[**A:**RESEARCH]

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THE *ORU* OF SRI LANKA:
A single outrigger craft of the northern Indian Ocean

Somasiri Devendra
E-mail: somasiri@hotmail.com
ICOMOS International Committee for the Underwater Cultural Heritage (ICUCH)
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Abstract

Vernacular Sri Lankan watercraft lay beyond the typical Indian Ocean boatbuilding culture, namely the Oru culture, which is presented here. Originally an inland water dugout, oru developed into a seagoing craft and then into a single-outrigger cargo vessel. Craft from the Oru culture sailed the waters off Sri Lanka, the Coromandel coast, Kerala and Lakshadweep, the Maldives and the Andamans. It is a nautical craft-culture in its own right, specific to this northern Indian Ocean region, with Kerala-Sri Lanka as the axis. Kerala is the preserver of this craft culture and Sri Lanka the innovator: reinventing the Oru to challenge mechanized craft. Its origins, how it links Kerala and Sri Lanka, how it adapted itself to a marine environment, and how the resultant morphological changes lead to an outrigger cargo vessel, are explained: as is the way the Sri Lanka Oru faced and coped with technological challenges of a post-craft culture age. Craft often confused with Oru, namely the double outrigger of south-east Asia and the multiple-hull craft of the Pacific, are re-visited as early opinions stubbornly persist. Some opinions are expressed to seed a dialogue

Introduction

The present paper summarizes ongoing research into technological aspects of Sri Lankan ships which survived into the twentieth century. Though several nautical cultures had existed in the country only with "*Oru* culture" is dealt with here. Since the middle of the last century several researchers (i.e. Hornell, Kapitän, Vitharana, Kentley and the present writer who are all referenced below) have spear-headed objective studies that, though previously reported, merit their being placed before new readers.

Many different boatbuilding cultures evolved, and yet exist in the Indian Ocean (Hornell:1943, 1946) (Devendra:2002, 2010) and the *Oru* culture, i.e. the Sinhalese single outrigger boat building culture, is one. Kentley (2003: pp180) commented:

> "Although the boats of Sri Lanka share with several other boat types of the Indian Ocean a common technique in fastening planks, indeed a special method of sewing, this is a

> single attribute and not sufficient to place Sri Lanka within a broad 'Indian Ocean boat building culture'. In terms of maritime ethno technology, Sri Lanka has a distinctive culture: sewing may be the only imported trait (though it cannot be ruled out that it developed here first)." (emphasis mine)

In this paper this argument is taken to the micro level of the *oru*, (commonly and inaccurately called "catamaran") culture, tracing it from an inland water dugout log boat to a single outrigger cargo vessel that sailed the waters of south Indian coasts and adjoining islands. This culture needs to be recognized as a vernacular craft-culture in its own right, specific to a north Indian Ocean region, with Kerala-Sri Lanka as the axis. Kerala remains as preserver of the traditional craft culture while Sri Lanka has carried it beyond the purely traditional, utilizing new materials and resources, to be able to compete with the newer mechanized mono-hull craft.

What is an *Oru?*

The *Oru* culture yet exists, in a variety of forms in Sri Lanka, from simple inland craft [Fig.1] to the *yāthrā*,[Fig.9] or ocean going cargo ship, last seen in the 1930s. They were originally linear dugout hulls with *either* a single outrigger *or* a twin hull to enhance stability. The Sinhala word for "boat" is "*oru-pāru"*, considers them one class. Whether on river and at sea *oru* were basically the same; and all were – till the 1990s – built of wood by specialist carpenters. Nails were not used; all elements are sewn or lashed together with coir rope.

The inland water *oru*, (*Sinh*. "pilā–oru"*)* is a 'canoe'; basically a hollowed out log (sinh. *orukañda*) which retains its natural, linear form. To add greater stability to the canoe shape, an outrigger balance log (*Sinh*. "kollāwa") is attached to it by two (no more, no less) spars, or booms (*Sinh.* "viyala"). [Fig. 1]

Fig. 1: *Pilā–oru* of inland waters. (*Source*: Kapitän)

The seagoing – or fisherman's – *oru*, now the dominant form, signals a major shift from this simple form. For use at sea the basic dugout hull is modified by (a) the addition of plank wash strakes "sewn" to the gunwales to avoid shipping water, (b) the replacement of the spars by two flexible booms of wood lashed to the gunwales, and (c) the addition

of sails. In no configuration is the shape of the original dugout altered. The *oru* is a composite structure, comprising the following parts:

The dugout hull: retaining the shape of the original log;
Plank wash strakes: forming a rectangular box-like superstructure, sewn to the gunwales of the dugout hull, with upward sloping ends extending beyond the length of the log hull;
A shaped wooden outrigger: or balance-log;
A pair of wooden booms: lashed to, and connecting the hull and the outrigger.

Apart from there are detachable parts, essential for sailing the craft:

Masts and **Sprits** of bamboo or timber,
Sails of treated cotton cloth,
Rigging of coir rope, and
Rudders and **leeboards** of plank, attached the hull by grommets.

All parts fastened to the dugout hull with coir rope, either by **sewing** or **lashing,** or both.

Oru are differently configured, for functionality. At sea the type of fishing dictates size and additional features such as rowing rails. Figs. 2 shows an *oru* beached upright and Fig. 3 shows it sailing.

Fig. 2: Beached *issaň oru* (*Source:* Mihiri Devendra)

Fig. 3: *Issaň oru* under sail (*Source:* Mihiri Devendra)

This indigenous boat-building technology developed into a fully-fledged shipbuilding culture that, with the arrival of the European power in the 16th.century, gradually regressed, leaving us today only inland and fishing craft. *Oru* are yet changing in response to new imperatives, yet retaining the dual-element form: a measure not only of its functionality but also of its deep cultural roots.

The *oru* is double-ended (i.e. no fixed bow and stern), with adjustable sails, leeboards and rudders. It "goes about" (i.e. changes ends), keeping the outrigger to windward, manipulating rudders, leeboards, and sails. Being double-ended, it has no "bow" and "stern"; similarly "windward" and "leeward" sides serve instead of "port" and "starboard". Fig. 4 shows an *oru* in plan, elevation and section, while Fig. 5 names its parts in nautical terminology.

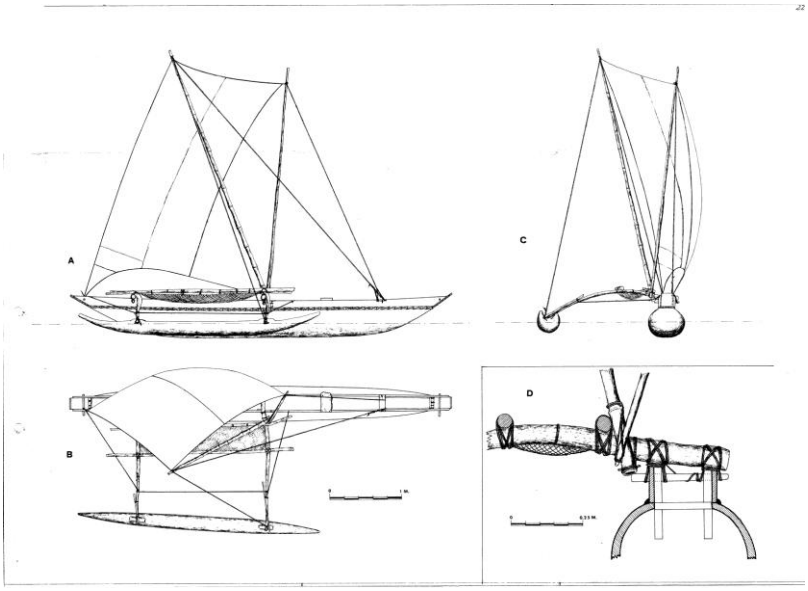


Fig. 4: Scale drawing of *issaň oru* (*Source:* Kapitän)

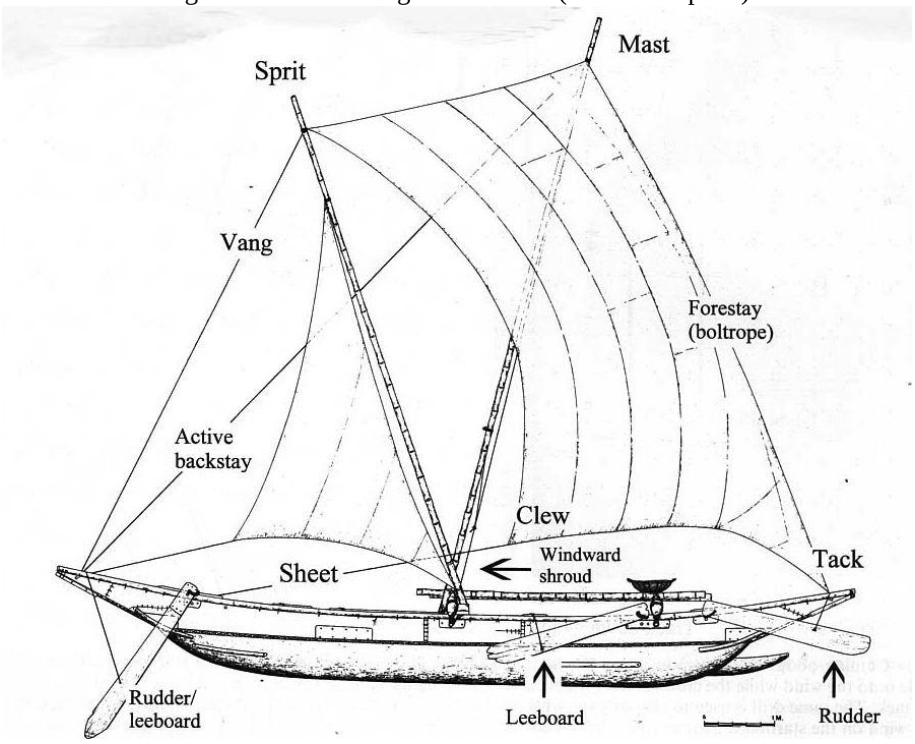


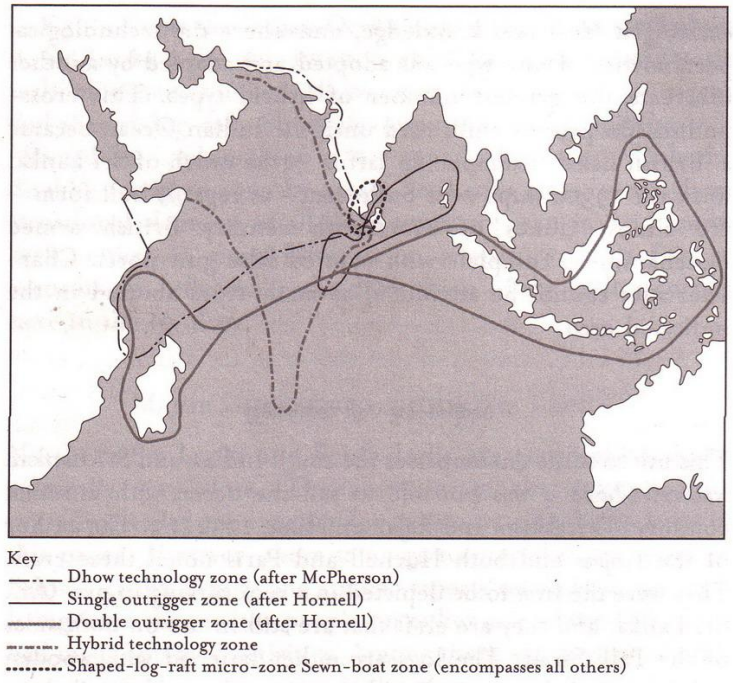
Fig. 5: Parts and rigging of an *issaň oru* using current terminology (*Source:* Grainge, adapted from Kapitän)

The reach of the "*Oru* culture"

The *Oru* culture is a vernacular form, not an exotic, which is limited to a region of the Indian Ocean. "Vernacular" means something that is (a) particular to a region; (b) indigenous in style; (c) conforming to traditional technology (d) using local materials and (e) ornamented according to cultural norms. Within these parameters, the *oru* is definitely a vernacular watercraft, and are described below.

Regional limits

Both, single (i.e. the *oru*) and double outrigger canoes are to be found in (1) Madagascar, the Comoros and the east coast of Africa, (2) in and around South India and Sri Lanka, (3) in the Indonesian archipelago, and (4) in the islands of the Pacific. They are distinctively different in each locality, with the main difference being those between single outrigger craft and double outrigger/double hulled craft. [Map 1]



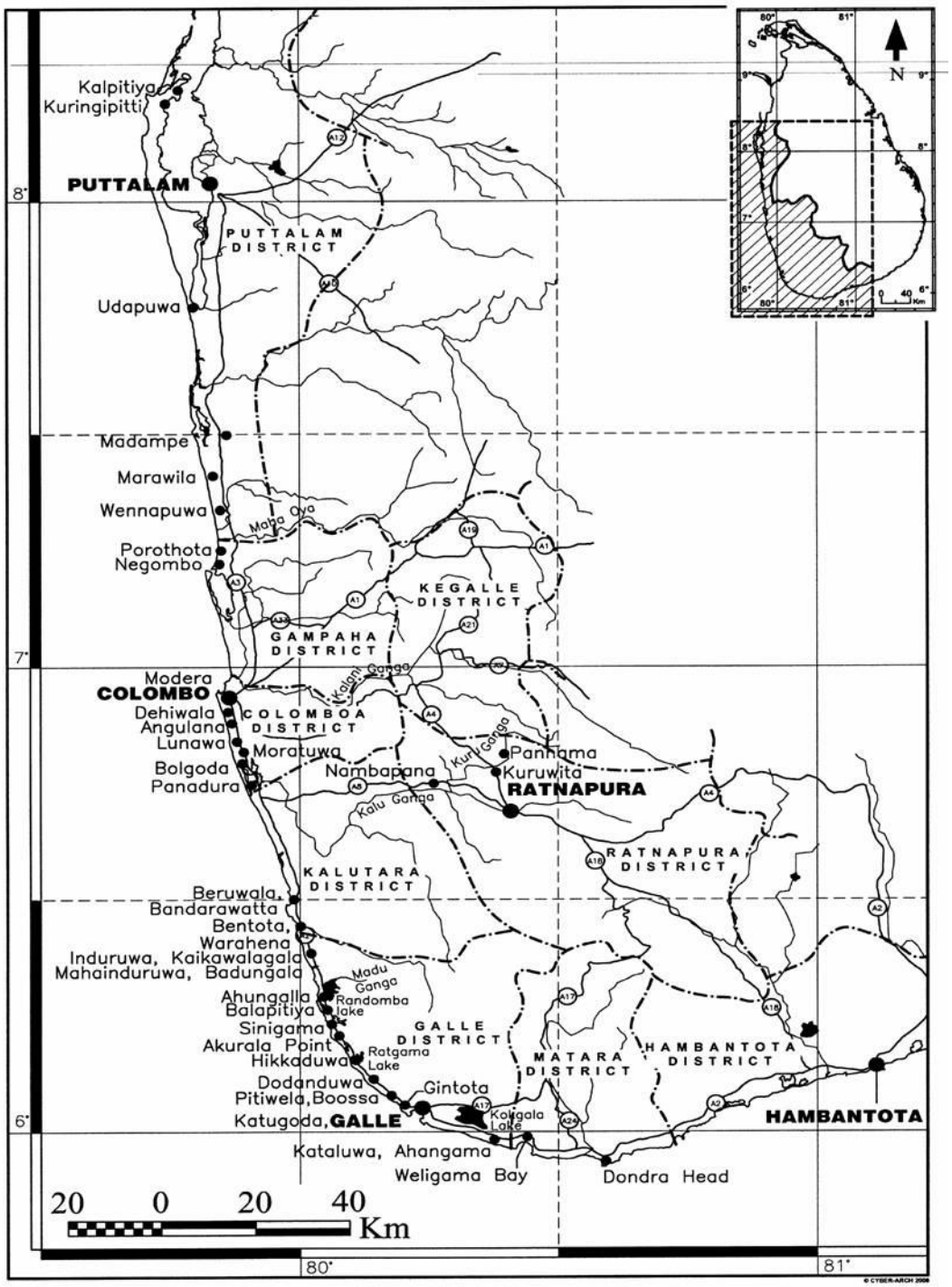
MAP 1: Indian Ocean shipbuilding zones (*Source:* Devendra)

In the Indian Ocean, double outrigger craft are used along its western and eastern rims (the "southern Indian Ocean") and the single outrigger is dominant only in the limited area of Sri Lanka, the Kerala/ Lakshadweep area and the Andaman Islands (the "northern Indian Ocean"). In the Pacific Ocean, on the contrary, single outriggers are found in most islands.

Sri Lanka is the centre of the northern Indian Ocean grouping: its nearest neighbors, in terms of nautical culture, are Kerala/ Lakshadweep (notably Minicoy) and the Andaman Islands. Hornell (1946: unnumbered last page) included the Maldives in his map, but it is not evident now there, unless one counts Minicoy, now part of largest of Lakshadweep, where the inhabitants are yet Divehi-speakers. He has also, inexplicably, left out Kerala. Errors aside, this is an interesting grouping. The Andamans are peripheral to this study; but traces of the *Oru* culture are yet healthy in Minicoy/Lakshadweep/ Kerala. Kerala, in fact, has had a long history of maritime and political contact with the western coast of Sri Lanka. It is in the western and southern coasts of Sri Lanka that the *oru* is mainly found

[Map 2] Hornell, (1943: pp 40-53) who once served as an advisor to the Sri Lankan Department of Fisheries, observed:

> No greater contrast can be found in small craft designing than that between the types used on opposite sides of the Gulf of Mannar, South of latitude 9° N. On the Indian, or Tamil, side the catamaran or boat canoe alone are employed; on the Sinhalese side, the outrigger canoe is the national and dominant design, the catamaran being used only in the northern, or non-Sinhalese part of the island and by migrant Tamil fisherman in Colombo
> (*NOTE: "catamaran" is here used correctly to mean a shaped-log raft and not O**ru)***

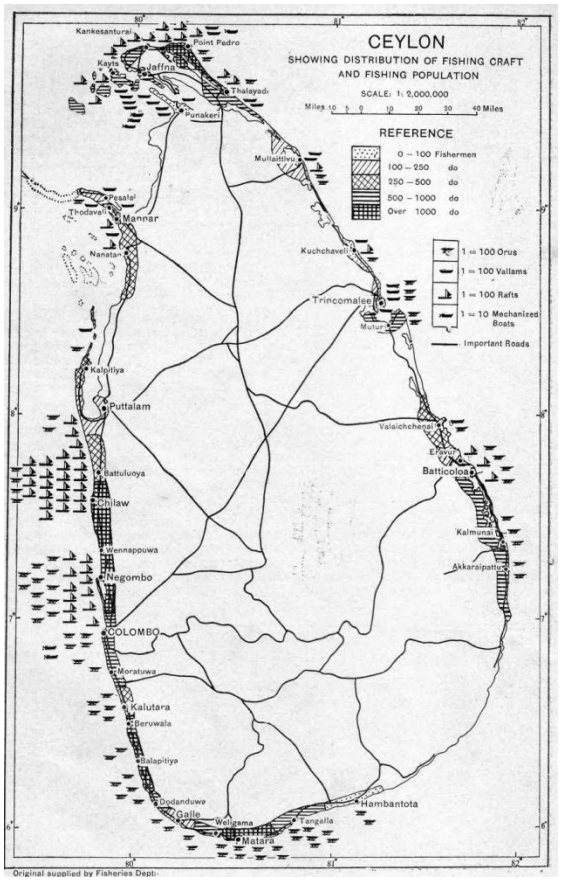


MAP 2: West and south coasts of Sri Lanka: the *oru* heartland (*Source:* Kapitän)

(In passing, *Tambapanni* – where *Vijaya*, the legendary founder of the present Sinhala State landed – is the northernmost point of Hornell's "Sinhalese side"). Thus, while Sri Lanka was one end of Sri Lanka-Kerala axis of the Indian Ocean *oru* culture, the heartland of the culture was south of the Gulf of Mannar, essentially the western and

southern coasts. The sea route from Kerala to Mannar lies westwards of Adam's Bridge: to its east lies the Palk Strait, the gateway to India's Coromandel coast.

Another map [Map 3]



MAP 3: Distribution of different fishing craft in 1958 (*Source:* Fisheries Department)

gives the following distribution of *oru* 50+ years ago, is useful for gauging the distribution pattern of *oru*, before the civil unrest of thirty years (and consequent loss of craft-technology): Western Coast (Kalpitiya to Galle) – 4000; Southern Coast (Galle to Hambantota) – 1900 [*a grand total of 5900*]; and Eastern Coast (Kuchchaveli to Akkaraipattu) – 1500. The west and south, taken as a unit was, therefore, the heartland of the *oru*. Here it was that it flourished and may have been born. A few years back, the definitive record of the vernacular naval architecture of the last of the *oru* of this area was, at last, published (Kapitän:2009).The regional reach of the single outrigger *Oru* culture is, therefore, the Sri Lanka-Kerala/ Lakshadweep/ Andamans area, and sub-region is its heartland in western and southern Sri Lanka.

Indigenous building style

The form and structure of the *oru* is not borrowed, but has evolved from the interaction of working environment, and available building materials and resources.

The working environment of the *oru* is both the open sea and sheltered inland waters. On river, lake, canal and lagoon, the *pilā oru* form was the norm. At sea, in a dynamic

environment of wind and wave, this form is not viable. Hence, the sides are built up vertically with plank wash strakes sewn on to the gunwales. The increased freeboard requires the outrigger booms curve downwards from the (now) vertically extended hull to which they are lashed (Devendra: 2011:pp 121) to the balance log which is now at a lower level. These modifications make it possible to either row or sail the craft. Both ends of the dugout hull are identical in shape and, with sails rigged on mast or sprit, the sea-going *oru* could efficiently sail to windward by changing ends (or "shunting") as it comes about, sailing equally well on either tack. It is a fast and maneuverable sailing craft capable of sailing reasonably close to the wind, though Grainge *(pers.comm)* has concluded that:

> … in a dynamic context in which other forces, in particular the aerodynamic heeling force, are taken into account…. the single outrigger logboat is a poor performer in terms of stability compared with a properly designed monohull…

This is undoubtedly true. Like all vernacular watercraft the *oru* was not a designed, but evolved incrementally within a particular context.

In early 2010, Grainge, (2012:pp 162) carried out a preliminary assessment of how an *issaň oru* (used for prawn fishing) is actually sailed to compare his findings with those of a previously published paper and has commented as follows:

> Using a hand-held GPS and a hand-held anemometer, I was able to record some performance data for the *oru*. The wind was north to north-easterly 6 to 9 knots (Force 3 occasionally dropping to the top end of Force 2). On various points of sailing from hard on the wind to running downwind, boat speeds in the range of 4 to 6 knots were recorded, averaging 4.75 knots. In terms of the apparent wind, windward performance looked respectable at some 45° off the bow. However, converted to true wind, this seems disappointing – *c.* 75° off the bow. Even so, few modern cruising yachts will do better than 40° off the bow in terms of the apparent wind….
> Such data, recorded on one occasion over a period of some three hours, must be treated with caution….
> In spite of this the overall impression is of a capable sailing craft.

Oru operate in comparatively shallow inshore waters, with shelving beaches, off-shore reefs, heavy surf close to land, a negligible tidal range, prevailing currents and counter-currents which are subject to abrupt change. Such waters call for craft of shallow draught, hardy construction, a sturdy bottom, that can breast, or ride the surf while remaining essentially a workboat. What this environment called for was a craft with the following:

a) Tough hulls, of available material, able to work both on wave and river and withstand abrasion when crossing sand spits and being hauled up the beaches.
b) Fastenings of easily replaced material, reasonably resistant to salt water, for "sewing" and lashing.
c) A double-ended, dual element configuration, of shallow draught (no keel) that can cope with the surf and be beached upright.

The *oru,* with its shallow draught (no keel), its dual element form and ability to flex (due to its lashed fastening) in the surf generated torque, was the resultant form.

Traditional technology

The earliest artisans who built these craft were carpenters, who must have been apprenticed under master craftsmen, as did all Sri Lankan artisans. But about six hundred years ago, fishermen began building their own boats; why this change took place cannot be definitively stated, though the arrival of colonialism may have been one. Iron and steel were produced locally two millennia ago, or earlier, and they would have had axes for logging, adzes for hollowing-out the logs and, perhaps drill-bits for the bow drills. Importantly, nails were never used though available. Parts of the *oru* were "sewn" or lashed (or both) together with coir rope.

Sewing was only used to fasten the wash strakes to the hull. Lashing is as important in *oru* building, if not more. This was first noted by Devendra (2011*b:* pp 122). Vitharana (1992) and Kapitän (2009) have made detailed drawings of the manner the booms are lashed on to the hull so that all the stresses experienced are transferred to the hull [Fig 6.].

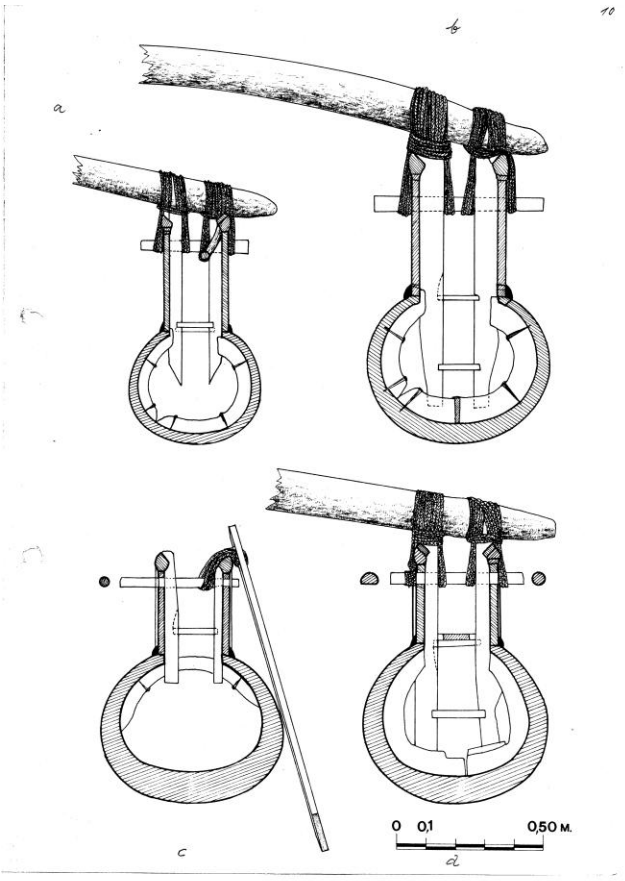


Fig. 6: Methods of lashing outrigger booms to dugout hull (*Source:* Kapitän)

The lashing of the bamboo sprits to the main boom and the hull, the fastening of the outrigger to the booms, the use of rope grommets for detachable features such as the leeboards are all very important in the construction of an *oru.* A craft belonging to the

oru tradition has more lashing on it than sewing making it a "sewn-and-lashed" craft (but not linked to the "lashed-lug" technology of Indonesia.)

An important feature of the dual-element form is that the outrigger is stayed fore and aft, or to one end inducing a definite "toe-in" under the tension. This ensures that the outrigger is not parallel to the hull and, while not affecting maneuverability, it adds to overall stability in a marine environment.

Materials and resources

All structural materials and resources were found in the heartland of the *oru* culture. The south-west of the island was, until the 19th.century, under heavy rain forest cover which afforded builders a wide spectrum of timbers. The oldest boat recovered from a river bed was built of *Artocarpus nobilis* (*Sinh.* "val del"): varieties of *Artocarpus* are used for boat-building in Kerala (*locally* "anjili") and in Sri Lanka even today. Vitharana (1992: pp 37), speaking of the fishing *oru* in the 1970s, lists thirty-eight different types of wood that could be used for seven major elements of the craft: three for the Hull, five for the wash strakes, five for the Booms, two for the Balance log, eight for the Rudder, four for the Mast, five for the Oar blade and six for the loom. A wider range may, possibly, have been available earlier.

The coconut palm provided the coir fibre (*sennit* in Polynesia) for sewing and lashing. The palm self propagates around the Sri Lankan coast (as all other coasts), but was also cultivated inland; hence there was no shortage of rope. Coconut timber and fiber were widely used for shipbuilding by other Indian Ocean cultures as well. Gunawardana (1990: pp 31), quoting al-Idrisi, says that Arab ships from Oman came here to obtain rope, coconut tree trunks for masts and spars and timber (other than coconut) for planking. Well laid-out coconut plantations are referred to in the reign of King Mahadathika Mahanaga (9-21 A.D.). Aelian, (170-235 A.D) says that:

> "…this island in the Great Sea which they call Taprobane has palm trees wonderfully planted in rows, just as in lush parks the park keepers' plant shady trees." (Weerakkody:1997: 235)

It is apparent that the birth of the "*oru* culture" is linked to areas with rich biological resources, and where the coconut palm grows: namely, in Kerala (South India), the *oru* heartland of Sri Lanka and the islands off the Indian coast. All are equally affected by the S-W Monsoon. In fact the oldest log boat, referred to above, was recovered from the bed of the bed of the Kelani Ganga in the Sri Lankan heartland and it shows holes drilled for 'sewing' in all the correct places. **(Devendra: 1993)** The bio-resources of the densely forested south-west of Sri Lanka provided the raw materials necessary, namely, large trees for dugout hulls, timbers with specific characteristics and coconut rope in commercial quantities. The last was a major factor in the development of seagoing *oru*.

The *oru* required only these few materials and cotton sail-cloth. Since these were always available, the *oru* and *pāru* forms persisted – responding to any changes called for – and flourished throughout known History and even earlier. The oldest example found, as noted earlier, is of *Artocarpus nobilis* (*sinh.*'Val-del') and is ^{14}C dated to 2300 ± 100 BP (*circa* 360-460 BC). McGrail (2003:14) quoting Kapitan, the present writer and the Laboratory that carried out the analysis, has this to say about the find which is worth noting:

> "There is clear evidence for the use of South Asian rivers and also for overseas trade… However, only one excavated craft is known in the whole subcontinent: a logboat from the Kelani Ganga in the Colombo district of Sri Lanka, which is dated to the to the sixth/fouth centuries BC…."

The number is, now, at least four, but none older than this particular boat. The antiquity of this boat and its high workmanship speak of skills that must have existed before the arrival of Indian settlers (*circa* 6th century BCE). Perhaps an unrecorded technological link with Kerala already existed.

As the *oru* is a vernacular watercraft, its morphological development can be traced sequentially. The chart below is of Sri Lankan craft, but has one reference to Kerala, which is treated as "conjectural". This is because the particular stage has not yet been found in Sri Lanka but exists in Kerala.

[SEE NEXT PAGE]

This flow chart traces the linear development of the *oru* form from the log to the cargo ship. The first step is hollowing out or 'reduction'. As the dugout form is inherently unstable for extended use, it is given stability by transverse extension (adding an outrigger or a twin hull). If an outrigger is chosen, the ***ORU*** form results. If the twin hull is chosen, the ***PĀRU*** form results. The two forms diverge at this point, as shown

The next stage is when both forms undergo vertical extension: *pāru* did not progress beyond this stage in Sri Lanka. Unlike the *oru,* the *pāru* did not take to the sea, to venture only just off-shore, laying beach seine-fishing nets (*mā-däl-pāru*). In inland waters *pāru* flourished as ferries, personal transport and cargo carriers. The dugout chine-strake of a large *pāru* has been ^{14}C dated to the 9th. Century BC has been found. In the northern Indian Ocean this form did not develop into a seagoing craft while, in Pacific waters, the double hull gave rise to the most advanced voyaging craft. Even the Indian Ocean "*Oru* culture" zone, too, the *pāru* seems to have arisen only in Sri Lanka, where it is an icon of folk culture. The *pāru* is certainly worthy of deeper study

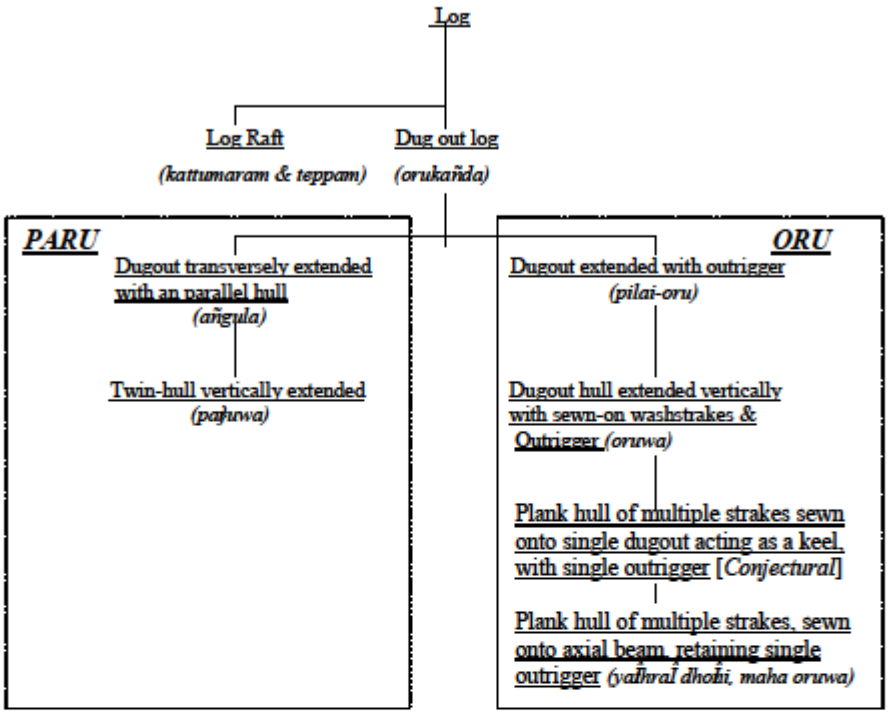


Fig.6 Development of watercraft within the **ORU** culture (Sri Lanka)

Fig. 7: Chart tracing development of *oru* form (*Source:* Devendra)

(Log rafts, though shown in the chart, are not dealt with as they are not "boats". The ***ORU*** group is the focus of this paper. The ***PĀRU*** is shown as a parallel development that has sprung from the same root and will be referred to only when relevant.)

The *oru* hull form, on the other hand, altered (as described earlier) successfully to meet the requirements for survival at sea. This is the archetypal *oru* form. It had always had only one outrigger and that this was attached to the hull by only two booms, no more, no less: elsewhere (in the Andamans, for example) this standard is not followed. But just as the *paru* did not develop into a seagoing craft, the *oru* did not develop into anything more than a fishing craft. Craft similar to *oru* are found in the Pacific, but with a sturdy, elevated platform built straddling the hull and the outrigger, thus making it a passenger and cargo craft. The weight of cargo and passengers being shifted toward the outrigger changes the centre of gravity, making the craft more stable. This platform *is* present in the *oru*, but in a rudimentary form, used only to store the gear of the fisherman or carry passengers on short coast-wise voyage. Having made the transition from inland waters to the sea very successfully, the *oru* had, seemingly, reached a dead-end.

However it was not so, as it next appears in the much larger form of the *yāthrā dhoni* or *maha oruwa* ("great *oru*"), a cargo ship, with the double-ended *oru* hull and an outrigger balance-log carried on two sturdy booms. Apart from the great difference in size it differs from the *oru* in an important way, namely, that it has a plank built hull raised upon an axial keel plank. From the Sri Lankan record one cannot see the steps by which dugout logboat acquired a keel and a plank hull. Fortunately they have been reported from, and photographed in India. Hawkins (1980:pp 11).) gives an example (Fig.8.) from Dona Paula, near Panaji, Goa, of a vestigial dugout hull retained as a keel-log with plank strakes sewn edge-to-edge, slanting outwards and upwards to form a V-section hull very reminiscent of the "Dhow" hull. This may be the genealogical link between the *Oru* and the *Uru* of Kerala.

Fig. 8: Boat from Kerala showing dugout keel-log (*Source:* Hawkins)

This demonstrates how the metamorphosis of the dugout *oru* into a plank hull may have begun, i.e. by the dugout changing, functionally, from "hull" to "keel-log", upon what had been the gunwales a plank hull is constructed by sewing on wash strakes. In the next step, this dugout keel-log is replaced by an axial beam in a process of simplification. The stage has been commented on by Hornell (1946: pp 192):

> "The final stage in the conversion of the dugout into a fully plank-built boat is attained when the dugout under-body is reduced to a keel-like axial beam, with sides raised upon its edges by numerous strakes of sewn-on planking. This was the method of construction employed by Persian and Arab shipwrights...and the Sinhalese coaster of the Gulf of Mannar …"

Hornell here refers to the *yāthrā dhōni*. While all this may explain how the *oru* hull became the *yāthrā* hull, it does not explain why it retained the outrigger and booms.

This brings us to the bottom of the chart, the *yāthrā dhōni* or *maha oruwa* of Sri Lanka, a cargo-carrier used in international trade. Nowhere has it been other recorded than in south and west coasts of Sri Lanka and the east coast of India (Reith:1993: pp 137). Here is an important difference between the nautical cultures of the northern Indian and Pacific Oceans and the southern Indian Oceans: in the former no voyaging craft are known and in the latter no cargo ships are known. The *yāthrā dhōni* was in use till the 1930s and photographs exist,[Fig.9] though Hornell apparently been unaware of them.

Fig. 9: Beached *yāthrā* (*Source:* Palinda de Silva)

Its single outrigger marks it as belonging to the *oru* culture, but its hull does not: a broad beamed, double-ended, boat-shaped sewn-plank hull (typical of seagoing ships) built on an axial beam instead of a log hull, with a rudder mounted on the stern-post. The booms enter the hull through the planking (*i.e.* not lashed to the gunwales as in *oru*)

Hornell (1943:pp 45) and Vosmer have tried to explain, or rationalize, the retention of the outrigger on the *yāthrā.* The former, whose had seen *yāthrās* in the early 20th.century, assumes, and concludes:

> "….. Hence the reason for fitting the outrigger upon the port side, for according to the tactics employed, the port side was always the weather side."

He assumes, in 1943, that they only sailed from Galle northwards starting with the weakening of the south-west monsoon, and concludes that the outrigger is placed on the windward side, because of the "tactics employed" by a double-ended *oru.* But the "tactics" of a double ended *oru* which changes end when going about, cannot be employed on a *yāthrā*, a three-masted schooner, with fixed bow and stern and a stern rudder on the stern post. Such a craft need not keep the outrigger to port (or weather) side. But some twenty years earlier, he (Hornell:1920: pp 124-141) has said that the *yāthrā* sailed north past Velvettiturai on the northern-most tip of the eastern coast, and later (Hornell:1946: pp 258) says that the "large and Weatherly design of the Sinhalese hull is probably a legacy from the days when trade between Sumatra and Ceylon and South India was active…". If we were to accept his 1920 and 1946 observations, which speak of these craft on the eastern coast, we have then to reject the position he has taken in 1943. Incidentally, Pâris,(Reith:1993:pp 137) too, has a drawing of a *yāthrā* which also shows the outrigger on the port side, and which he attributes to *"Ceylan et côte de Coromandel".*

Thus, Hornell offers no clue to why the *yathra* required an outrigger.

Vosmer, (1993:113) who measured a large and accurate model, taking the lines off, and tested them on MacSurf software, makes an interesting remark:

> "The use of an outrigger is curious on a vessel that appears to possess a rather stable hull rig configuration. Hydrostatic analysis of the hull form showed it to be a reasonably seaworthy vessel even without the outrigger. Its use demonstrates how firmly wedded are the Sri Lankan builders to the concept of the outrigger."

From the perspective of hydrostatics or nautical architecture (perspectives from which he conducted his study) there was no technical reason for the *yāthrā* to have an outrigger. Its retention is a cultural, and not a technical choice.

There is another aspect to this. Vosmer, Hornell and Pâris all speak of the late 19th and 20th century *yāthrā dhoni* which, as noted above, were schooners with two masts, with fixed bow and stern, and fitted with rudders on the stern-post. *Yāthrā* in 20th.century photographs are remarkably similar to both the model studied by Vosmer and the drawing made by Pâris. That of a beached *yāthrā* (www.imagesofceylon.com), however, clearly shows the impressive booms and outrigger to starboard. In craft cultures there are no fixed criteria apart from cultural or operational requirements.

It is possible that some variation existed within the broad *yāthrā dhōni* form. A model in the Museum of Mankind (London) (Devendra: 2010*a:*pp 341.Fig.5) shows a different, perhaps smaller, version. It is of a boat shaped craft, with sewn plank strakes and a single square sail on a pole mast (lashed to the main boom as in an *oru*). It is undecked, but there are the remnants of a split bamboo canopy. It is double-ended, and does not have a fixed rudder. The booms enter the hull through the planking. In this configuration, where

every constructional detail (other than the substitution of a plank hull for a dugout hull) conforms to the "*oru* culture", the craft can keep the outrigger always to windward, just as any *oru* would. It is undoubtedly a product of the "*oru* culture".

Ornamentation

Ornamentation should also be indigenous in style for the *oru* to be considered a vernacular craft. Taking surviving *oru* as the standard, there is a total lack of ornamentation. The *oru* that we are aware of are no-nonsense, workmanlike craft: very well built by fishermen-carpenters but lacking in ornamentation. Whether the craft were equally plain when a "grand culture" prevailed in the country is not known. The *oru* we know are unpainted, unornamented craft.

A new development, stemming from the substitution of fiberglass hulls for dugout log hulls, may be noted. While the process of the change to the *oru* by the substitution of other, synthetic materials for to wood, coir rope and of outboard motors for sails has been dealt with elsewhere (Devendra: 2010 *b*) it is necessary to note here that the new hulls are ornamented to the extent that the hulls are painted in different colors, though with no specific style visible. Nineteenth century *yāthrā,* too, had hulls painted black with white trim.

Was the *oru* native or an exotic?

That the *oru* is not an exotic has been stated earlier and a brief comparison of it with similar craft in the southern Indian and Pacific Oceans is necessary. Being vernacular, *oru* have some unique features, as do the others.

The basic morphological differences have been mentioned. In the *oru* culture, a single outrigger joined to the hull by two booms is not deviated from, unlike elsewhere where there is no such uniformity. The fishing *oru* operate in coastal waters although they have been said to have sailed over twenty miles off-shore to known fishing grounds. The similar craft in the Pacific appear to have been limited in range to calm waters: one I have seen in the *Pu'uhonua O Honaunau* National Park in Hawaii was not vertically extended by wash strakes and wase very close to the inland water *pilā–oru.* However there was another single outrigger canoe with booms of naturally curved timber which curve upward of the hull (which it enters from the side) and downwards again to the outrigger: perhaps to deal with wave-generated stresses.

Outrigger/ Double canoes with platform decks raised well above the water level were the chosen form for open sea sailing. These truly remarkable craft – one of which, the "*Hokule'a*", built in 1975 – were those on which long voyaging was undertaken. The 60-foot replica, built and sailed by Herb Kawainui Kāne, sailed 16,000 miles between the northern and southern points of the Polynesian triangle. These ships, with their impressive sea-keeping qualities, carried even small communities on board as well as provisions, but they were for voyaging purposes, not for trade or carriage of cargo

In the double outrigger region, the original form of large craft is still built in Indonesia. The "Borobudur ship" replica was built a few tears ago of locally available materials by local builders and she literally "flew" across the Indian Ocean in one reach in almost no time: a considerable vindication of that craft form. Variations of this form still exist in

Madagascar, although only as fishing craft. In recent times, fishing boats in coastal waters have dropped one outrigger although the two vestigial booms are retained for the 'missing' outrigger.

The large Indonesian double outrigger craft were for voyaging. Although they may have made many a voyage across the Indian Ocean once communities were established in Madagascar and East Africa, they were cargo ships as such. Bas-reliefs of ships with outriggers are found at Borobudur temple and a replica, named "The Borobudur ship", sailed most impressively from Indonesia to Ghana. It, too, was not a cargo ship. Photographs of the craft show that it did not carry two outriggers balance logs, but was a substantial mono-hull with two stabilizers. An outrigger that was an integral part of the ship for purposes of stability, with both hull and outrigger both touching the sea all the time. Stabilizers, on the other hand are meant to moderate the angle of heel: on even keel, the stabilizers are out of the water. The bas reliefs from Borobudur temple also show that the feature is really a stabilizer.

The *yāthrā* – belonging to the *oru* culture – was different from all these because she was not built for voyaging but for trade. She a cargo-carrier and was used to carry trade goods from Sri Lanka to India, the Maldives and across the Bay of Bengal to Malacca. This difference between the *yāthrā* and the large craft of Indonesia and the Pacific is a cardinal one. It must also be considered in the light of large-scale maritime trading that was taking place in all areas of the northern Indian Ocean: Sri Lanka was only one of many sea-borne traders.

How old were these outrigger craft is their various regions? The oldest is likely to be the craft of the Pacific which are said to have originated around Taiwan and gradually spread southwards to Papua-New Guinea. From there, in a series of movements connected with the Lapita culture, with millennia separating one movement and the next, they spread across the whole of the Pacific. The start of this movement cannot yet be dated: the entire movement may have taken 30,000 years or more.

The movement of the Indonesian peoples to Madagascar is also unknown. However, in terms of chronology, it was not long ago. It has been suggested that the route followed the coast of south Asia in short steps and thence southwards to East Africa and later, from Africa to Madagascar. Hornell himself gave credence to this. If that were so, then the *oru* may have been introduced by them. But the consensus today seems to be less romantic: the Indonesian presence in Madagascar is now believed to be later than the 5th.century CE. By this time the pattern of alternating monsoons and the route across the Indian Ocean was well-known to the Chinese, among others. Indonesians, who were experienced sailors, would have been aware of all this. Sri Lanka is said to have been settled by a supposedly more advanced Indian maritime culture around the 6th.century BCE. Yet, as noted above, a large log-boat, of pre-Indian origin has been dated to around the same time. This is material and objective evidence that the *oru* was at least a millennium older than the settlement of Madagascar.

The balance of probabilities, therefore, favors the position that the Southeast Asian movement of double outrigger ships to Madagascar had no impact on the single outrigger *oru* culture of Sri Lanka and the Indian Ocean. This would be in keeping with the position that the "*oru* culture" was a vernacular one.

Vitharana,(1992) a Sinhala lexicographer, examined the etymology of the word *"oru"* in his work on the *oru* and *yāthrā*. There are several uses of the word *"oru"* in the language, meaning "to hollow out" in Sri Lanka and India. In Kerala, till recently, was a craft was built at Beypore, in south Calicut and called "*Uru*" which, as Wikipedia notes, means "Big Boat" (compare with "*maha oruwa"* or "Big boat"). Following a remark oft-repeated parrot-wise that there was, in the Malay language, a word for a boat "ORU-U" Vitharana hunted in Malay language Dictionaries, unsuccessfully. Recently, however, this elusive word was traced in a Dictionary of Watercraft (Mariners' Museum: 2000: pp 419).The word there is not "oru-u" but "ORO-U". It is a defined as "A Double canoe of Mailu Island, close of the eastern end of the south coast". There is a place-name, "Oro" in the *north* coast of Mailu Island, not the *southeast* end.

Why is the Sinhalese the '*oru*' beyond tradition ?

Earlier in this paper it was said that: "Kerala remains as preserver of the traditional craft culture and Sri Lanka has carried it beyond the purely traditional, using new materials and resources, to become a viable alternative to the newer mechanized mono-hull craft." This requires further explanation.

The base form of the *oru* was depended on bio-diversity – forest and cultivated produce – and pre-modern craft technology. That is how it was built, then. Today, built of synthetic material, it remains unmistakably an *oru*: the archetypal dual-element craft.

The process of transformation has been dealt with at length elsewhere (Devendra: 2010 *b* and 2011 *a*) occurred. The *yāthrā* became economically non-sustainable after the arrival of western colonialists and became, finally, redundant. This fate did not befall the fishing *oru,* however. There is a steady demand for fresh fish in a country where meat-eating is not widespread and, hence, there was a niche for fishermen and their craft in community life. But they had to transform themselves to keep that niche intact, because bio-resources were dwindling, skilled builders had no regular work, new materials and life styles were emerging and, traditional fishermen could not compete with mechanized fishing craft for the larger urban consumers.

Transformation involved substitution of non-traditional materials for traditional ones; adopting new forms of propulsion as they became economically feasible and consequent changes to the *oru* hull without sacrificing identity.

Thus the dugout hulls gave way to molded hulls of fiberglass, with wash strakes incorporated, eliminated the need for sewing. For lashings, manila or nylon rope became available as hand-spun coir ropes were hard to come by. Sails were replaced by outboard motors which, fitted at one end of a modified hull, also made rudders and leeboards redundant. The double-ended craft now acquired a fixed 'bow' and 'stern' and 'port' and 'starboard' sides. Yet they are canoe-shaped hulls linked by two booms to an outrigger. Possibly the rationale was economic, not technical. Motor Fishing Vessels are beyond the *oru* fishermen's limited finances while a modest, kerosene fueled outboard motor gives an *oru* hull a very respectable turn of speed to the known fishing grounds at a comparatively modest cost. The beach is free for their use. Thus transformed, the *oru* yet holds its own against the mechanized mono-hull craft of commercial fishing.

But *one* timber structural member has not been replaced by synthetics: the flexible booms "marrying" the hull to the outrigger. Booms from discarded or damaged *oru* are lashed onto "state of the art" GRP hulls and outriggers. It is interesting that the booms have been the last to fall victim to GRP. Vitharana (1992: pp 39) says:

> "Of any dugout outrigger canoe it is the boom, of all its parts, that comes under almost constant and, at times, the most tremendous strain; and a broken boom means, invariably, a capsized hull. If a mast, rigging and sail stand the onslaught of a gale-force wind and the outrigger remains buoyant, a weak boom – just one of the pair – can spell death to the crew."

Perhaps the fishermen buying their molded hulls off-the-shelf entrust their personal safety to the naturally curved timbers they attach on to the hulls on their own.

Conclusion

Although the fiberglass *oru* had been steadily displacing the wooden *oru* for several decades, the older craft continued to exist even when none were being built. The *tsunami* of 2004 destroyed all of them, and the fiberglass clone is the *oru* of today: the quintessential Sinhala watercraft which had adjusted itself to many a change in circumstances, and yet remains defiantly alive. It is an icon and a techno-cultural artifact worthy of great respect.

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