

A Study of Traditional Boats of Goa

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Abstract

Goa, being situated along the Arabian Sea of India, is known for maritime activities and traditional boatbuilding throughout the history. Traditional folk songs of Goa frequently mention 'Vodem' which denotes canoe. The recent discovery of stone panels with boat (canoe) motives bears testimony to the fact that the people were aware of boatbuilding since ancient times. The present paper discusses on traditional boats of Goa. The Goa coast provides good evidence of various types of traditional boats such as dugouts, extended dugouts with and without outrigger and plank built boats. Most of these boats are distributed along the coast except small dugouts and plank built boats which are noticed along the rivers. The construction of traditional boats passes through various stages like seasoning of timber, cutting, bending, joining of planks, fastening, sewing, outside treatment, etc. 'Kharvi', the fishing community of Goa have been involved in fishing, boatbuilding and maintenance. The study shows that Goa has preserved the traditional knowledge which has been continued for centuries and which enables to understand the boatbuilding technology of the past.

Keywords: Traditional boats, Boatbuilding, Maritime History, Ports, Anchor, Sail, Goa.

Introduction

Goa (15⁰48'00"N and 14⁰53'54"N Latitude and 74⁰20'13"E and 73⁰40'33"E Longitude) is a tiny state of the Indian Union and its western boundary lies on the Arabian Sea and eastern border along the Western Ghats. The coastal tract of Goa extends from the River Terekhol in the North to Kalinadi Creek in the South. Sandy beaches separated by rocky headlands, cliffs, river mouths and estuaries have formed the coastline of Goa. Tiracol, Chapora, Mandovi, Zuari, Sal and Talpona are the major rivers of Goa which originate in the Sahyadri mountain range and join the Arabian Sea.

A study of traditional boats provides information in reconstructing the history of boats or ships (Greenhill 1995; Adams 2001; McGrail 2004). Such studies have been conducted worldwide including India. European and Indian scholars have studied the traditional boats of the east and west coast of India. European scholars such as Hornell (1920), Blue (1997) and McGrail (1996, 2003, 2004) have studied traditional boats of India in general whereas Indian scholars have studied the traditional boats of India in particular Orissa (Sila Tripathi 1995), Andhra Pradesh (Thivakaran and Rajamanickam 1993), Tamil Nadu (Rajamanickam and Arulraj 1991), Andaman & Nicobar (Rajamanickam and Thivakaran 1992), Lakshadweep (Varadarajan 1998, Tripathi 1993), Kerela (Greeshmalatha and Rajamanickam 1993), Karnataka (Swamy 1994, 1999; Gaur 1993; Sundaresh 1993), Maharashtra (Jain 1993).

Evidence suggests that maritime history of Goa must have contributed towards the growth and development of boatbuilding. As a part of dissertation preliminary studies have been carried out on the traditional boats of Goa (Shaikh 2009), but prior to this, scholars have referred to the traditional boats of Goa: Hornell (1920) has mentioned *Rampon* type of boat of Goa and Apte (1973) has described the boats of the Konkan coast in which boats of Goa have been illustrated. Boats are portrayed on the hero stones which are displayed in Archaeological Museum (ASI), Old Goa have been studied (Rajagopalan 1987; Sila Tripathi 2006; and Sabnis 2008) and recently stone panels with boat motives have been discovered from various parts of Goa (Gaur and Kerkar 2007; Kamat 2008).

Classification and distribution

The traditional boats of Goa have been classified into four categories on the basis of their existence (Table. 1) and taking into account the classification of traditional boats of India made by Rajamanickam (2004). Seabed topography plays a prominent role in distribution of traditional watercraft (Fig. 1). Skin boats are found in rivers because of calm water (Fig. 2) but dugouts and dugouts with outrigger are found mostly in rivers, tributaries, estuaries and all along the coastline. Extended dugouts without outrigger are found along the near shore zone engaged in fishing (Fig. 3).

Sl. No.	Categ.	Type of boat	Local term(s) for boats	boatbuilding centres	Carrying capacity tonne	Purpose
I		Dugout		Betim, Katem Baina, Betul, Benaulim		
	a	Without outrigger	<i>Ponjal / hodi/ponyao/Vodem</i>		0.15-0.20	Inland fishing
	b	With outrigger	<i>Ponyao / hodi / Vodem</i>		0.20 - 0.25	Inland and offshore fishing
II		Extended Dugout		Betim, Katem Baina, Betul, Benaulim		
	a	Without outrigger	<i>Hodi / Vodem</i>		0.50	Offshore fishing (long distance)
	b	With outrigger (2/3 strakes)	<i>Hodi / Vodem</i>		1-1.5	Offshore fishing (long distance)
	c	With outrigger (3 strakes)	<i>Ramponchi hodi / Vodem (Rampon)</i>		2 or 2.5	Off shore fishing (short distance)
III		Sewn Plank Boat with keel	<i>Revechem hode</i>	Tiracol, Chapora, Amona	10 to 12	Removal of sand from river bed
IV		Skin boat		Karnataka		Inland fishing

Table 1. Classification and distribution of traditional boats along the Goa coast

Extended dugouts with outrigger having 2/3 strakes dominate all along the Goa coast (Fig. 4 - 6). Sewn plank boats in which sand is transported are found mostly along the interior rivers of Tiracol, Chapora and Amona (Fig. 7).


Raw material and Stages of boatbuilding

Boatbuilding process goes through several stages including selection, seasoning, cutting of timber, bending, planking, caulking, fastening and outside treatment. The traditional boats entirely depend on quality, size and buoyancy of timber. Usually straight timber with minimum 0.75 to 1.00 m diameter and 6 to 8 m in length is preferred. Essentially mango (*mangifera indica*) and Jackfruit (*Artocarpus integrifolia*) timber is chosen for construction of dugouts, and malat (*Aganosma caryophyllata*) and Jambal (*Sizyginm cumini*) for plank built boats. Bamboos, bhendi (*Thespetia populnea*) and other locally available timber are used for making the

outrigger. Instead of using different types of timber builders prefer to use one type of timber for the entire boat. Timber is seasoned in muddy or backwater for 15 days and more and dried in shade without exposing to direct sunlight. This treatment enhances its resistance against woodborers, makes it stronger and scooping easy.

Planking, joining, bending and fastening

The height of traditional boats is extended by adding a row of planks one above the other. In extended dugouts a row of planks is added to the dugout but in case of plank built boats, firstly a row of planks is added to the keel, then upper rows of planks are added one above the other. Edges of the planks are joined with a 'J' shape cut, whereas planks are joined either with 'V' groove or 'L' angle joints. Male and female 'V' grooves are made on either plank then both are fixed. Such joints provide better strength to planks and chances of detaching are very minimal. Damaged portions are replaced with new timber (Fig. 8). The damaged portion of the boat is removed, then a female 'L' shaped angle is made on the edge of the plank, afterwards a male 'L' shaped angle is made which is joined to the female 'L' shaped angle. Gunwale planks (locally called '*pakhi*') are curved and provided at bow, middle and stern of the boat. In order to get a better bend of plank - *kadu* oil is applied on either side and heated at a minimum temperature until the required bend is achieved. Then it is fitted at the appropriate position of the boat.

Wooden pegs, coir, coir rope and nylon rope, copper nails, stainless steel nuts and bolts are used for fastening of the boats. Special types of copper nail called rabbets are used for fastening ribs. Cracks on the plank are secured with small and thin copper nails. Stern is fastened with copper rod, nuts, nylon rope, wooden pegs and sometimes with stainless steel bolt. The damaged or woodborer affected planks are replaced with new timber and fastened with rabbets and washer. Besides cautious fastening, sewing is carried out to avoid detachment of planks. Sewing of pivots is done with coir. Sewing is carried out by two persons; one who sits inside the boat passes the rope to the outside person through the holes and the rope is pulled very tightly with the help of a wooden stick by the outside person and passed again to the inside person and it continues till the end. The sewing appears as 'X' or '

Caulking and Coating

Caulking is applied made to traditional boats to prevent water seepage and leakage. Caulking is carried out while planking and after planking with '*carī*', *tar* and cotton (Fig. 9). '*Carī*' is a type of glue prepared by local carpenters. Before joining the planks, '*carī*' is applied on the edges of

planks and cotton is placed over it. Afterwards planks are sewed. 'Dig', the coating material, is applied for caulking of traditional boats. It provides additional strength, durability and protects from woodborers and enhances longevity of boat. 'Dig' is applied both inside and outside of the boat wherever required. Even as a part of caulking wooden nails are immersed in 'dig' then put into holes made for sewing. If any holes or cracks are noticed on the boat, those are filled with 'lambi', it is a mixture of 'cari' and 'chunnam' (calcium carbonate) made by local carpenters.

Boatbuilding techniques

The 'Kharvi' community of Goa has engaged in construction of traditional boats, their maintenance and fishing. After the Portuguese conquest of Goa in 1510 AD a large number of Kharvi community were converted into Christianity (Pereira 2008). Presently, both Hindu and Christian Kharvis reside along the coastal belt and pursuing their traditional profession. People of other communities are not involved in building of traditional boats. Traditional boatbuilding technology is closely associated with inherited knowledge of local carpenters and this tradition has passed from father to son. Most of these boats are built in temporary boatbuilding yards which are erected near the beach or river banks.

I. Dugouts without and with outrigger

Dugouts are variously known as 'ponjal', 'ponyao', and 'vodem' built from a single log. Most of the dugouts are made of mango (*mangifera indica*) wood. A centre line is marked on the log, which helps to cut the timber into the required shape and size. The log is kept in backwater for a fortnight or so then dried in shade. Under wet condition scooping is carried out with adzes, chisels and axes, because in soggy condition scooping can be carried out efficiently and the required shape of the canoe can be obtained both from inside and outside. Mostly two to three persons are engaged in this task for 15 - 20 days. While scooping uniform thickness is maintained, i.e. about 0.6 m thickness at bottom, 0.7 m gunwale and 0.4 m starboard (Fig. 10). Sometimes the choice of thickness varies from carpenter to carpenter. This shows that as scooping is carried upwards along the gunwale, thickness of the timber increases at middle and reduces at upper side. Such measurements are maintained with the help of a small stick. In certain cases ribs are provided in reserve while scooping for better strengthening. Then thwarts are added to it by lashing them on gunwales either with coir or nylon rope. Thwarts are fixed to the dugout by making 'L' shape angles in the four corners in "└" shaped groove made on the gunwale plank (Fig. 11). Once the construction is completed cashew oil ('dig') is applied to the

entire boat. The width of these dugouts is more at the centre and it reduces at bow and stern. Dugouts have a 'V' shaped vertical cross section at bow and stern whereas 'U' shaped vertical cross section in the middle. Simple dugouts are narrow and have limited lateral stability. In order to improve its lateral ability people use methods like heat expansion of the beam of the boat, stabilisers and outriggers, etc (McGrail 1978). In Goa outrigger is added to simple dugout whenever it is required.

II. Extended dugout

Extended dugouts are built by placing a row of planks (strakes) one above the other on the dugout. The extended dugouts played an important role in early periods in Indian and Indonesian waters (Johnstone 1988). There are three varieties of extended dugouts in Goa namely extended dugout without outrigger having 1 strake, extended dugouts with outrigger having 2 or 3 strakes locally known as *hodi* or *vodem* and extended dugout with outrigger having 3 strakes locally known as '*Ramponachem vodem*' (*Rampon*).

Mango (*mangifera indica*) timber is mostly preferred for construction of these types of boats. Once the dugout is built depending upon its type, rows of planks are provided edge to edge by giving a 'I' shaped joint. For instance in an extended dugout with 1 strake one row of planks is added, similarly two to three rows of planks are added in extended dugouts with 2/3 strakes. The edges of the planks are attached precisely without leaving any gap and no chance of water leakage. Before joining the planks '*car*' (glue) is applied on the edges and cotton is smeared over it then planks are fixed. Holes are made at intervals of 0.6 to 0.8 m on the planks then sewed with nylon rope. The holes made for stitching are packed with wooden nails. Before packing, the wooden pegs are dipped into '*dig*'. The topmost plank at bow and stern in extended dugouts is known as '*khol*'. The bow '*khol*' is bigger than the stern '*khol*' to increase the height of the bow.

Once planks are added, U' shaped ribs made of single timber are fixed at regular intervals with copper rabbet inside the dugouts. In case of extended dugout with one strake and *hodi* ribs come up to the half of gunwales and in '*rampon*' ribs are fitted at two places where outrigger posts are fastened. Ribs are made of single piece of timber in extended dugout with 1 strake. In *hodi* and '*rampon*' ribs are made of two pieces. Thwarts are added over the second last strake i.e. just before the top most strake is fitted. Thwarts provide horizontal support to the hull and prevent it from cracking. They are also used for seating. Lastly keel is added to the dugouts.

Keel is prominent at the base and merges with bow and stern in extended dugouts with 1 strake and in *hodi*. In case of '*rampon*' keel is made of three pieces of timber and joined together. The bow and stern keel are fastened by making 'V' groove and then sewed with coir. Whenever the keel is made of two timbers, it is joined by making male and female 'V' groove. No outrigger is provided in extended dugouts with 1 strake but outrigger is added in *hodi* and *rampon*. After completion of the entire construction cashew oil is applied to protect it from woodborers.

III. Sewn Plank boat with keel

Sewn plank boats of Bangladesh, India, Pakistan and Sri Lanka have been studied (Edye 1834; Hornell 1920, 1926, 1946; Greenhill 1971; Chittick 1980; Kentley 1985, 1993). Sewn plank boats of Goa are made of '*Malat*' (*Aganosma caryophyllata*) wood which is believed to be more durable in riverine conditions. These boats are locally known as '*Revechem hode*'. These boats are mostly engaged for transporting sand from rivers. Two to four persons are involved in construction of these boats and it takes almost 1½ or 2 months for construction. In such boats keel is laid first. Keel is made of three pieces of timber and they are known as main or middle keel, bow keel and stern keel. The stern and bow keel are joined with main keel with 'Π' groove (Fig. 12). After laying of the keel 6 to 8 rows of planks are added on either side one above the other in such a way that the vertical section in the middle becomes 'U' shaped whereas the bow and stern look 'V' shaped. Ribs are then added by making male and female shape '>' groove joints or 'L' shaped male and female grooves. Ribs are fixed at about 1m distance and fastened with coir rope. Thwarts are added with coir rope at varied intervals. The available space between bow and first thwart and stern and last thwart is used as a deck. In the middle an iron rod is provided horizontally for strengthening the boat and to prevent damage or cracking. Cashew oil is applied to the entire boat as a preservative coat after construction.

IV. Skin boats

Skin boats or hide boats are locally known as '*Harigolu*' or *butti* made of bamboo strips. Bamboo strips are lashed together like a basket and their sizes are 0.30 to 0.40 m in height and 1.5 to 2 m in circumference. In appearance they look like a wide circular basket. These are suitable only to use in calm water particularly in lakes and rivers. A coat of '*tar*' is applied at their base to prevent water seepage. Presently, some use polythene sheets and apply *tar* to check water seepage. The fishermen of Karnataka use these boats in Goa waters. However these boats are neither used nor constructed by Goan fishermen. It has been observed by Johnstone (1988)

that skin boats are generally found on the edges of the populated world. These boats are found more in southern India and are called *parical* or *paricu* in Tamil and *harigolu* or *butti* in Kannada (Deloche 1994; Swamy 1999; McGrail 2003).

Gear and propulsion of boats

Skin boats are propelled by paddles and simple dugouts are operated with oars. The requirement of oars depends upon the size of dugouts. Extended dugouts with 1 strake are propelled by oars, sometimes rudder and sail are fitted. *Hodis* are propelled by oars and outboard engine and even oars are used for propelling *Rampon*, but for long distance fishing rudder and outboard engines are used. Plank boats are operated with long bamboos (pole) and rudder. Neither oars nor outboard engines are used for these boats.

Sail and Anchor

Occasionally extended dugout with 1 strake use sails. Sail is made of a coarse cloth locally called '*cori elepha'* and they are of rectangular shape. The sail is tied to mast and yard, locally available bamboos or timber used as mast and yard. Local cotton rope called '*beed'* is used for tying the sail, now it has been replaced with nylon ropes.

Both stone and iron anchors are used which are known as '*Nangor'* or '*Nangar'*. Round and irregular shape of stones are used as anchors in dugouts and five fluked iron anchors are used in plank boats. The weight and size of the anchors depends on the size and capacity of boats. Anchors are used while fishing, loading and unloading of cargo and in case of emergencies.

Utility of boats and nature of fishing

Dugouts all varieties are used fishing. Sometimes smaller size dugouts are engaged for ferrying. Dugouts and dugouts with outrigger are mainly used in calm water of 5 - 8 m depth. Presently, extended dugouts attach outboard engines and go up to 45 to 50 km away from the shore irrespective of depth for fishing. '*Rampon'* boats are oared and used in nearshore zone about 8 - 12 m water depth. Plank built boats are utilised in transporting sand from rivers to hinterlands.

Local fishermen undertake various kinds of fishing along Goa coast and a particular type of boat is used for different types of fishing. Mention can be made that fishing is carried with *hodi* for mackerels and other type of fish (*Round mag*), using big net for fish and prawn catch (*Minipersin*), near shore fishing for mixed fish catch (*Rampon fishing*), only for prawns catch

(*Sungta mag*), near shore or along estuary (*Sinzel*). Of these, *rampon* fishing is an integral part of Goan society. In *rampon* fishing a long net is dropped in semicircular fashion and about 24 *ramponkars* (fishermen engaged in such fishing) haul the net from the sea for a good catch.

It has been noticed that fishing community of carry out fishing in a systematic manner. Even female members also participate in fishing. Male members go to the sea for catch and on arrival at shore; females disentangle fish from net and sort them out according to size and species and sell in market. This shows the division of labour among the '*kharvi*' community. '*Ramponkars*' also maintain a book in which apart from profit and loss they also record who were participated in the catch. Further, 10% of the profit is kept for maintenance of boat and rest is shared among the members. 10% of his share is deducted those who did not participate in fishing.

Discussion

Different types of traditional boats are found along the Goa coast, but predominant are the dugout type of boats. Though in appearance and construction dugout and extended dugout look the same there are some differences. Dugout with outrigger is an additional attachment which provides stability, better manoeuvrability and utility. Outrigger is fixed once the dugouts are used in the sea, because in the sea these boats require more stability. Dugouts with outrigger are used in estuaries and near shore zone whereas dugouts without outrigger are used in rivers and shallow waters where water is very calm.

There is a structural difference between *hodi* and *rampon*, in *hodi* 2 rows of planks are provided whereas 3 rows of planks are fitted in *rampon*. It is also wider than *hodi*. *Hodi's* in which oars and outboard engines are fitted are used in sea for long distance fishing and *rampon* are deployed in near shore zone. There is a difference in the method of joining of bow and stern planks in *hodi* and *rampon*. Bow and stern planks are interlocked and fastened with rabbets in *hodi*, whereas in case of *rampon* planks are joined and sewed with coir or nylon rope. It has been observed that the centre portion of the dugout is 'U' shaped and bow and stern is 'V' in shape.

Except some minor differences in joining of planks such as 'V' and 'L' groove no major changes has been observed in construction of boats building techniques of Goa and Karnataka. Most of the technical terms of boats of Goa and Karnataka are also comparable. Detailed study of the traditional boats of Maharashtra and Gujarat is essential for a comparative study with boats of

Goa, similarly with boats of other parts of India. Skin boats which are used by people of Karnataka in Goa waters have no impact on boatbuilding technology of Goa.

The boats depicted on hero stones displayed in Archaeological Museum (ASI), Old Goa and stone panels with boat depiction recently discovered (Gaur and Kerkar 2007) along the river Mhadei in Sattari taluka of North Goa District depicts vessels similar to traditional types which prevails presently in Goa. The sewing pattern plank built and *rampon* boats are similar as shown in one of the hero stones, displayed in ASI Museum, Old Goa, which portray a naval warfare (Fig. 13). The sternpost rudder is also alike to that of plank boats, even triangular oars shown on hero stone are similar to oars used in *rampon* and dugouts. The canoe type of crafts shown in hero stones (Sila Tripathi 2006) can be correlated with dugouts of Goa. Likewise the stone panel discovered from Nagve, located on the tributary of Mahadei, in Sattari taluka depicts a boat motif which has four grooves on the outer surface and resembles with plank built boat (Gaur and Kerkar 2007).

Conclusion

The study of traditional boats has brought to light new information on boats of Goa. In spite of advancement in technology, traditional boatbuilders have retained their inherited knowledge which passes from father to son this shows the continuation of traditional knowledge. At the regional level this study has provided good evidence on traditional boats of Goa. In order to understand the differences between the boats of Goa and other parts of India a comparative study is essential. Boatbuilding centres of Goa have been noticed along the coastline and riversides, but their number is falling because of changes in raw material and construction technology. In the recent past fibre was used a great deal in construction as well as repairing of traditional boats because of cost and easy availability. Most of these boatbuilding centres have engaged in repairing and maintenance of boats. However, boats are built on order basis. Traditional boats of Goa have been designed in accordance with the seabed topography of Goa. For instance '*Rampon*' boats are used off straight sandy beaches and these boats have a large distribution in Goa as compared to other boat types because of sandy beaches. Among boats '*Rampon*' stands as a unique type in the history of boatbuilding technology of Goa. The economic condition of traditional fishermen can be assessed on the basis of type of boats they owned, for instance middleclass fishermen own extended dugout or '*Rampon*' boat whereas poor fishermen own simple dugouts.

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Fig. 13. Hero stone depicting sewn boat which is similar to present day plank built and *Rampon* boats of Goa.



Fig.1. Map showing distribution of traditional boats in Goa.

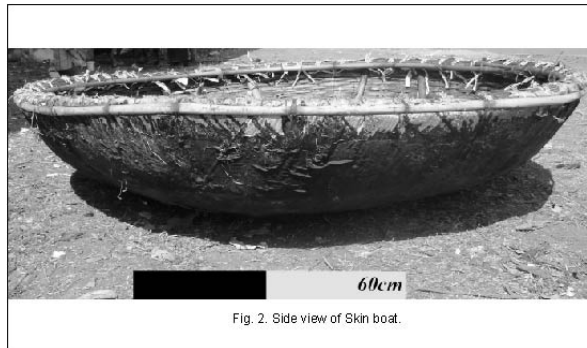


Fig. 2. Side view of Skin boat.

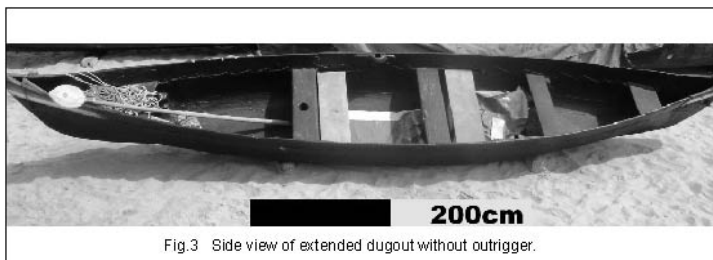


Fig.3 Side view of extended dugout without outrigger.



Fig. 4. Side view of extended dugouts without outrigger (2/3 strakes).

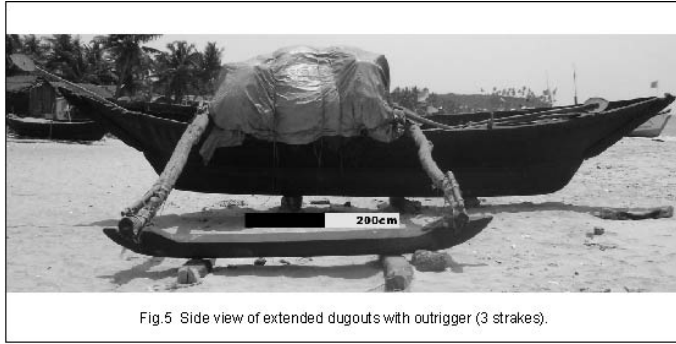


Fig.5 Side view of extended dugouts with outrigger (3 strakes).



Fig. 6. Top view of extended dugout with outrigger (3 strakes).

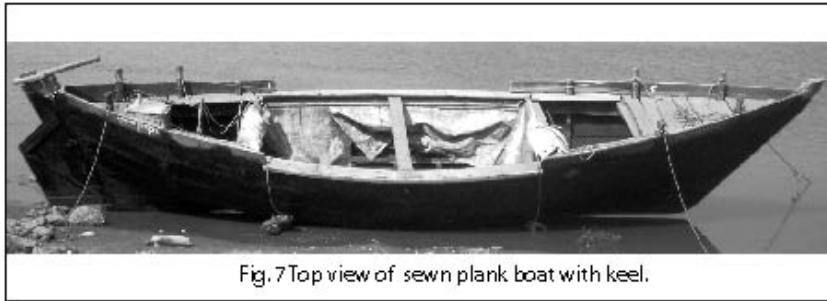


Fig.7Top view of sewn plank boat with keel.

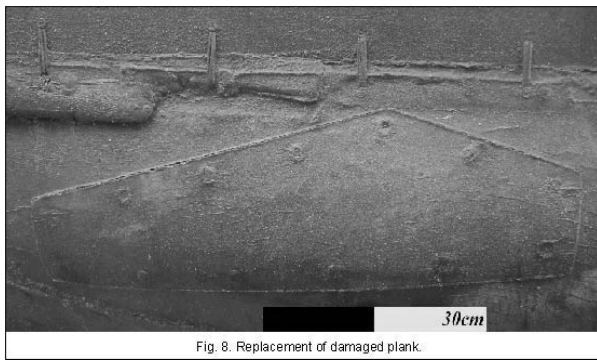


Fig. 8. Replacement of damaged plank.

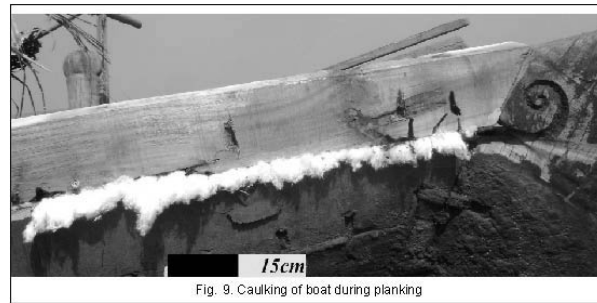


Fig. 9. Caulking of boat during planking

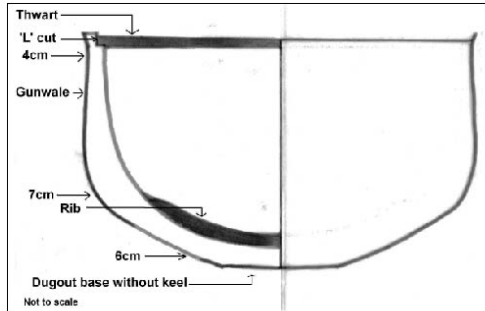


Fig.10. Section showing the gunwale where thickness of timber increases at middle and reduces at top.

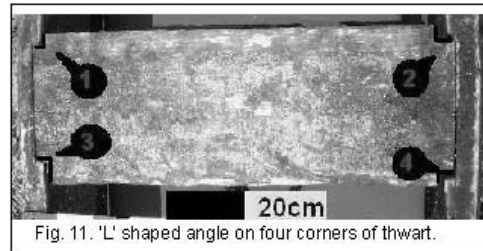


Fig. 11. 'L' shaped angle on four corners of thwart.

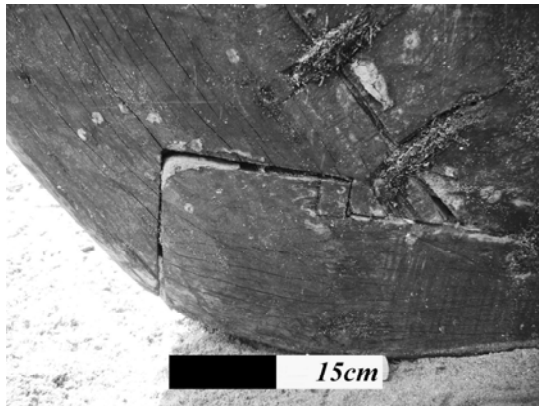


Fig.12. Keel joined with 'T' groove in plank boat.

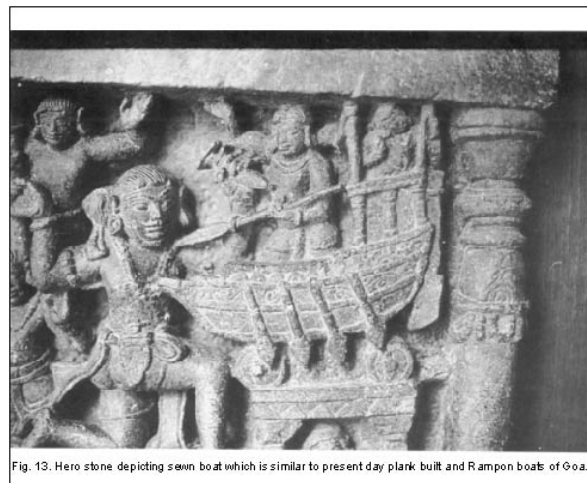


Fig. 13. Hero stone depicting sewn boat which is similar to present day plank built and Rampon boats of Goa.