cloth of about 25 m<sup>2</sup> is rigged serving as the sail of the craft.

The Bajaus also have larger sailing crafts of about 10 m or more long which have a long bowsprit and a mast of ketch rig, as shown in Fig. 13. During our stay at Bakori, the craft with 11 Bajaus from Butung I. called this island to land 2 men and sailed again for north Sulawesi to visit their family tribes.



Fig. 13. Sea going house boat of Bajaus called at Bakori I.

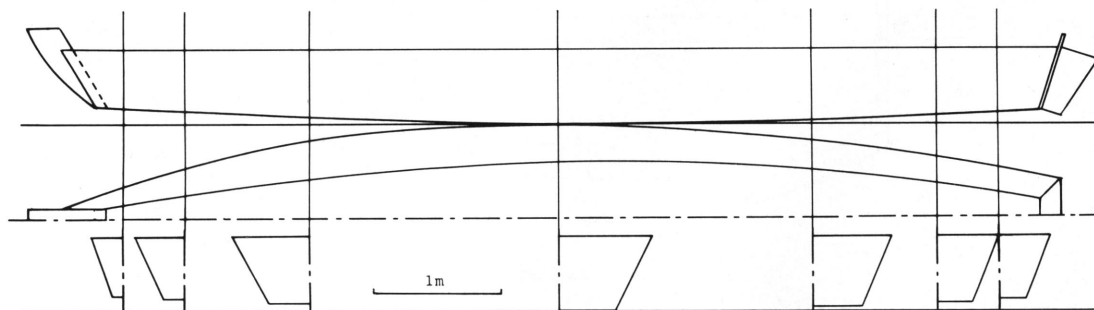


Fig. 14. Hull-lines of a small sewed boat, "bote" at Aparri, 1986  
LBD = 7.97 × 1.48 × 0.59 m

The mean size of "paraw" is LBD = 7.8 × 0.6 × 0.57 m. This craft is used for line fishing, squid jigging and small type bottom otter trawl (9 m in head rope length) fishing

#### 2. 5 Double Outrigger Canoe in Albay

In Albay District at the southeast corner of Luzon, indigenous fishing canoes of 4-27 m in

#### 2. 4 Sewed Boat and Semi-Dugout of Aparri

Aparri is an important fishing port at the northern end of Luzon facing Babuyan Strait and located at the mouth of Cagayan River. An interesting sewed planked boats of two types were observed as reported before<sup>15, 16</sup>. The big sewed boats is called "barangay" (12-17 m long in mean) while the small one is "bote" (7-9 m long) as shown in Fig. 14. The "barangay" with an outboard engine of 40ps is operated near the mouth of Cagayan River using a stow net, filter bagnet, for catching small shrimps, *Sergestes* sp..

Another type of fishing craft of Aparri is the semi-dugout "paraw" with double outriggers. This type of canoe is composed of a shallow dugout (12-18 cm high at midship) and marine plywood plating (5 mm thick) supported by frames at 40-50 cm intervals as shown in Fig. 14 and well agrees with "banca" of representative of semi-dugout with double outriggers in Philippines.

length, commonly hold their outrigger floats with three transverse booms to fixed on the top of the hull sides. The fishing canoes consist of dugouts and semi-dogouts and of 60% for the district total install an inboard engine of 10-120 ps.

Many illustrations of Albay canoes in front, lateral and plane views, were given by a staff of

College of Fisheries, Bicol University as shown in Fig. 15-17. The crafts of 10 m or more used for lift-netting, "basning", have fishing derricks of bamboo as shown in Fig. 15. The net are hung

by a rope from the derrick tops of the craft in water outside of outriggers and hauled by heaving the ropes into the craft.

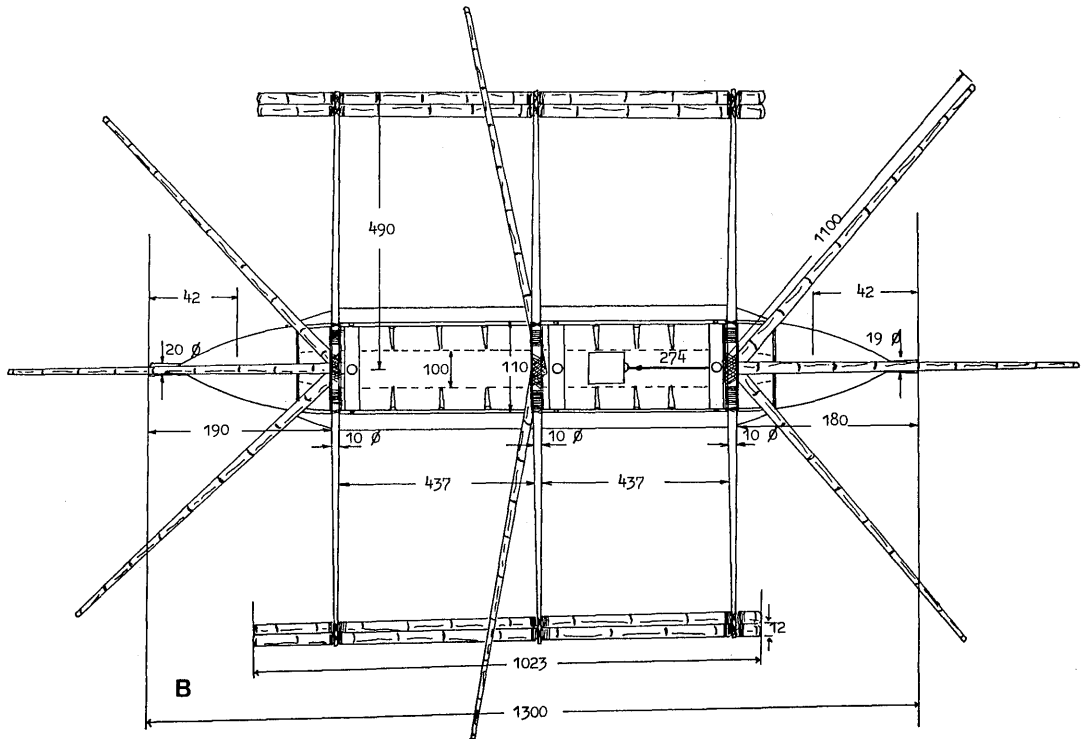
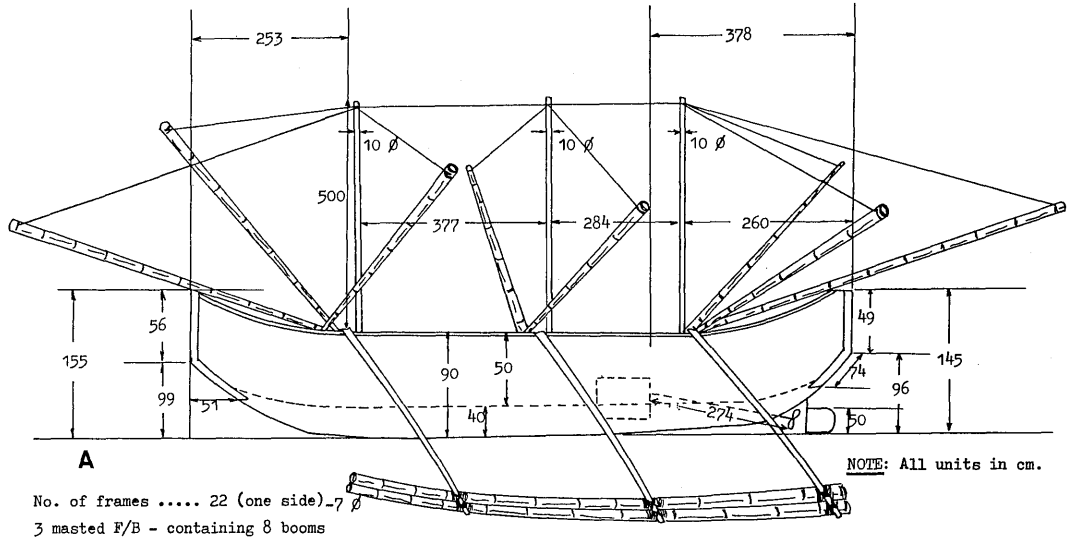


Fig. 15. Various sketches of outriggers, "Basnigan", at Bacakay in Bicol of southern Luzon in 1986 (by Mr. A. Cante, Bicol University): A, side view, B, top view  
LBD = 13 × 1.1 × 0.9 m, float of 10.2 m long, 16ps inboard engine, bag-net fishing

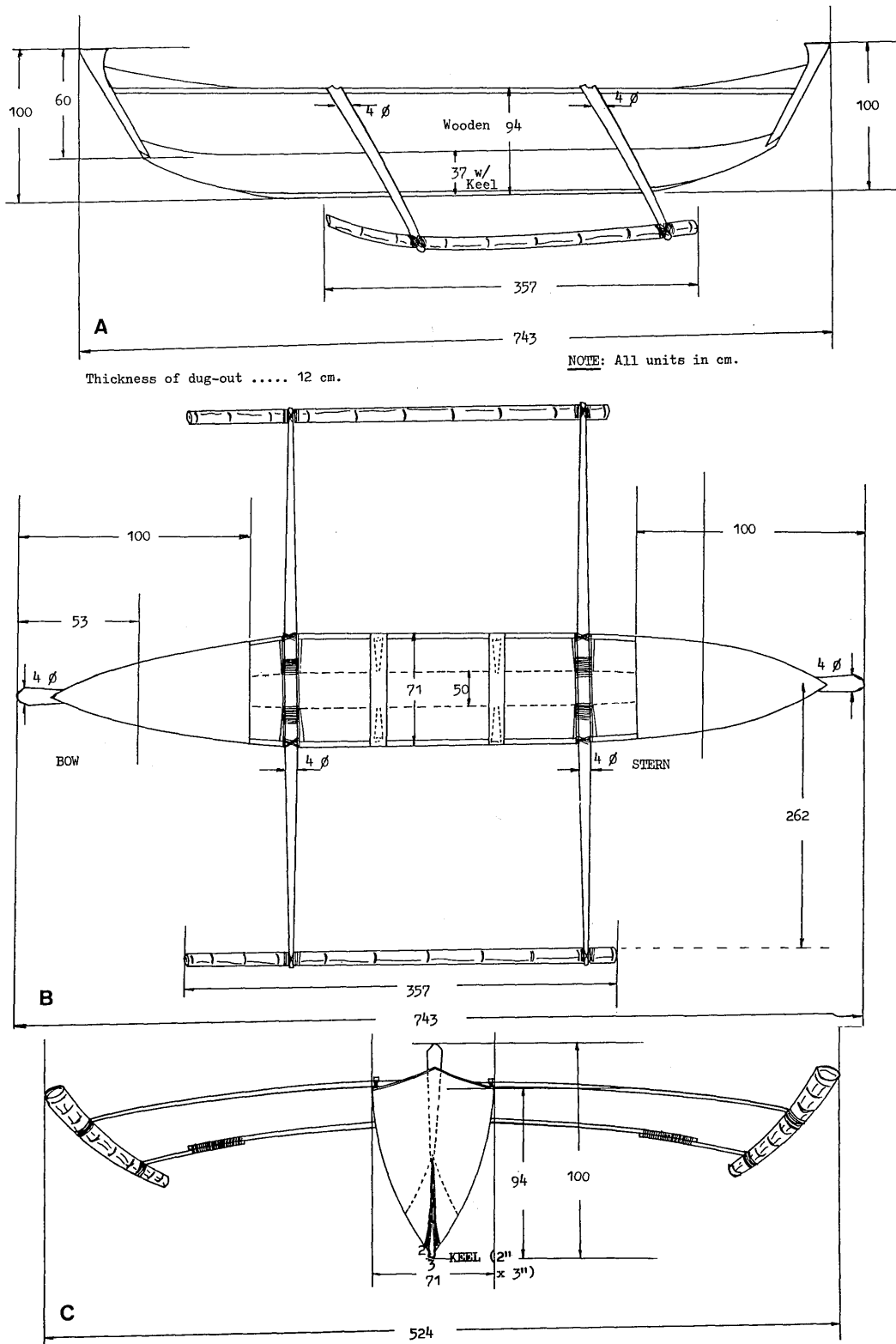


Fig. 16. Various sketches of outriggers, "Sapyawan", at Albay in Bicol of southern Luzon in 1986 (by Mr. A. Cante, Bicol University): A, side view, B, top view, C, front view  
 LBD = 7.43 × 0.71 × 0.94 m, float of 3.6 m long, skimming-net fishing

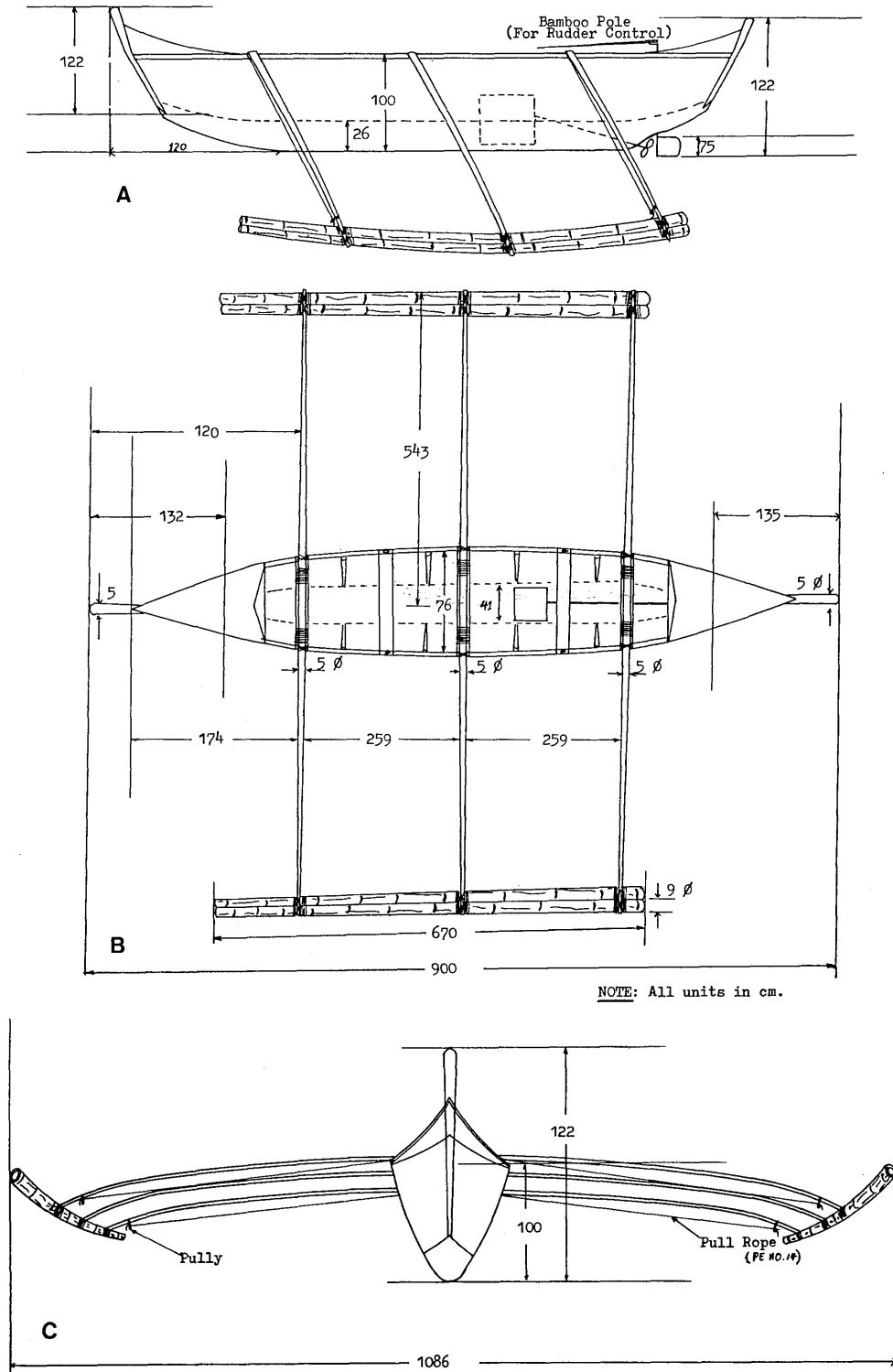


Fig. 17. Various sketches of outriggers, "Motoran", at Albay in Bicol of the Philippines in 1986 (by Mr. A. Cante, Bicol University): A, side view, B, top view, C, front view  
 LBD =  $9 \times 0.76 \times 1.0$  m, float of 6.71 m long, 16ps inboard engine, baby bag-net fishing

## 2. 6 Comparing Outrigger Canoes in Various Villages

The outrigger canoes surveyed in this survey consist of dugout and semi-dugout in type and single and double outriggers in number of outrigger float of a canoe. For example, canoes of Lae-Lae of Ujung Pandang are single outrigger and a outrigger float of bamboo is fixed by nylon lines onto the free ends of two transverse booms of wood. Canoes in Sulawesi and the Philippines generally have two outrigger floats and 2-3 booms to hold them.

Considering local variations of various outrigger canoes, (LBD =  $7.0 \times 0.58 \times 0.58$  m in pooled mean), a cluster analysis applied with Mahalanobis distance (a dissimilarity scale) and interval of boom-boom, height ratios of stem and stem ends for the depth of a canoe and ratio of drive engine size in ps and the product of a mas of LBD in m, by 73 outrigger canoes from Manado (32 canoes) and Ujung Pandang (10 canoes) of Indonesia and Aparri (10 canoes) and Albay (22 canoes) of the Philippines. Among them, non-powered canoes are ranged shorter than 7.5 m long and the horse power in local mean is relatively bigger on outboard engines of Ujung Pandang and Aparri canoes.

The fundamental statistics of the above canoes are shown in Table 1.

In this table, the length of outrigger boom is a horizontal distance between the hull top and outrigger float and the interval of boom-boom is the length of the float excluding the lengths of two free ends of the float.

Some significant regressions among the above dimensions of the pooled data are :

$$L = 10.954 B - 0.6155 \quad (r = 0.8405)$$

$$L = 10.646 D - 0.8826 \quad (r = 0.8696)$$

$$L = 1.442 (\text{length of outrigger float}) - 0.825 \\ (r = 0.8995)$$

$$L = 2.006 (\text{length of holding boom}) - 2.8237 \\ (r = 0.8197)$$

It was resulted from the cluster analysis as Table 2.

**Table 2.** Frequency distributions of local outrigger canoes by cluster

Location	Cluster	I	II	III	IV	pooled data
Manado		30	2			32
Ujung Pandang*					10	10
Aparri		9	1		1	11
Albay		5	5	1	5	16
cluster total		44	8	1	16	69
mean length (m)		6.7	8.8	7.6	6.1	7.0

\* : single outrigger canoes, and others are all double outrigger canoes

- 1) The canoes are divided into 4 clusters and the clustering on the hull and float constructions are not so clear, since the Mahalanobis distances are no so long as 15-25. This shows that the outrigger canoes does not generally show previously local variation on hull shape and outrigger size.
- 2) Cluster-1 (written as CL-1) consists of major canoes from Manado (londe and pelang) and Aparri and 5 Albay canoes of 32% for the local total. Thus the canoes of Manado and Aparri well resemble in construction.
- 3) DL-2 consist of larger Albay canoes with 3 long transverse booms hold 2 outrigger floats and 2 Manado canoes, pelang basar used for light boat of purse seine unit.
- 4) CL-4 consists of single rigged canoes in Ujung Pandang and others and shows relatively deeper and fair hull while CL-3 are slim hull.
- 5) This trend is also improve by a discriminant analysis applied with the real data of the above 11 dimensions.

## 3. Conclusion

The indigenous fishing canoes (small crafts in

Table 3) of three villages surveyed in Sulawesi are motorized as canoes of 43% for the local total in Bitung of Manado, 45% in Ujung Pandang and 3.5% in Kendari, according to "Indonesian Fisheries Statistics-1985" while the motorized fishing crafts through the areas surveyed in the Philippines are 90% or more.

Table 3. Statistics on fishing crafts and fishing gears of Sulawesi in 1984  
Source: Fisheries statistics of North, South & Southeast Sulawesi, Indonesia (1985)

Fishing craft (unit: 10 boats)

Regency	Pooled total	Class of fishing crafts										
		non-motorized					motorized					
		sum	dug- out	planking			out- board engine	sum	inboard engine (G/T)			
				S	M	L			0-5	5-10	10-20	20-
Bitung*	242	235	136	99	-	-	100	7	-	1	2	4
U. pandang	141	130	45	56	29	.3	59	11	5	4	1	.4
Kendari	283	279	270	10	-	-	10	4	-	-	3	1

Number of units of fishing gears in various fisheries (unit 10 sets)

Regency	Category of fishing gears								
	Total	Seine	P.seine	GillN	DipN	Angling	SetN	trap	others
Bitung*	218	14	7	12	4	164	9	-	-
U. pandang	221	4	5	84	38	61	31	4	24
Kendari	329	16	3	91	57	107	50	31	-

Remarks: Bitung is Southern coast of Manado

The principal mean dimensions of fishing crafts of the areas surveyed are presented in Table 1.

The fishing crafts of Sulawesi are generally smaller in length than those of the Philippines. Comparing the dugout crafts, the Manado crafts with double outriggers are slimmer than those of the Kendari crafts without outrigger. Even with single outriggers, the crafts of Ujung Pandang well resemble in hull shape to those of Kendari without outrigger. The principal dimensions and ratio of the sewed craft of Aparri are different from the other types of fishing crafts.

Fig. 18 shows the interrelation between the length overall (L) and the width (B) of the pool-

ed data of fishing crafts surveyed. In this figure, the crafts with outrigger and those without are clearly segregated into different groups. The sewed boats of Aparri (\*) and the Kendari dugouts (O) appear on the upper portion of the graph which indicates that these two types of crafts have larger width as compared to the other crafts surveyed. For the outriggered crafts, the width is varied with the length. Among the crafts with outriggers, the width of the Manado craft (●) remains constant even with the change in length.

While the interrelation between the length overall and the depth (D) of the pooled data of all fishing crafts surveyed, is unlike in the previous graph. There is no clear grouping.



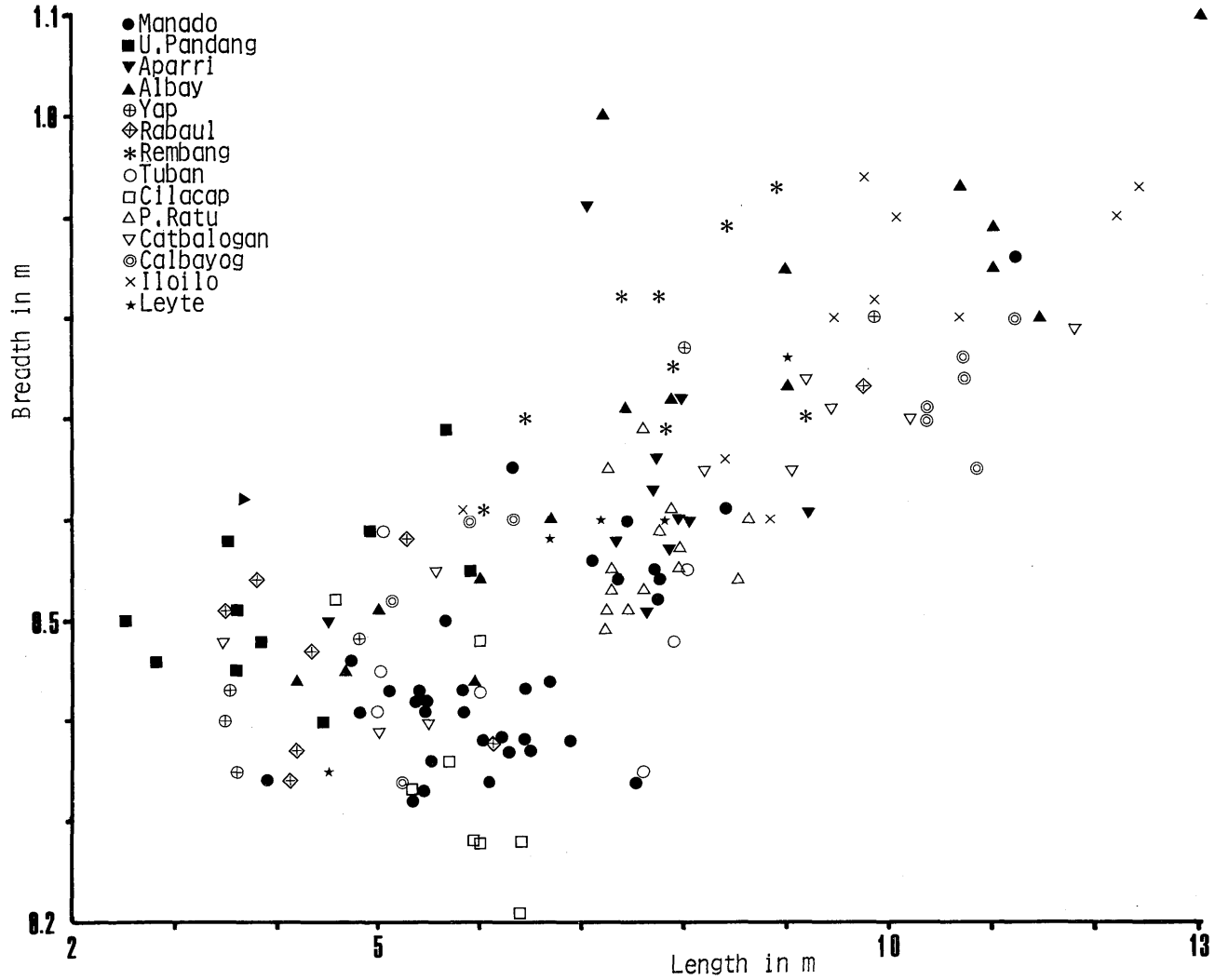


Fig. 18. Interrelation between length overall and width of indigenous fishing crafts in selected locations surveyed from 1984-1986

For the larger Aparri sewed boats (>10m long), the depth does not vary with the length. This design may be influenced by the type of fishing operation conducted where a shallow free board is necessary. The Kendari dugout without outrigger have shallow depth and does not vary so much with the increase in length.

As seen in the above two graphs and Fig. 19, the semi-dugout crafts of Sulawesi and the Philippines are of the same portions, L/B and L/D. At a glance, these crafts may look the same, however, detailed inspection will show distinguishing characteristic particular to each village surveyed. Similar observations were

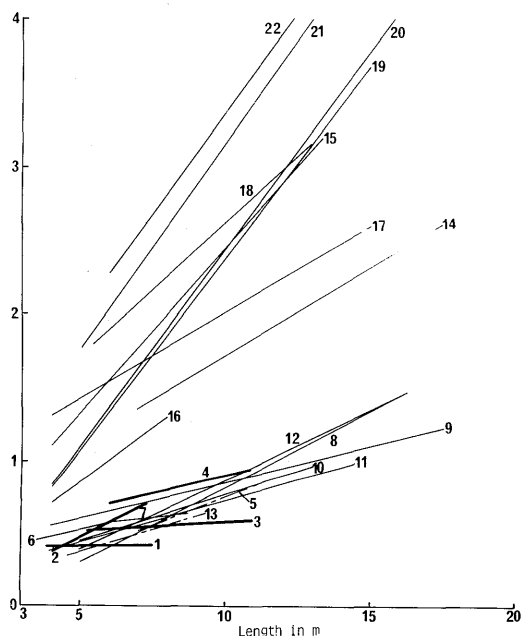


Fig. 19. Various regression lines of widths for lengths of crafts in selected location surveyed and in other countries for comparing

Line number: 1) Manado d/o, 2) Kendari d/o, 3) Visayas d/o, 4) Albay d/o, 5) Manado s/d, 6) Ujung Pandang s/d, 7) Aparri s/d, (above are measurements in 1986), 8) Sto. Nino s/d, 9) Catbalogang s/d, 10) Carigara s/d, 11) Calbayong s/d, 12) Albay s/d (above by Flores, 1984), 13) Jawa s/d, 14) Aparri sewed boat, 1986, 15) Jawa plank boat, 16) "sabani" in Okinawa, 17) "wasen" of Japan, 18) Yamaha FRP fishing crafts, 19) Thai fishing boat, 20) Chinese Junk & sampan, 21) Korean fishing boat, 22) European sailing craft  
Source: 13, 15-22 from Gunawan and Shibata (3)

reported in a previous study by Gunawan and Shibata<sup>3)</sup> in comparing with the same type of fishing crafts of Java and Marcedes of southern Luzon.

In comparing the length and width, interrelation of semi-dugouts of motorized and non-motorized crafts, the width of the later craft does not change much with the increase in length. On the other hand, the width of motorized crafts increases proportionately with the increase in length. This is a general tendency due to the result of motorization which increases the loading capacity of the craft.

Various regressions of L and B for fishing crafts, surveyed in 1986 and referred from Gunawan and Shibata<sup>3)</sup>, were summarized into Fig. 20. In this figure, the length are ranged in size of respective classes of the crafts, i. e., constructions, locations or countries. This figure shows that Jawa planked crafts well resemble Chinese and Thai planked crafts while the dugout and semi-dugout canoes in Indonesia and the Philippines and Aparri sewed boats tend to have relatively slim body as compared to the above planked crafts.

The fishing crafts surveyed have a long history of changes which involved non-powered crafts for the respective villages except for the sewed crafts of Aparri. With the emphasis on fisheries development by the respective governments, there is an increase in fisheries activities in the coastal areas with the introduction of new technology which include fishing craft and gear. With this exposure, motorization was introduced to the indigenous fishing crafts. Motorized fishing crafts were seen in Manado, Ujung Pandang, Aparri and most fishing villages in the Philippines. In Manado, the introduction of moter engine changed the construction of the fishing craft with the modification of the stern section to a transom. As a reference, the wooden fishing craft of Japan<sup>3, 17)</sup> has undergone changes due to motorization (Fig. 20). Motorization of

fishing crafts in Japan started during the Taisho Era (1912-1926) with the introduction of inboard motors. Because of the big size of the engines, the small wooden crafts could not be motorized. On the other hand, many large fishing boats were constructed during this period which make use of the inboard engines. After the Second World War, small inboard engines were developed in Japan which were suitable for the small crafts. With motorization, the width of transom gradually increased. During the sixties, the outboard motors were introduced with large horse powers resulting to the increase in the tonnage and width particularly the transom of the previously small crafts.

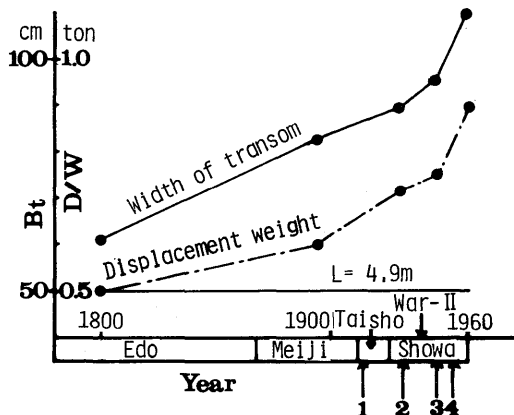


Fig. 20. Historical changes of transom widths and displacement weight of Japan-type wooden crafts, "Wasen", standardized statistically at 4.9m in total length.

Symbol; 1) introduction of marine engine, 2) introduction of seme-diesel engine, 3) introduction of outboard engine and 4) introduction of Fiber Reinforced Plastic (FRP) for hull construction

Sometime in 1950, bigger fishing boats in Japan were replaced with the western type boats for skipjack pole and line, tuna long line and purse seine. This was followed by the gradual increase of the width of small coastal fishing crafts. In the seventies, two types of coastal fishing crafts evolved, the big coastal fishing crafts (FRP) with inboard engine and the small coastal fishing crafts mainly for outboard engines<sup>3)</sup>.

The changes in the coastal fishing crafts of Japan due to modernization are considering the following factors: i) speed, resulting to fair type hulls, ii) fishing operation, this varied depending on the type of fishing, iii) accommodation<sup>18)</sup>.

With the ongoing motorization of indigenous fishing crafts of Java, Sulawesi and the Philippines, similar changes in Japan are expected also to happen in the development of the coastal fishing crafts of Japan in southeast Asian countries.

In consideration of the present stage of the coastal fisheries and the developmental plans of the countries in the region, it is important that documentation of the indigenous fishing craft of the regions be made in order to preserve their respective cultural values for posterity. The research group together with the local co-operators of the areas surveyed should present suggestions on the development of the indigenous fishing crafts and gears. Since the construction of the hull of indigenous fishing crafts is dependent on the supply condition of local materials, it also should be considered in the development of local fishing crafts.

The followings are some suggestions to develop the local fishing crafts in the areas surveyed; i) when install inboard engine onto the crafts, the vibration resistance of a hull body made by indigenous techniques should be considered against the machine related ship's operations, ii) for keeping the freshness of the fish caught, it is suggested that fishermen go to the sea with an ice-box. While on a modern fishing boat with insulated fish holds, there should be no air-ventilation in the closed air-space between the insulation and inside hull plating. This will result to the decay of the hull material and it will be greatly increased with high temperature of air and sea water in the tropical zone. This problem should also be deeply considered when applying the insulation.

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\*: in Japanese and \*\*: in Dutch

## スラウェッシ島および、ルソン島北部アパリにおける 在来型漁船の現状について

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### 要 約

東南アジアの沿岸漁船の現状を把握し、その将来像を探求するため、1986年7月、インドネシア共和国スラウェッシ島周辺のマナド、ウジュンパンダンとケンダリならびに、フィリピン共和国、ルソン島北端のアパリ、同南端に近いアルバイにおける六つの漁村において、在来型沿岸漁船の各部計測と船型計測をおこなった。

これらの地域では、豊富な森林資源に恵まれていることもあって、その沿岸漁船は、構造的には総て在来型の丸木舟あるいは、これをベースにした準構造船であり、ケンダリを除く地域では、殆ど双アウトリガー・カヌーが用いられている。中でも既に報告したアパリ縫合船のほか、船体下方両端に象牙状の吻を持つマナドのカヌー、ウジュン・パンダンのみで、単にアウトリガー舟、およびクォーター・ラダー、そしてケンダリではバジョー族の家船など極めて、地域性が高い船型あるいは構造を実見することができた。

また、今回調査を行なった範囲では、クラスター分析の結果から、これらの漁船は可成り相似の船型を持っているが地域毎に固有の形状構造を持つことも確かである。

しかし、近年、近代的な漁法、あるいは、船用機関が導入されつつあり、また、周辺の森林資源が減少し船材供給が困難になったため、その漁船の船型も変化しようとしている。