

THE ARCHITECTURE AND CHEMISTRY OF A DUG-OUT: THE DUFUNA CANOE IN ETHNO- ARCHAEOLOGICAL PERSPECTIVE

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Introduction

On the 4th of May, 1987, in a village called Dufuna between Potiskum and Gashua, along the Komadugu Gana river bed in north-eastern Nigeria, a dug-out was discovered (GARBA et al., 1988) by a Fulani cattle rearer while digging a well to water his cattle at the outskirts of Dufuna village. The excavation site is two kilometres north of Dufuna, on the edge of a plain which is seasonally flooded after heavy rains. Mallam Ya'u, a quintessential Fulani cow herdsman, is well schooled in animal husbandry. His sustenance derives from survival of his cattle, his life orbits around the salubrity of his herd (KUJU, 1995, 30-33). When encountering a hard surface at a depth of 4,5m, he continued. Upon realizing he had found something of importance, he reported the matter to the appropriate authority.

The initial excavation was sponsored by the University of Maiduguri, between 1989 and 1990, to ascertain whether what we were dealing with was actually a canoe, and to procure chipped samples for radiocarbon dating. The amount to be expended on further exploration was so enormous that neither the University nor the State Government nor the Federal Government of Nigeria could have given much backing to the project in view of our ailing economy. Under the auspices of the Universities of the Frankfurt/Maiduguri joint Research Project, Professor Dr. Peter Breunig obliged to assist the project in whatever way possible. The second excavation was jointly conducted by Prof. Breunig and the author under the Joint Research Project, and monitored by the National Commission for Museums and Monuments. A second chipped sample was obtained and a much fuller documentation was achieved. The radiocarbon datings were collated from different laboratories (Kiel and Köln) and the dates tallied.

In prehistoric studies an "artefact" unearthed can only speak for itself when the archaeologist subjects it to multifarious analysis. Other than that, the "find" may not have any meaning, as the people who produced it and used it are no longer alive, and hardly could anyone come across oral information transmittable from that epoch to the present. In our quest for the meaning, methods and processes of production and functional utility of the artefact in question (the dug-out), the archaeologist uses ethnography as a tool of

investigation, by studying the material culture of contemporary society which manipulates similar environment. To this end, an experimental ethnographic mode of producing a dug-out was commissioned at Dufuna and the ethnographic result would be placed side by side with the excavated "find" when finally removed for preservation and exhibition. This craft manufacture is likely to die out. The recent re-enactment is meant to compare the modern analogue with the antique dug-out when finally removed for preservation and exhibition. This might be the beginning and end of a tradition lasting for eight millennia.

The ethnographic investigation and experimentation were conducted in February 1995, by commissioning a carver based at Dufuna to re-enact the carving of a dug-out (BREUNIG, GARBA and HAMBOLU, 1995). The carver, Mallam Turai Aliyu, a Hausa migrant from Sokoto having had sojourns in various places along the Komadugu Gana, finally settled at Dufuna, where initially he was a hunter, and later a farmer preoccupied with carving.

Architecture of a dug-out

For any artisan with an intent of carving a dug-out canoe, the selection of the best tree species is crucial. The size and length required is fundamental. Its transportation from tree source to workshop site is very significant. Since prehistoric times, man had the basis of selecting specific trees for the production of a dug-out canoe. Examples are abound in Europe where a dug-out made from pine tree that dates as far back as 6300 BC was discovered at Pesse in Holland. The culture of dug-out construction became imminent in northern Europe as soon as suitable tree species for boat building migrated to the respective areas (CHRISTENSEN, 1990). Most Stone Age boats in Europe were constructed from softer tree species such as lime and alder, and sometimes oak which is harder. In terms of chronological framework, evidence from the dug-out discovered in Europe indicated that there was a shift of use of lime in the Mesolithic to the use of alder in the Neolithic. Lime was the most preferred material on the coast, while alder was the preferred species on the inland lakes. The choice of tree species is therefore relative to the length and width of the trunk, longevity in water, inhibition of cracks and split when it dries out, and most importantly durability. In Nigeria the tree species chosen for the "antique" dug-out probably belonged to the genus *Khaya* (BREUNIG, 1995, P.C.), while the present tree chosen for the ethnographic experiment was the *ma'aje* (Hausa), the Copaiba balsam tree *Daniellia oliveri* (BREUNIG, GARBA and HAMBOLU, 1995). The choice was predicated by singular contextual presence of few large species with trunks long enough for dug-outs in this area. The other tree species used in such construction according to my informants, are the *Acacia albida*, *Spondias SP*, African mahogany, and possibly *Borassus SP*. They were best used because they had larger trunks, are softer to hollow out the pulps, and could last longer and withstand hardship and weathering particularly when subjected to preservatives.

With the right selection of the tree species for the manufacture of the dug-out, custom demands that the carver, Mallam Turai and his retinue assistants, had to undergo some rituals. "Careful enough to protect himself and his workers with some magical powders - the composition of which was a trade secret to avert the possibility of the tree falling on any of them," (BREUNIG, GARBA and HAMBOLU, 1995).

The tree selected was felled by series of axes cutting from one side to give room for the tree to fall in the other direction. In contemporary Nigeria a tree can also be felled by burning around the base or stem, a practice possibly in consonance with prehistoric populations.

With the felling of the tree, measurements took place and the dimension desired earmarked. The branches were pruned (removed). The two terminals emanating from the base and the branchiation point were determined and cut. Having obtained the terminals (i.e. the tips), the trunk was then barked. Notches at intervals were made on the trunk to speed up the hollowing of the pulps. The interior was scooped out leaving the tips to be reworked at a later stage. It took much time and effort to smoothen the interior. Tools of various sizes were applied to file out edges and curved angles that the axe could not reach, and also to pick up bits of pulps feasible.

It has been speculated that in prehistoric times the hollowing of the dug-out could have been achieved using fire. This has not been conclusively proved from the myriads of dug-outs identified in most parts of the world. Scholars have not yet ascertained whether hollowing was initially achieved using fire, but certainly fire could have been used for felling trees by burning the base (stem). Henry HODGES remarked in his book "Artifacts" (1961:114-5) that

"... in the remote past ... eye witness accounts of the making of these boats by primitive people today are ... the major part of hollowing fire on the log and burning out the interior, and this was followed by cutting away every last piece of charred wood with an axe or adze".

Charlie CHRISTENSEN in a book titled, "Experimentation and reconstruction in Environmental Archaeology" (1990:119-14) remarked in an uncomplacent manner: "Facts handed down to generations of school children is that stone Age dug-out boats were hollowed out using fire". He further concluded that, "there is no evidence (with the possible exception of the rather dubious sondersted 1 boat) for the use of fire in boat construction."

Excess wood barks and bits were removed from the bottom to lighten the canoe when floating on water. On accomplishing the hollowing, the interior and exterior parts were smoothened with a scraper. The aquiline shape was ultimately achieved to enable the canoe glide easily through the water as well as manoeuvre easily against the wind.

Carving concepts

The group of carvers interviewed were made up largely of the Takari, a migrant Hausa group from Sokoto, who by the nature of their livelihood live close to water sources to harness and exploit the aquatic resources and engage in large scale farming. The concepts applied in carving by the group is purported to be Hausa. They are as follows:

<i>Shaàbaá</i>	Removal of the bark of the tree, which is achieved largely by using axe and adze.
<i>Sàssákaà</i>	That is the actual carving which commences after felling the tree, using all types of implements such as axe, adze, and a scraper or a smoothener.
<i>Cîn-Cíkîi</i>	Scooping out the unwanted pulps from the twig, to provide a cavity using axe, adze and scraper.
<i>Gaàtáíí</i>	Axe; used in felling tree and initial scraping and removal of barks.
<i>Gìzaàgóó</i>	Adze; used in scraping the bark of the tree. It is a tool because of its cute nature is manipulated in whatever angle where big implements cannot reach.
<i>Mómbàlîí</i>	used for scooping out pulps from the trunk cavity.
<i>Máfúúráa</i>	used for smoothening. It is a sharp tool for cleaning out pulps.
<i>Máyérnîi</i>	(or <i>Kokkofa</i>)-acute implement used in hard digging of pulps within the trunk cavity.

It should be noted that possibly some of the concepts used were not general terms acceptable to all Hausa speakers, but may be a term used by a few spectrum linguistic group within a limited locality.

Chemistry of a dug-out

The African Encyclopaedia (1974) defined chemistry as "the study of what things are made of." Having had a thorough mode and method of production of a dug-out, this section would examine the role of chemistry in the preparation of a dug-out. Even though the present investigation was achieved using the participant observation of extant societal practices, one would ponder if such practices had been in existence in prehistoric times. If certainly it was, prehistoric populations might have had - even in rudimentary form - the knowledge of chemistry and chemical compositions which were used in the preservation of organic materials, including the treatment of a dug-out.

With the accomplishment of work on the dug-out, Mallam Turai and his group of carvers demanded some amount to purchase animal fat for the wood preservation. As is obtained today, chemical treatments on wood are made

using the orthodox chemicals. Among the local communities where orthodox chemicals proved expensive and hard to source, local chemicals are prepared from organic materials ranging from cow dung, groundnut oil, animal fat and even automobile (engine) oil. Cow dung is commonly applied to carved items, but in the case of Dufuna experimental dug-out, "the work was completed with the rubbing of the canoe with animal fat to prevent it from cracking" (BREUNIG, GARBA and HAMBOLU, 1995). The animal fat was subjected to fair heating, metamorphosing into fat oil which was then rubbed on both interior and exterior parts of the dug-out to prevent cracking and termites attack. The dug-out was then exposed to the sun to dry up, lightening the weight of the canoe. When this was achieved the canoe was transported by any means of transport to a river side to test the effectiveness of the dug-out, and identify parts which leaks, and in the absence of that, it is permanently placed by the river side to aid transportation of people and goods. But in the case of the Dufuna dug-out being experimented, the boat will be prepared for exhibition at Damaturu after the excavation and preservation of the prehistoric canoe. As they will be exhibited side by side, the visitor will be able to see the beginning and the end of a canoe carving tradition which lasted several millennia in this area (BREUNIG, GARBA and HAMBOLU, 1995).

Fundamental questions

Even though this paper is concerned with an experimental canoe, it is the ardent view of the author to put forward some general questions regarding the "antique dug-out", that could trigger further research.

What could have been the Dufuna environment and adjacent areas at the time the canoe was in use? In a nutshell what was the vegetation like and the aquatic nature of the area? Is it the same environment we have found today? If the vegetation was more luxuriant and denser what might have led to its deterioration? What type of prehistoric populations were present at the settlement? Could they have any link with the present population or adjacent groups? Could it have been possible that the Mega-Chad extended up to this area 8500 years ago? Is the canoe indigenous to this area or could it have been transported from elsewhere to this area? What was it used for? Speculating on the vegetation of the area the author in a recent interview with the Meridian Magazine (1995:30-35), remarked, "that most probably the vegetation ... must have been luxuriant 8,500 years ago and we assume that the Savannah vegetation which is reflected there is not the type of vegetation obtaining during that epoch (KUJU, 1995:34).

At this juncture it is worth asking some fundamental ethnographic inquiries as follows:

Would it not have been proper to attempt the construction of a dug-out by hollowing, by means of burning and later the application of lithic tools to

remove charred parts as an experiment to give us further insight into the prehistoric technology, if fire was at all employed in the manufacture?

A much more serious question is with the nature of production of the dug-out in relation to the tools used in the carving as well as the time taken to produce a dug-out Canoe. It is also worth comparing the production of the experimental canoe with the excavated - which belonged to the prehistoric period. If the experimental one was produced within ten hours fifteen minutes together the amount of time on daily basis of which we arrived at this summation, with a work force of eight people, and the application of iron implements such as the axe, adze etc., one would wonder how much time it would have taken a prehistoric group (of late Stone Age) to work a dug-out of that nature, knowing fully the absence of iron implements. In a recent paper titled, "The carving of a Canoe at Dufuna, Yobe State, An ethno-archaeological experiment" (BREUNIG, GARBA and HAMBOLU, 1995) we concluded by asking "would it then not be logical to pursue the research further by attempting the production of one using stone tools only?"

Conclusion

For a proper grasp of the processes involved in the production of a dug-out Canoe in prehistoric times, it is worth experimenting using late stone age tools in fashioning the dug-out to quantify the work hour taken to produce one. By so doing, we would have a fuller picture of what obtained several millennia, and as well appreciate the amount of technological skill and expertise of precursors of our technological heritage. For the sake of curiosity, I put it as a request to the German Research Foundation to sponsor this aspect of the project, for the enhancement of academic knowledge and scholarship.

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Commentaries

1. Someone asked the tree species from which the antique dug-out was made. In response to this I informed him that it was from the African Mahogany (Khaya).
2. As a challenge to the German Research Foundation, I urged for the re-enactment of a dug-out using stone implements. Someone from the audience stood up and informed me that the re-enactment using stone implements had already been conducted in Europe and he would be glad to give me the literature source. I demanded immediately while I was on the presentation table but he said he would give me the source during the plenary session break, of which we could not see up to the time of my departure.
3. Somebody asked whether I had an idea if fire was employed in the carving of a dug-out in the prehistoric past. I told him that I only came across one literature by Henry Hodges titled, "Artifact", where he indicated with no strong assurance that fire was perhaps used in the past.
4. Someone also asked whether the antique dug-out exterior wall backs were removed as was done in the modern analogue, I answered in the affirmative.
5. Thanks for all those who questioned and commented. It serves as a bedrock for insight in the new scientific information and cross fertilization of ideas.

Abstract

It is the intention of this paper to highlight the processes involved in the production of a dug-out. Two disciplines appear strikingly clear in the title of this paper; architecture and chemistry. It is deliberate, exhibiting the multifaceted approach to issues in archaeology. The Dufuna canoe, the main subject of the discussion, is entirely an organic material, long used by prehistoric populations, abandoned and covered in a huge deposit of earth, unearthed by the spade in two streams of excavations for the purpose of dating, measurements, documentation, which yielded a date of 8500 years as the oldest canoe in Africa and one of the oldest in the world. Who could have produced such an "artefact"? These and other related questions are fundamental towards the understanding of the history and society that lived in that environment in prehistory. Since we are dealing with a single "artefact" produced by prehistoric populations, long gone and extinct, we would not be in a position to reconstruct the processes of manufacture of the dug-out by any source other than by ethno-archaeological and ethnographic investigation and experiment of the contemporary society which manipulates similar environment with a view to stimulating the past mode of production. The method used in the data collection was by oral interviews and field observation.

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