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DEVELOPMENT OF 2.14 M ONE SHEET CANOE (SAMPAN) FOR POND ACTIVITIES

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ABSTRACT

A 2.14 M length overall (LOA) flat bottom modern canoe (Sampan), was designed and constructed using locally available materials. The canoe features include easy construction, portability, least cost, light weight, shallow draft, and easy maneuverability. The light displacement (weight empty) was 25kg, which was less than local canoe of same size. When placed on water a draft of 5.5cm. The capacity of the canoe was 200kg, and the total production cost of N10, 000.00, which was not beyond the reach of an average fisher folks, or any fish farmer. The canoe was easily maneuvered when propelled by paddling as it floated at a shallow draft; this makes the canoe adequate for use on shallow water bodies such as ponds and reservoirs. The craft, because of its easy maneuverability, can also be used on shallow water bodies for recreational activities such as, sport fishing and canoeing.

INTRODUCTION

The expanding human population increases food need, scarcity sets in and there was need to go beyond the shallow waters and sea shores to collect more foodstuffs and there were needs to preserve aquatic products for future use. It became desirable to go to any part of the water bodies to catch fish in large quantities where they were found. This necessity led to the discovery of simple waterborne crafts that can be used for mobility on water (fishing crafts), hence increasing the areas where exploitation of aquatic resources can be carried out. A Fishing craft can be described as a floating plat-form used to transport the crew, gear, and cargo to and from the fishing ground and to support the crew and equipment during fishing operation (NRC, 1988).

Fish farming in these enclosed water bodies requires an adequate management practice which includes removal of unwanted floating objects, aeration of oxygen depleted ponds, collection of water samples for water quality assessments, feeding of experimental fish in net hapa etc. These activities could be achieved more effectively with the aid of a small craft that could be used on a shallow water body. This work was prompted by the need for a craft that is cheap, potable and could be used on shallow water bodies, with the following objectives:-

- Produce a craft that is cheap, potable and could be used effectively on a shallow water body.
- Enhance aquaculture activities in ponds, reservoirs, raceways and other enclosed water bodies, thereby ensuring increased fish production.

MATERIALS AND METHODS

Design

The design data was obtained from the free hand sketch of the canoe, which was drawn with a HB pencil, putting in place all the required design lines and making all

necessary adjustments. A metre rule was used to measure the specifications of the free hand sketch in accordance with Love (1979). The design data was then used to draw the canoe to scale (1:15.3) using drawing instruments. The design guideline according to Chapelle, (1956) was used.

The canoe's layout was drawn on a sheet of plywood maintaining the required sizes and shape of each part that needed to be put together to make the complete canoe. Lines were drawn to divide the plywood sheet into eight equal squares, each 600 mm x 600 mm. Points A, B, C, D, E and F were Measured and mark on the lines according to the measurements given in the drawing. This was achieved by using a long wooden curve batten to aid making of proper curved line with a HB pencil. First a line was drawn lengthwise in the middle of the plywood sheet. From this centerline, measurements and marks of the bottom on one end of the sheet was made according to the requirements. The side curve was lofted on one side only, and then the measurements were mark with small dots on the other side. Then measured and marked the transom on the other end of the sheet. The transom and bottom meet, there were no left over plywood between them.

Construction

Cutting out the parts

The marked plywood served as the screeve-board for the construction. A jig saw was used to saw along the lofted side of the bottom. Then the side strip was flipped over, onto the other side of the sheet, and the other edge of the bottom along the sawn edge of the side. The drawn curve was checked to confirm if it matches the measured points. The other edge of the bottom was then cut. The six pieces of plywood: The bottom and two strips each for the sides of rather nonspecific shape were produced. The side strips were cut in two, 1200mm from the end. The pieces were swapped, and wider ends of the strips were connected using butt joints.

Fixing of the cut pieces

To the bottom strip hard wood blocks were fixed 200cm apart, and then the side strips were stitched after glue was applied and small screws were used to fasten the joints. The sides were first put together with the butt blocks, then the bottom and sides using the 50mm x 50mm blocks and screws. The gunwales, and strips in place of transoms are 25mm x 25mm pine. The quarter knees have been glued on top of the gunwale battens. 25mm thick hardwood was then prepared and fixed as seating platform (thwart). The gunwales were made of 21 x 21 mm pine batten and fixed together with the quarter knees. Quarter knees in the stern and bow were fitted to act as handles, and they make the canoe look nice.

Finishing

After completing the main construction, a paste of saw dust and glue was used to seal off the seams for water tightness. The hull of the craft was sanded off thoroughly then cleaned with a rag to prepare a good surface for painting. After sanding, emulsion paint was applied as primer then three coats of oil gloss paint was used to paint the craft allowing one coat to dry before applying the next.

DETERMINATION OF SPECIFICATIONS

Light Displacement

The light displacement (weight empty) was determined by direct measurement of weight of the canoe after construction using a spring weighing balance.

Deadweight (capacity)

The capacity of the canoe was determined by direct addition of weight to the canoe while floating on water until it carried the maximum weight it could carry.

Displacement

Displacement was determined according to Teale (1981),

Cost Estimate

The cost of the canoe was estimated based on the local market cost of materials used for the construction in respect of their sizes and specifications.

Testing the Canoe

The canoe was gently placed on water then allowed to float empty, while being observed for leakage, stability, and draft. The capacity was then tested for by allowing one person at a time, until it carried the maximum weight it could carry.

RESULTS AND DISCUSSION

The design sketch (scale drawing) of the canoe obtained from the freehand sketch is shown in figure 1. The layout design of the components on a sheet of plywood is shown in figure 2. Table 1 shows the design data obtained from the free hand sketch. The specifications of the canoe (Table 2), indicates that the breadth overall (BOA) is 0.75 m, the length overall is 2.14 m, while the depth was 0.37 m. Scantling sizes and cost of construction of the canoe is presented in Table 3. When the canoe was placed on water, it floated at a shallow draft of 5.5 cm with stable equilibrium (Plate 2), whereas the draft was 19 cm while carrying a maximum of 3 persons of about 70 kg average weight.

The specifications of the canoe indicates that the breadth overall (BOA) is 0.81 m which is about 34% of the length overall (LOA), while the depth was 0.35metre about 43% of the BOA. These specifications are within the range of design guidelines according to Chapelle, (1956), The construction resulted to the production of a canoe that has the fore and aft look alike. The canoe is light in weight (25kg) in relation to its size, such that one person can carry without difficulty. The light weight gives the canoe increased dead weight, as it floats at a shallow draft leaving greater part of the canoe above the water line as free board there by increasing its capacity to carry more load. The construction process utilized a sheet of plywood leaving no leftovers, so the work achieved maximum utilization of materials. The cost of construction was N10, 000, which is affordable in relation to the cost of local canoe of same size based on the national survey of fishing crafts (NIFFR, 2002). The canoe was easily maneuvered when propelled by paddling as it floated at a shallow draft; this makes the canoe adequate for use on shallow water bodies such as ponds and reservoirs.

Such easily maneuvered craft can also be used on pond or reservoirs for recreation which include, sport fishing and canoeing.

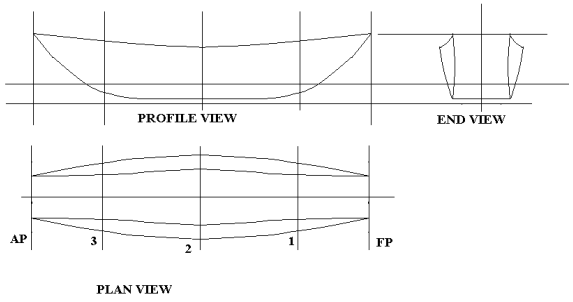

Fig. 1: Design Sketch

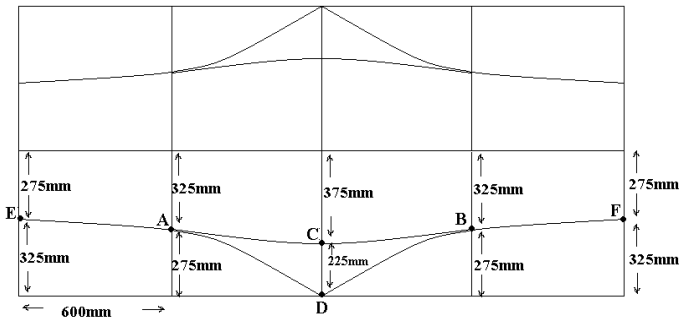

Fig. 2: Design Layout

Plate 1: Fixing the gunwale

Plate 2: Completed canoe being tested

CONCLUSION AND RECOMMENDATION

The craft (Sampan) have light weight, least cost, ability to float at a Shallow draft, adequate stability and easy maneuverability as its attributes. These important qualities are adequate for a craft needed for activities on shallow water bodies. This craft is recommended for use on fish ponds, reservoirs and any other large aquaculture system. It is also recommended for use on less turbulent inland water bodies, hence it can be introduced to fishermen operating on calm water bodies as a replacement of the locally built canoes. It is recommended that same technology be used to construct larger canoes for use on bigger water bodies, to replace those local canoes that are characterized by short lifespan and low capacities.

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Table 1: Design data

Design ordinates	**Sections**				
	FP	**1**	**2**	**3**	**AP**
Keel/chine HA/B	0.46	0.052	0.026	0.052	0.46
Chine H/B	0.14	0.156	0.195	0.156	0.14
Sheer HA/B	0.46	0.43	0.39	0.43	0.46
Sheer H/B	0.14	0.235	0.28	0.235	0.14
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Sheer H/B	0.14	0.235	0.28	0.235	0.14

Table 2: Specifications of the Canoe

Length overall (LOA)	2.14m
Breadth overall (BOA)	0.81m
Moulded depth	0.37m
Draft	5.5cm
Light displacement	28.5kg
Displacement	228.5
Deadweight (capacity)	200kg (3 prs)
Scale	1:15.3

Table 3: Cost implications for boat construction

Material	**Size**	**Qty**	**Unit**	**Unit price**	**Amount ₦**
Plywood	6mm	1	Sht	2500.00	2,500.00
Hardwood	25X25mm	1	No	800.00	800.00
Screw	25mm	2	pkt	250.00	500.00
Screw	35mm	1	pkt	300.00	300.00
Screw	45mm	1	pkt	350.00	350.00
Wire nail	Assorted	2	lb	200.00	400.00
Glue	1kg	$1^1/_2$	kg	400.00	600.00
Paint brush	4”	1	**No**	100.00	100.00
Primer paint	4lt	¼	lt	1000.00	250.00
Gloss paint	4lt	¼	lt	2000.00	500.00
Labour cost					3,700.00
TOTAL					**10,000**