TECHNOLOGICAL STATUS AND DEVELOPMENT PROSPECTS OF SMALL SCALE FISHING CRAFTS IN NIGERIAN COASTAL WATER.

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ABSTRACT

A study of fishing crafts was conducted in some coastal states to elucidate findings on the existing crafts as the baseline for further developments.

Based on the technical designs, three types of fishing carfts were identified; planked, dug-out and half dug-out canoes. They plunked canoes have the largest cubic number and dug-out canoes the least. At loadwater line, the ratio of freeboard to draft was 2 : 1 for planked canoes, indicating reserved bouyancy. Trim of planked canoe is by stern. the beam-length ratio for dug-out canoes showed high drag. Most of the sea-going canoes have U-shaped bottom hull profile capable of withstanding the rigours of surf landing and displayed good stability against longitudinal water wave. Gunwale and thwarts provided respectively the longitudinal and transverse strength of planked and half dug-out canoes.

With its characteristics "weight low down" construction, planked canoe represent the climax of small scale fishing crafts developments in Nigerian Coastal Waters. It's only draw back is durability. Further improvement in this canoe should be aimed at increasing the hull size and stiffness, water tightness of deck by coating, caulking, fastening, increasing level of motorization and installation of deck working equipments. Experimental design and use of fibre glass, aluminium and ferrocement hulls, along side with improved planked canoe is highly advocated.

INTRODUCTION

Like fishing gear, crafts have passed the test of time, evolving from logs of wood, floating calabash and popyrusraft to wooden dug out canoes, planked canoes and fibre glass all in an attempt to complement changing sea condition and various fishing gear developed and employed. In the coastal artisanal fisheries, crafts are designed to suit the following; surf crossing, beach landing, buoyancy and stability at sea and different types of artisanal fishing techniques. Gulbrandson (1974) and Haug (1974) outlined the construction and suitability of V-shaped and flat shaped bottom canoes respectively in different water bodies and stated the restrictive use of flat bottom canoe in inland protected water ways. Information on fishing crafts design, construction and suitability for Nigerian coastal waters is lacking. Nonetheless, Udolisa and Solarin (1985) gave an account of the performance of a 13-metre (LOA) wooden shallow draft vessel designed to cross over the estuarine sand bars of Imo river.

The sea going quality of coastal fishing craft in Nigeria is based mainly on the length overall. This criterion only ranks big canoes as sea worthy and could not explain the sea going qualities shown by small canoes with good design features. The design and construction of an ideal fishing craft is an illusive idea, because the condition for an ideal crafts so varied and depends on an array of factors such as people's culture, fishing gear, water body and motorization. It is therefore easier to design a craft that will satisfy one condition at a time. For improved design to match new fishing gears developed and the changing sea condition the level of development of the existing canoes have to be studied. The investigations was therefore carried out to elucidate findings on;

(1) Type and principal dimensions
(2) Hull features and sea-kindliness of the existing canoes as the baseline for further development.

MATERIALS AND METHODS

Survey trips were made to coastal fishing villages in Akwa Ibom State, Delta State and Lagos State in 1995 and 1996. Technical data and design features of the existing canoes were obtained. The canoes were identified and classified according to the mode of construction and material used. Bottom profile and propulsion methods were also observed.

Principal and constructional dimensions of the canoes such as thwart distance from stem, length overall, length between perpendicular, moulded depth at midship, moulded breadth at midship, draft and free board were taken with a measuring tape according to themethod described by Nomura and Yamazaki (1975). Position, presence or absence of features like transom, keel, gunwale, bulkhead and wave breaker were made by comparing the length of freeboard with draft at load water level (Nomura and Yamazaki, 1975). The cubic number of the canoes were computedusing Haugh (1974) method. All measurements were made to the nearest metres.

RESULTS AND DISCUSSION

Type and Principal Dimensions of Canoe

Three types of fishing crafts were identified in the area namely: dugout, half-dug-out and planked canoes. Figure 1 shows the deck dimensions of the typical canoes, while table 1 shows the principal dimensions of the canoes in one coastal state. Apart form dug-out canoe, others had undergone several modifications to suit different purposes over the years, example in Lagos State (Figure 2). Constructional features of the canoes are elaborated in Table 2.

Hullfeatures and Sea-Kindliness of Canoes

(1) DUG-OUT CANOE: It is carved out from a log of wood e.g. iron wood *Lopia alata.* The thickness of the wood is between 2 - 2.5cm. Because of the nature of its construction, the hull is strong and rigid. Longitudinal re-enformcement of hull is not required while transverse strength is achieved by few number of thwarts (2 - 3) laid across of deck from one side of free board deck line to another. The aft of the canoe terminates in a stern piece which serves as a platform for standing while operating gears and for sitting while paddling. The hull is heavy the free board to draft ratio at load water line is approximately 1:2 respectively, hence poor buoyancy. The shape is narrow, low curvature with long water line length. Because of these features, much energy is required for manual propulasion, hence the canoe cannot go far and is limited to creeks. The canoe after carving is seasoned by burning with grass to give its characteristics black colour.

(2) **Half-Dugout Canoe:** The heavy hull reduced buoyancy of dug-out canoe is buffered against by the addition of one or more planks made of soft wood to both sides of the freeb and deck line. This gives rise to half-dug-out canoe. To maintain the rigidity of the hull, more thwarts are laid across the deck for transverse strength. Another hull features that imparts longitudinal strength and stiffness to the canoe is the gunwale. It is nailed to the top side of the freeboard deck line and runs from the stem to stern on both sides. The canoe is small with an averaged LOA/Beam ratio of 6:1(Table 3). It has a long water line with low

degree of curvature. Trim is equal at both stem and stern (Table 4). Shear of free board deck line is unpronounced. Buoyancy is improved with an averaged freeboard-draft ratio of 1:1 at load water line. In Lagos State, the hull has a wooden wave breaker of about 2m length and 5m high installed at midship of the two deck lines to prevent entry of water. Immediately after the wave breakers are the stem and stern platform (Bulkhead) which extends 1m to the breast hook at both the aft and fore canoe portions. The breast hook joined the two side planks together. The second thwarts from both the stem and stern carries a hole (about 3cm in diameter). This hole is for the fixation of sail mast.
Floar boards are laid inside the canoe form stem perpendicular to after perpendicular position. They serve as a chamber/compartment for storage of gears and caught fish. Two rectangular pieces of wood are nailed inside the canoe at the stern perpendicular to serve as foot holes for the helmsmen while paddling. Some of this canoe have a rigid sun roof, this is because the canoes fish far and up to two days before coming to the shore. The drawback in this installation is that the canoe can capsize during a small wave-induced roll as its stability is low.

(3) **Planked Canoe**: The construction of more robust planked canoe is;
- (a) To compensate for the shortage of large dug-out canoe due to non availability of big timber.
- (b) To increase the deck working space and
- (c) To improve the sea worthiness

Both the small sea planked canoe (7 - 9 planks) of Akodo and Magbon Alade (Lagos State) and big seaplanked canoe (12 - 16 planks) of Folu Ibeshe (Lagos State), Okoro-Ete, Utan Iyata (Akwa Ibom State); Arunton and Beniboye (Delta State) have the same features but different method of fishing and operation. The small ones are not powered by outboard engine while the big ones are motorized. Longitudinal and transverse reinforcement is by gunwale and (5 - 7) thwarts respectively. Frames also provide transverse strength. The bottom profile is while the base is about 5cm flattened to enable the canoe stand upright when dry docked. The round bottom shaped provides stability against longitudinal water wave and ability to withstand the rigours of surf landing. The canoe has high camber/curvature with cresent shape (Table 3). The waterline length is small for powerful drag. Short water length enables small propulsion power/force to overcome heavy hull weight. Trimis by stern. The shear of freeboard deck line is well pronounced, with shear at stem greater than at stern. It has the greatest cubic size (Table 4), hence large working space on board.

The gunwale, in addition to rail protection, hull strength also serves as a bumper for jetty landing and as a grasping material in case of capsizing. In folu (Lagos State) the outer gunwale is covered with rubber sheet to prevent abraissive weaving of the wood while hauling net. In Okoro-Ete (Akwa Ibom State), planked canoe for bonga fishing has no gunwale for smooth hauling withoutsnagging of the monofilament bonga-net.

In all the sea-going planked canoes surveyed, the bottom plant is 40 -50cm in thickness while the side planking is 25 - 30cm thick. In a similar way the bottom plank is mae of hard wood for negative buoyancy (Table 5). These massive weight low down dimensions impart great strength againstwave-pounding and impact resistance particularly to the keel which is exposed to surf landing on sandy shore especially during manual dry-docking by rolling movement. The planks are held together by frames, but in smaller planked canoe (7 - 9 planks) of Lagos State, there are no frames and the planks are held together by staples on the outside. Water-tightness is achieved by nailing a strip of galvanized iron/aluminium plus caulking over the plank seams (joint). The canoe has a flat keel ofabout 5 - 8cm wide so that it can sit upright on the rollers or on the sand when being hauled on the beach. Reservedbuayancy is high, at load water line, a freeboard - draft ratio of

2:1 was obtained (Table 6). The planked canoes used int he lagoon has a long and narrow beam and equal trim.

Development Prospects and Conclusion

Wooden canoe have had a wide acceptance by the fishermen and will continue even if a new material for construction is introduced. The continuousavailability of suitable qualityand adequate size of timber for canoe construction is not certain because of danger posed by forest depletion. Gulbrandson (1985) observed that, the minimum size of tree for a long and big canoe is 165cm diameter which could take over 100 years to grow. As a soluion, the Federal Government should mandate the Federal Department of forestry to reserve certain species of trees like iron wood Lophiro alta, Obeche Triplochiton sclerozylon, Mahogany Khayaivorensis and black afara Terminalia ivorensis for the Nigerian fishing industry.

Ferrocement, fibre glas and aluminium hull canoes can be experimented in research stations along side wih a model planked wooden canoe. The new canoe will have a gradual acceptance with years especially if it is cost effective, and light hull with water tighness. Planks are readily available, and at the moment, wooden planked canoe is well accepted and represent the climax of small scale fishing crafts development in Nigerian Coastal water, its only draw-back is durability.

Improvements in the present planked canoe can continue in the following ways:

(1) Increase in hull size and stiffness
(2) Water tightness of deck by appropriate coating, caulking and fastening
(3) Increase in the level of craft motorization in combination with sailing rigs
(4) Installation of deck working equipments both rail and deck mounted haulers, rollers, fish hold and net storage drum.

Table 1: Principal dimensions of Fishing Crafts in Akwa Ibom State.

{PRIVATE } Characteristics	Type of Canoes		
	Planked	Half dug-out	Dug-out
Length overall (m)	6.5 - 9.6	6.0 - 7.2	5.95 - 6.8
Length between perpendicular(m)	4.1 -6.91	4.0 - 4.9	3.93 - 4.82
Moulded depth (Midship)	0.65 -0.78	0.44 -0.56	0.29 - 0.41
Moulded breadth (Midship)	1.0 =1.7	0.89 - 1.08	0.79 - 0.95
Draft (Midship)	0.25 - 0.31	0.21 - 0.27	0.19 - 0.22
Free board (Midship)	0.40 - 0.47	0.23 - 0.29	0.09 - 0.13

Table 2: Constructional features of the canoe hull

{PRIVATE }Characteristics	Type of Canoes		
	Planked	Half dug-out	Dug-out
Treansom	-	stern transom	-
Keel	-	Flat keel	-
Gunwale	-	Present	Present
Bulk head	-	-	Present
Thwarts	Few (2 - 3)	Many (5 - 8)	Few (3 - 5)
Breast hook	-	Present	Present
Stern piece	Present	-	-
Floor board	-	-	Present
Bottom prile	Round	Round with flattened based	Round
Frames	-	Present	-
Wave breaker	-	Present	Present

Table 3: Shape and drag (pull resistance) of canoes obtained from principal dimensions ratios

{PRIVATE }Type of Canoe	L:B	Lo A: LPP	Shape	Drag
Dug out	5:1	5:3	Long narrow	Very high
Half dug out	6:1	3:2	Long, narrow	High
Small planked	5:1	3:1	Robust and cresent	Very low
Big planked	8:1	8:5	Long and stream line	Low

Table 4: Size and Trim of Canoes

{PRIVATE }Type of Canoe	Trim	Cubic Size
Dug out	Equal	$1.91m^3$
Half dug out	Equal	$3.23m^3$
Small planked	By Stern	$2.27m^3$
Big planked	By stern	$7.77m^3$
Purse seine planked	Equal	$50.87m^3$
Lagoon planted	Equal	$4.98m^3$

Table 5: "Weigh low down" construction of planked canoes

{PRIVATE }Characteristics features	Construction Materials	Thickness	Significance
Bottom plank	Hardd wood (Mahogany, iron wood)	40 - 50cm	(1) For positive buoyance (2) For abrassive resistnt during dry - docking (3) To withstandd wave pounding (4) For stability
Side plank	soft woodd (Back and white afara)	20 - 30cm	

Table 6: Reerved buoyancy of canoes obtained from draft-freeboard ratio.

{PRIVATE }type of Canoe	Draft/Freeboard ratio	Buoyancy
dugout	2:1	Poor
Half-dugout	1:1	Average
Planked	1:2	Good

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