

## Sea Worthiness Of Coastal Planked Canoes In Nigeria

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**Abstract:** The paper reported on the assessment of sea worthiness of planked canoes used in Nigerian coastal waters and ways for further development. Result showed that; the cubic size of the canoes ranging between 2.27m<sup>3</sup> and 51.5m<sup>3</sup> gave ample working space aboard; at load water line, the ratio of freeboard to draft was 2:1 indicating reserved buoyancy for safety. The transom at the stern provides attachment point for out board engine motorization,. The initial drag and hydrodynamic resistance are low due to short water line level and trim by stern. Stability is enhanced by its 'weight low down' construction technology, which makes the bottom to be heavier than the upper parts. The planked canoes represent the climax of small scale fishing craft development in Nigerian coastal waters. Future modifications of hull forms should take into consideration the introduction of deck machinery and increased level of motorization to match the sea condition and new fishing gears. Preservation and maintenance measures to increase the useful life span of the wooden canoes are proffered.

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### 1. Introduction:

Fishing boats design and sophistication represent the overall level of fisheries development in coastal nations. It is on this basis that many international fisheries development programmes like; the Bay of Bengal Development Programm (BODP) in India and Sri-Lanka, Integrated Development of Artisanal Fisheries in West Africa (IDAF), Cotonou spent a substantial part of their resources on small fishing crafts development as a priority (Gulbrandsen, 1985). Unfortunately, in third World Countries, this area of fisheries have remained in a cooler for a long time because it has deviated from the biological concept in which fisheries is known of to physical concept requiring technical approach.

The metamorphosis of canoes in Nigeria from the primitive fishing crafts (floating calabash, logs of wood & papyrus raft) to modern fishing craft is greatly due to the desire of the fisherfolks to improve the sea going quality of the canoes through; increase in hull size, use of better and readily available construction materials, increase in the level of motorization and installation of deck machine ( Udolisa *et al.*,1994). Consequently, modern fishing craft in Nigeria evolved from dugout canoes to half dugout canoes and to planked canoes. The purpose of this research was to assess the sea going qualities (cubic size, buoyancy, stability, motorization, drag and hydrodynamic resistance) of planked canoes and proffered suggestions on preservation and rooms for further development.

### 2. Materials and Methods:-

The authors studied planked canoes in all the eight coastal states of Nigeria when and as convenient for over 20 years during the implementation of the following projects;

(1) FAO/UNDP sponsored project on a catalogue of small-scale fishing gear in Nigeria

(2) World Bank assisted project on the survey and evaluation of fisheries resources in Nigerian coastal waters.

(3) World Bank/NARP sponsored project on the treatment of wooden canoes to prevent borers infestation.

Technical data and design features of the existing canoes were obtained. Principal and construction dimensions of the canoes such as; thwart distance from the stern, length overall, water line length, moulded depth at midship, moulded breath at midship, draft and freeboard were taken with a measuring tape according to the method described by Nomura and Yamazaki 1975; Haug, 1974). Observations on the stability and buoyancy of the canoes were made by comparing the weight of bottom planks with side planks and the length of freeboard with draft at load water line respectively (Nomura and Yamazaki 1975; Gubrandsen, 1974). Trim was measured as the difference between draft at stern and draft at stem (Haug, 1974). The cubic numbers of the canoes were computed using the method of Haug (1974). All measurements were made to the nearest meters.

### 3. Result and discussions:

Four categories of planked canoes were identified to be operational in Nigerian coastal waters. Each of the canoe has a specialized fishery (table 1). The big planked canoes were the most popular and abundance (85.1%) while the purse seine planked canoes were the least (0.9%) as shown in table 1, together with other design and operational details.

**3.1 The cubic size.** As shown in table 1, the size of the canoes ( $2.27\text{m}^3 - 51.5\text{m}^3$ ) provided ample working space aboard depending on the fishery. The size increases as the crew number increases, an indication of sea kindliness since more volume of gears will be operated for good landings and on board storage. One of the criteria used to assess the sea going quality of artisanal fishing craft is the attainment of certain length or size. Gulbrandsen (1985) observed that the minimum size of a tree to carve out a long and big canoe is 165cm diameter and this could take over 100 years to grow. Big size planked canoes can be made from planks which are readily available unlike big size dug-out canoes which forest depletion has prevented.

**3.2 Buoyancy:-** Good reserved buoyancy is an indication of safety of the canoe at sea. At load water line, a free board to draft ratio of 2:1 was obtained for the planked canoes indicating reserved buoyancy. Reserved buoyancy makes the canoe not to easily capsize in event of any strong wave induced roll. The good buoyancy is attributed to its lighter hull imparted by soft wood side planks.

**3.3 Stability:-** In all the planked canoes observed, the bottom plank is 4-5cm in thickness, while the side planking is 2-3cm thick (table2). In a similar way, the bottom plank is made of hard wood for negative buoyancy and durability and the side plank is soft wood for positive buoyancy. These massive weight low down dimensions impart great strength and stability against wave pounding and also

impart resistance particularly to the bottom which is exposed to surf landing on sandy shore especially during manual dry-docking by rolling movement.

**3.4 Motorization:-** In recent years, motorization of planked canoes has become the most important technological change introduced in Nigerian fisheries. It is a low cost substitute for mechanized fishing. While in mechanical fishing, human labour is replaced by machines in both propulsion and hauling operations, motorization provides only the former leaving the actual fishing operations to human labour. Motorization is mostly possible in planked canoes because of its robust and ample size. Yamaha, Marina (endure) Suzuki & Archemedes brands of outboard engines with horsepower of 8, 15, 25, 40 are used. Motorization had resulted in the modification of stern of planked canoes. This involves carving out of an engine well and installation of transom for out board engine attachment. The engines are all 2-stroke with high rate of fuel consumption. Premixed oil and petrol are the fuel used. Manufacturer recommended and oil to petrol ratio of 1:50 litres. This ratio is ignored by our fishermen and prefers an oil richer ratio of 1 liter of oil to 21 liters of petrol.

**3.5 Drag and Resistance:-** Shear of freeboard deckline, trim by stern (draft at stern greater than draft at stem) and short water line length of the canoes give an indication of the low hydrodynamic resistance and initial drag of the canoe. In most of the planked canoes surveyed, the ratio of length overall to water line length was 8:4.5 showing a very low pull resistance. This means that any small propulsion force applied to the canoe will move it faster by over coming high hydrodynamic resistance, since a smaller portion of its bottom relative to the entire length is in contact with the water surface.

### 4. Preservation/maintenance

**Table 1:-** Design characteristics and operational details of coastal planked canoes in Nigeria, Type of planked canoes

Characteristics	Small Planked	Big planked	Purse Seine Planked	Brackish/freshwater planked
Cubic size ( $\text{m}^3$ )	2.27 – 3.01	7.77 - 8.91	50.87 – 51.5	4.98 – 5
Fishery (species)	<i>Ilisha africana</i>	All species	<i>Ethmalosa fimbriata</i> , <i>Sardinella spp</i>	All species
Fishery (water bodies)	Sea	Sea and brackish waters	Sea	Brackish and fresh waters
Fishery (fishing gears)	Drift gill net	All artisanal fishing gears	Purse seine	All artisanal fishing gears
Location	Lagos State	All coastal states	Delta, Akwa Ibom, & Rivers	All coastal states
Number of Planks	7 – 9	12 – 14	50 - 55	8 - 12
Crew Number	1	2 – 3	10 - 15	1 - 2
Propulsion	Hand paddled	Hand paddled and motorized (5-25HP)	Motorized (25-40 HP outboard engine).	Hand paddled
Percentage contribution	1.3	85.1	0.9	12.7

**Table 2:- Weight low down/dimensions of planked canoes**

Characteristics features	Construction materials	Thickness (cm)	Significance
Bottom plank	Hard wood (mahogany, iron wood etc)	4 – 5	(1) For positive buoyancy (2) For abrasive resistant during dry docking. (3) To withstand wave pounding. (4) For stability
Side plank	Soft wood (black and white afara etc.)	2 – 3	(1) For negative buoyancy. (2) For lighter hull.

It is suggested that the following routine or occasional maintenance activities should be carried out to preserve the usefull life span of the canoes: (1) Coating of canoe hull with marine paint, aluminum sheet, and spraying of the outer hull with gamelan 20, coal tar and cuprous oxide to kill fouling community like; barnacles, tube worms, mussels, oysters, hydroids and others. The maintenance of a smooth surface, free from marine fouling growth is important because a rough or fouled bottom leads to reduced speed and increased fuel consumption, thus this method of preservation increases both the speed and life span of the fishing craft (2) Regular caulking of cracks and joints in the canoe with soaked cotton wool in coal tar. This method of preservation does not allowed water to enter the canoe while on motion (3) Fastening of the planks joint firmly with copper nail to prevent breaking of the planks by wave pounding and (4) complete removal of canoe from water after each fishing trip to control and reduce fast decomposition of planks through microbial attack.

## 5. Recommendations:

Planked canoes represent the climax of small scale fishing craft development in Nigerian coastal waters, further developments should be in the following ways;

**5.1 Deck equipment:** For planked canoes that fish in protected water ways (lagoons, estuaries and creeks) and those that fish in the sea but carry less quantity of gears, their only requirement is a storage bin for the nets with a smooth edge or rail for the nets to slide over when shooting. The hauling can easily be done by hand, and all that is required is space for the man to haul either in the stern or near the aft of the canoe. However, for motorized planked canoes in the inshore sea, the equipment requires some further refinements. First of all, there should be some kind of hauling device. There are a large variety of different types of haulers that can be fitted on motorized vessels such as, rail mounted or deck mounted haulers. Deck equipment/machinery like fish hold, rollers, haulers, reels and drums are generally absent in artisanal fishing boats. These equipments reduce much labour

and quicken fishing operations like shooting, hauling and net storage. Presence of fish hold will give more working space in the canoe and as well extend the shelf life of the fish. These equipments should be constructed and handed over to fishermen through Extension Agent for installation in canoe and technology adoption thereafter.

**5.2 Propulsion power:** The economy recession and structural adjustment programme induced soaring price of outboard engine make it unaffordable to fishermen, they now expect it as a Government subsidized input which is not forth coming. The Government should provide engine to the fishers. Frequent petrol shortage in Nigeria have caused periods of enforced fishing inactivity and steadily increasing operational costs per unit of catch especially in drift net, purse seine and drag stow net, Automative gas oil (AGO) should be reserved and sold to fishermen at a reduced price.. The only source of readily available propulsion power is the hand paddle, hence far and productive fishing grounds are not exploited. Increased degree of 4-stroke out-board engine motorization in combination with sail and outrigger are lacking in artisanal fishing crafts and need introduction.

**5.3 Alternative hull forms:** Wooden canoes have had a wide acceptance by the fishermen and will continue even if a new material for construction is introduced. Ferrocement, fibreglass and aluminum hull canoes can be experimented in research stations along side with a model planked wooden canoe. The new canoe will have a gradual acceptance with years especially if the hull is lighter with water tightness of deck and cost effective construction.

## 6. Conclusion:

It is concluded that the present status of planked canoes should be improved further for safety at sea and increased in capture fisheries production. The cubic size, a product length overall, depth and width of the canoa should be increased to meet up with the volume of gear and fish caught. At the same time, other durable materials for canoe construction need to be sourced and experimented.

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