THREE

FISHING BOAT DESIGNS IN INDIA:
INITIAL CONDITIONS AND HISTORY OF LATER DEVELOPMENTS

A combination of archaeological evidence, ancient religious texts and travelogues, inscriptions, folklore and also more recent historical analysis based on all the former point indisputably to a hoary tradition of navigation, boat building and the related activities of fishing and maritime trade between the Indian sub-continent and other parts of the world (Mookerji, 1912; Hornell, 1920; Rao, 1965; Gopal, 1969; Heyerdahl, 1978, 1980).

The ancient inhabitants of the country settled along the bountiful river banks and coastal areas. Over centuries of observation and learning by labour, they developed a sophisticated understanding of the aquatic terrain as well as the possibilities it opened up as a source of food and a medium for movement. It stands to reason that an illustrious maritime tradition must necessarily have evolved from the humbler occupation of fishing.

Fishing as an occupation and maritime voyages for trade have however developed along distinct paths though they had a common origin. Writing about maritime communities in his work on trade and civilization in the Indian Ocean, K.N. Chaudhari suggests that though navigators and seamen on ancient ocean vessels learnt their art as fishermen, many of them belonged to a different segment of the population than the traditional community of fishermen (Chaudhari, 1985).

What traditional fishermen and seamen shared in common was the science of navigation and the vast accumulated fund of knowledge about the sea. The point of departure between the two was with respect to the evolution of technology -- particularly in the realm of boat-building. For maritime trade it is axiomatic that the
technology of shipping must have attained a certain level of development before men
could sail safely and carry goods across the open sea. In the case of fishing, however,
since fish was not a major source of the diet, the artifacts used did not need to
achieve any significant measure of sophistication. Fishing boats were basically
platforms for keeping men afloat while fishing.

Despite the relative simplicity and the slow pace of evolution of the technology of
boat-building, a strong element of diversity of design has been their hallmark.
K.N. Chaudhari argues that the diversity was the result of the

cellular structure of these inbred societies which made it difficult to
coordinate them into a single national maritime tradition (Chaudhari,
1985).

We regard the views held by Chaudhari regarding the causative factors for diversity
to be partial. Socio-economic and cultural factors, of both endogenous and exogenous
origin, were arguably less important. The strongest compulsion for diversity lay in
certain specific dimensions in the form of a variety of nature processes along the
coast: the pattern of fish dispersal in the waters; the configuration of the continental
shelf and sea bottom; the presence or absence of natural harbours; and the availability
of materials for boat construction -- particularly timber.

The resultant interactions between the socio-economic, cultural and nature processes
created the initial conditions and had a strong bearing on the evolving nature of
diversity and adoption of boat design in India. The historical evidence which we can
muster to give substance to our argument is largely found in the observations of one
discerning student of the maritime traditions of India -- James Hornell.

INITIAL CONDITIONS

James Hornell was a British administrator of the early part of this century. He was
the first Director of Fisheries of the Madras Government. Hornell's work entitled "The
Origins and Ethnological Significance of Indian Boat Designs" (Hornell, 1920) is the
only comprehensive account on this subject which traces the history to a period as early as 2000 BC using appropriate evidence. Hornell embarked on this enquiry basically to question the then prevalent view of a cultural world drift from west to east. In his pursuit for an answer to challenge this view, he chose boat designs as an indicator of the cultural antecedents of an era. This view was premised on the assumption that early migrations to India and contacts with the inhabitants of this land were as much over the ocean as they were over the land.

Very early in his enquiry on the question, Hornell was confronted with the correlation of particular designs with definite regions on the coastline characterized by some clearly marked physical features and usually also by racial divergence (Hornell, 1920:139).

He found that the overlap was comparatively insignificant. His enquiries with the people, and other documentary evidence which he collected, led him to conclude that the prevalent designs of fishing crafts are the same now [early 20th century] in each region as they were hundreds of years ago (Hornell, 1920:139).

The only exceptions to this were the considerable change in designs in the boats used for carrying cargo along the coast.¹

For a closer analysis of his proposition Hornell divided the coastline of the Indian sub-continent (including the islands of Maldives, Laccadives and Andaman & Nicobar) into eight regions having distinct features in boat design. His summary of these region-wise characteristics provides a succinct gist of the interactions between

¹ In the archives of the National Maritime Museum at Greenwich and the National Library of Scotland, Edinburgh there are manuscripts written by French and English personnel who served in various capacities in India which give details of boat designs. Looking at these drawings made in 1782 and 1836, it is clear that the traditional crafts of today have not changed since then.
the ecological, socio-cultural and economic factors which have influenced boat design and is worth quoting at length.

Each of these regions has its own boat types, its own characteristics in weather, climate and coast formation. In frequent cases characteristic boat types are co-extensive in range with the limits of race and language or influence of foreign sea trade. The North-West coast is arid and stony, with physical and climatic conditions closely approximating to those of Arabia and (here) Arab boat designs are dominant and characteristic. In Bombay itself we get the same types mingled with others truly Indian in origin, but southward in the much indented coast, moist and well wooded, that stretches to Goa and Mangalore, we find Arab influence ousted by indigenous and Polynesian types, but reviving partially in Malabar where ... the Arab type is largely built at those Mappila centers where the strain of Arab blood is appreciable, as for example at Calicut, Beypore and Ponnani. Turning Cape Comorin we find that Polynesian and indigenous types have held their own successfully against the Arab. The former influence ... is seen in strength in the north-west corner of the Gulf of Mannar and universally in Palk Bay and Palk Strait. Northward of Point Calimere is the real home of the Catamaran, a truly Indian type, specialized for use upon the surf-beaten Coromandel and northern Telugu coasts where the catamaran and masula boats must continue to hold their own wherever there be no harbour of refuge, such as Madras and Cocanada. In Bengal the smaller coast craft have little importance, the types seen being really varieties of Ganges dinghies and of dugout canoes. River craft are types apart and throughout India are all very archaic in their general features, resembling ancient Egyptian and Mesopotamian types so closely (Hornell, 1920:140).

Taking up from Hornell we shall elaborate on some of the associations which he postulates to further exemplify the specific manner in which socio-economic and ecological interrelations influence the diffusion of technology of boat design (See Map 3.1 where we attempt to map out the features mentioned by Hornell). Our examples will be taken from the two regions along the west coast of India.

The *North-West Coast: Large Boats in a Poor Coastal Fishery*

The North-West coast comprises the present day states of Gujarat and Maharashtra. Large parts of this coast look like a continuation of the sandy home of the Arabs.
It was the only land in India that the Arabs occupied even temporarily. This is the region where there has been evidence of a flourishing maritime trade with the peoples of the Persian Gulf as far back as 1500 to 2000 BC (Heyerdahl, 1980; Rao, 1965). Through this trade came the diffusion of the variety of boat designs used for transport of merchandise and for fishing. It is therefore natural to find Arab influence dominant in the boat and ship designs along this coast. The kotia, the baggala, the lodhia, and the machwa are the finest examples. The latter two are fishing boats of fairly large size, built by boat makers of great skill.

It must be noted that the biological productivity of fish in the coastal sea is lowest off this region of India: it is about 6 tonnes per sq.km in the near shore waters compared to 35 tonnes per sq.km in the south-west coast. Another factor which we must account for is that the consumption of fish in the hinterland of the north-west coast is also by far the lowest in the sub-continent. Consequently, one is confronted with the anomaly of the region with the poorest fishing grounds and the lowest demand for fish using the largest sized traditional fishing boats in the country.

The Arab cultural influence in the initial adoption of the boat designs seems a reasonable assumption. However, the continued use of these large sized boats in a poor fishery require an explanation based on more sustained economic and ecological factors that have continued to remain in the region even after the waning of Arab influence. Hornell himself provided an answer to this by stating:

The supply of fish in their home waters being limited, [and] the estuaries along this coast ... also rapidly silting up .. the great majority of these boats [have to] resort to three months in the fair weather season, taking to the carrying trade when the fishing season becomes unprofitable (Hornell, 1920:144).

The size of the boat was, therefore, determined by the range of activities, which had to be undertaken by their owners in order to earn a livelihood. It is also apparent that building such boats in a region without a hinterland of forests also presupposed a continued supply of good timber. Hornell points out that this was always brought from Malabar where the Arabs had made commercial, religious and cultural contacts.
It is therefore apparent that the centuries long preservation, continued replication and diffusion of a large-size fishing boat design in this region were due to a combination of very specific cultural, ecological and economic factors. Though the reality may outwardly seem a contradiction, only a closer analysis of the interrelations of ecological and socio-economic factors reveals the rationale for the adoption and continued replication of specific boat designs.

The Lower South-West Coast: Indigenous Designs on a Rich Fishery

In fairly sharp contrast is the lower south-west coast region of India, particularly its lower part which is constituted by the erstwhile Malabar District and the Travancore region. Today it is comprised of Kerala and the Kanyakumari District of Tamilnadu. (The case study in this thesis is situated in this area). This region has had long established trade contacts with the Egyptian, Syrians, Arabs, Romans and Chinese (Arul Raj et al, 1990). Of these, the maritime traditions of the Arabs and Chinese are well known and so are their distinct boat designs. In fact, the most famous centre for the repair, design and construction of Arab type boats outside the Arabian gulf was situated in the famous port of Beypore in Malabar. The majority of the population in coastal Malabar were also converted to Islam following the arrival of the Arabs for trade in the 8th century. However, despite the religious and cultural affinities, the availability of timber and boat building skills, the fishing boat designs of this coast have not been influenced either by the Arab or Chinese designs.

The three main boat designs of this region are the dugout canoe, the plank canoe and the kattumaram -- all of which are indigenous to the region. The predominance of the dugout canoe in Malabar is a direct influence of the availability of large trees in the forest hinterland of Malabar.

Hornell attributes this lack of diffusion of "better" designs to the "lack of maritime enterprise in the coastal population" whom he refers to as the "lethargic or phlegmatic Malayali.... (for whom) life is too easy in Malabar to justify such exertion" (Hornell, 1920:151). While there may be a ray of truth in Hornell's criticism, what he has not highlighted is that the fishery resources in Malabar were available so near the coast.
and almost seven times more abundant than along the north-west coast. This ecological fact made boat design and boat carrying capacity a non-issue for fishermen. Instead, what we see is that it was the designs of fishing nets which are influenced by the element of the exotic.

Along the southern part of this coast from Quilon down to Cape Comorin the boat designs alter fairly fast. In the words of Hornell:

the crank dugout canoe [Note: by this he means the plank-built canoe] to which the Malayali adheres with such touching fidelity as far north as Quilon .... finds its supremacy challenged by small catamarans of primitive form constructed from 4 to 5 logs tied together raft-fashion. From Quilon southward both forms of craft exist side by side as far as Colachel where catamarans of improved form --boat catamarans -- appear and finally oust both the dugout out and the raft catamaran. Between Colachel and Cape Comorin the coast is particularly exposed and surf beaten throughout the year and is also bare of any landings place suitable for dugout canoes (Hornell, 1920:152 note ours).

The monopoly of the kattumaram as the dominant boat design for fishing in the surf beaten coastline of this area is accompanied by the tremendous diversity of fishing gear observed along this stretch of coastline. Gear diversity in turn is a function of the seasonality and variety of fish species found in the inshore waters of this area. The nets are usually named after the species of fish they are used to catch namely: *netholi vala* (anchovy net); *chala vala* (sardine net); *konju vala* (prawn net); *valai madi* (ribbon-fish seine) etc.

The kattumaram performed the function of a "wash through" platform at sea from which to fish. Since the nets were small, the fish caught was not unduly large in quantity to need more than such a "wash through" platform to bring it ashore in small flexible palmyra baskets. The additional fact that the fish, though netted, continue to be awash in sea water and thus stay fresh for a longer period of time was another important factor in favour of retaining this boat design.
While laying stress on the physiographic and oceanographic factors which condition the nature of boat design, the role of socio-religious and cultural factors cannot be overlooked. A prime example of this is to be found in the fishing centre of Vizhinjam, the only large natural harbour in the kattumaram belt. Along a coastline generally dominated by Christian fishermen, Vizhinjam is the only fishing village with a large pocket of Muslims who trace their links back to villages in the Malabar region. In Vizhinjam both the kattumarams and dugout canoes fashioned in the Malabar design coexist. However, the kattumarams are used exclusively by the Christian fishermen whereas the dugout canoes are used exclusively by the Muslims. Undoubtedly, it was the safety of a natural harbour from which they could use their traditional dugout canoes that accounts for the presence of the large but isolated Muslim fishing community. On the contrary, for the Christian fishermen, the safe haven did not result in their abandoning their traditional kattumarams for dugout canoes that were seemingly more appropriate for use from a harbour. This duality continued for several centuries until the advent of plywood boats in the 1980s.

POST-INDEPENDENCE DIFFUSION OF BOAT DESIGNS

At the dawn of Independence, the fishing boat scenario along the west coast of India was very much like what has been described above. In some of the princely states like Saurashtra and Travancore and British-ruled states like Madras and Bombay Presidencies, the administrators were alive to the complexities of the boat designs in the fisheries sector and had even taken some initiatives to examine the possibilities of technological improvements. It was against the background of such long traditions and diversity of boat designs that we must situate the initiative of the Government of India in 1953 to request the FAO/UN for assistance "to improve available boats; advice on mechanisation of available boats; and design new, improved types of fishing boats" (FAO, 1958:5)

This request materialised in the form of a technical mission of two of the most reputed boat designers of the time -- Paul B Ziener and Kjeld Rasmussen. They spent a total period of 60 man-months in India between 1953 and 1958 travelling
extensively along the coastline of all the maritime states of India with the exception of Kerala. Kerala, the leading maritime province of the country, was left out of their agenda probably to prevent overlap with the work of the Indo-Norwegian Project (more about this below), which was also expected to undertake a similar exercise.

Ziener and Rasmussen found the fishing craft scenario in India very similar to what Hornell had described. They were impressed by the diversity and the quality of the traditional crafts, and had little to offer by way of suggestions to improve the existing designs. As regards mechanisation of the existing designs they were of the opinion that only about six of them could be economically mechanised, while a larger number could easily be motorised with outboard motors. After extensive study, the advice they had to offer was the following:

There are still too many unknown factors in India’s fisheries to make it possible to predict the future development of boat types, boat sizes, engine sizes, fishing methods, etc. Due to this uncertainty, and considering also experience elsewhere, it seems as if the fastest development would be through a step by step approach, rather than by the sudden introduction of large, complicated and expensive machinery. The mechanisation of existing boats is, in the main, a temporary step. Once fishermen have engines in their boats and earn more money, they are likely to want larger boats. Then is the time for modifying the design to suit better the installation of engines and the new fishing methods (FAO, 1958:48, emphasis ours).

Zeiner and Rasmussen were of the opinion that the requirements for a successful mechanisation scheme were: fisheries departments staffed by energetic men with a good understanding of commercial fisheries; boats which could take an engine; engine installation and maintenance facilities; financial facilities; and training of fishermen (FAO, 1958:49).

**Mechanisation of Existing Boat Designs**

All these factors mentioned by the experts seemed to have existed in the erstwhile State of Bombay. Here the Director of Fisheries in 1950 took the initiative of mechanising the existing boats -- called lodhias and machwas -- by merely
strengthening the framework of the vessels to fit an engine. The experiment was an instant success.

As Zeiner and Rasmussen comment:

It is true that conditions in the State of Bombay were favourable e.g. the availability of good boats, the existence of engine importing firms with maintenance facilities, and a wise Government financing and subvention scheme. The main reason for the success, however, was not the physical facilities available, but the spirit, energy and common sense with which it was initiated and managed during the initial period before the individual fishermen fully realised the benefits of mechanisation (FAO 1958:48).

In a decade (by 1961) as many as 1500 boats were mechanised.

We must also point out that it was the "large boats in a poor fishery" which we referred to earlier in this chapter which proved a boon for this step towards modernisation. Considering that the existing boats could be mechanised for a relatively small cost implied that the ownership structure and the work organisation in the fishery was not disturbed. This was a major factor in creating a social conflict-free process of new technology adoption and diffusion.

The mechanised fishing boats of Maharashtra and Gujarat today, which have evolved from this experiment, are clear pointers to the fact that a prudent and sensible approach to the mechanisation of indigenous crafts can yield remarkable results.

Efforts in the other states to modify the existing crafts to make them suitable for mechanisation however met with only limited success. The lack of commitment to this difficult task, on the part of department officials, was an important reason for this failure.
Diffusing Exotic Boat Designs

The next logical step was to try to introduce suitable small mechanised fishing boats which could gradually replace the indigenous ones. This process started as a part of the post-war reconstruction programme in the late 1940s. The credit for initiating the programme of small boat mechanisation must go to the Department of Fisheries of the erstwhile Madras Presidency which introduced in 1949 a hard-chine open fishing boat powered by a single cylinder 5 HP diesel engine. After this came the initiatives of the Indo-Norwegian Project in Kerala. In 1955 the INP introduced a small, open 6.5 metre fishing boat. Almost at the same time, under the Technical Cooperation Mission (TCM) of US-AID, beach-landing crafts of Danish origin were successfully tried out in Madras. This was followed by the introduction of the 7.5 metre boat designed by Zeiner of FAO, and named after him as the Pablo boat. In the subsequent years the "pablo" almost became a synonym for the mechanised fishing vessel in the country.

The original versions of the mechanised fishing boats were meant mainly for gill-netting for which the mechanical power requirement was relatively low. The power was used only for propulsion of the boat to and from the fishing ground since gill-netting was undertaken with the engine switched off and the boat anchored or adrift in the current. For, as long as this was the main use to which the new mechanised vessels were put, there was rather slow diffusion of the proven models. This was primarily because there was no real technical or economic advantage to be gained by using these boats. Between 1950 and 1961, in the three states of Karnataka, Kerala and Tamilnadu, where these gill-netters were introduced, only 192 boats were built and together they accounted for not even one per cent of the fish landing.

Lopsided Development in Boat Design: Compulsions and Consequences

The period of the initial diffusion of the gill-netters in the late 1950s coincided with the enhanced demand for shrimp in the international market and the location of rich shrimp grounds along the south-west coast. With the development of the shrimp export industry, the compulsion to adapt these vessels for the more profitable proposition of trawling for shrimp was considerable. It also resulted in the
development of larger and more powerful versions of these vessels, primarily for use as stern trawlers.

It is important to note that this historical circumstance has had considerable influence on the pattern and the nature of diffusion of fishing craft technology in all but two of the maritime states of India -- Maharashtra and Gujarat. On the one hand, it led to a total abandonment of the efforts to develop small beach-landing craft which could have meant a highly decentralised and productive fish harvesting sector spread along the whole coastline of the country. This implied that the vast majority of the fishermen had to continue operating their non-mechanised traditional crafts. The number of these crafts increased rapidly between 1961 and 1980 in all the coastal states except Gujarat and Maharashtra. (See Table 3.1).

On the other hand, it resulted in giving a narrow focus and scope to fishing boat mechanisation, stressing only the need for power for the fishing operation -- bottom trawling -- rather than for a balanced technological and economic upgradation of the fish harvesting activity as a whole. Using mechanised boats exclusively for trawling operations was the most prevalent manifestation of this bias, and was again evident in all the coastal states except Maharashtra and Gujarat. (See Table 3.2).
The consequence was that the marine fisheries sector of all but the two states of Maharashtra and Gujarat, missed out on the opportunity to extend the depth range of fishing, increase the fishing effort, enhance the fishing capability, reduce the risks of fishing in inclement weather, upgrade the facilities for better fish storage at sea, provide equitable increase in the profitability, and improve the economic condition of those who owned and worked the boats.
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<tbody>
<tr>
<td></td>
<td></td>
<td>Trawls</td>
<td>Purse-Seines</td>
</tr>
<tr>
<td>Gujarat</td>
<td>3413</td>
<td>35</td>
<td>-</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>4718</td>
<td>36</td>
<td>-</td>
</tr>
<tr>
<td>Goa</td>
<td>908</td>
<td>54</td>
<td>8</td>
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<td></td>
<td></td>
<td></td>
<td>38*</td>
</tr>
<tr>
<td>Goa</td>
<td>908</td>
<td>54</td>
<td>8</td>
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<tr>
<td>Karnataka</td>
<td>2004</td>
<td>82</td>
<td>16</td>
</tr>
<tr>
<td>Kerala</td>
<td>3038</td>
<td>87</td>
<td>1</td>
</tr>
<tr>
<td>Tamilnadu</td>
<td>2920</td>
<td>95</td>
<td>-</td>
</tr>
<tr>
<td>Andhra</td>
<td>580</td>
<td>100</td>
<td>-</td>
</tr>
<tr>
<td>Orissa</td>
<td>469</td>
<td>75</td>
<td>-</td>
</tr>
<tr>
<td>West Bengal</td>
<td>740</td>
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<td>NA</td>
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* Primarily in Daman & Diu which for fishery purposes can be considered part of Gujarat and Maharashtra

Source: Compiled from CMFRI, 1987

In all these states a sharp technological dualism developed in the harvesting activity. On the one hand there was the state-supported "modern" sector composed largely of trawlers and oriented to catching prawns for the export market. On the other, the traditional sector of non-mechanised boats was left largely to survive on its own as it had over the centuries.
Going into the specificities of this history of the diffusion of boat designs, we examine the case of the marine fisheries sector of the lower south-west coast region (hereinafter referred to as "the region"); comprising Kerala and the Kanyakumari District of Tamil Nadu.

This region, consists of the erstwhile state of Travancore-Cochin and the Malabar Province of Madras State under British Rule. It was only in 1956 that this region was divided along the lines of linguistic states and Kanyakumari, which was part of the erstwhile State of Travancore, was attached to Madras State and the remaining portion of Travancore-Cochin was merged with the greater part of Malabar Province to form Kerala State. (See Map 3.2).

The focus of our historical narrative will be on the socio-economic and ecological factors which conditioned the diffusion of technology in the marine fisheries sector. Our attention will centre around the initiatives to introduce new fishing crafts and examine the circumstances under which these efforts met with success or failure.

The Initial Premise of Fisheries Development in the Study Area

The basic premise of fisheries development in the Travancore-Cochin state hinged on the judicious exploitation of marine resources by effectively and gradually raising the productive capabilities of the existing facilities, giving primacy to the accumulated skills of the fishermen. The thrust was to ensure that technological and scientific research for this purpose be conducted on the basis of sound commercial principles ... without overlooking the interest of those engaged in the industry and their urgent problems (John CC quoted in Shah KT, 1948).

There were many ongoing programmes to facilitate this. Among them, those which were related to the technology of craft and gear design included the supply of wood
to fishermen to build their kattumarams and canoes and cotton yarn to make their nets, a programme to mechanise suitable traditional crafts, and efforts for tapping new resources in deeper waters by using a large mechanised boat to tow traditional fishing boats to and from these offshore fishing grounds. It is important to note that all these programmes were initiated by the government.

Inspite of the large number of indigenous initiatives to develop fishery resources, there was a strong opinion in the concerned fishery circles of Travancore that the adoption of some of the technology of fishing from developed countries such as Britain and Scandinavia would augur well for Travancore.

This desire materialised in the form of the Indo-Norwegian Project for Fisheries Community Development (in short, INP) which began in 1953. One of the main objectives of the INP was to bring about an increase in the income and quality of life of the fishermen using a strategy for increasing the productivity of fish harvesting. Initially, this was to be done through attempts to improve and motorise some of the existing fishing boats in order to enable them to fish longer and further out at sea.

Dropping the Existing and Introducing the New

INP did not however pursue this objective diligently. They took a model of the dugout canoe of the area (Quilon District) all the way to the fjords of Norway, motorised it, and after a few months pronounced that it was unsuitable for motorisation. Interestingly, it was precisely at this time that the dugout canoes in the State of Saurashtra (mentioned in Chapter One) were being motorised successfully. This pronouncement by INP was an important watershed in the nature of fishing technology development of the region: it foreclosed the possibility of improving the existing craft designs in the Region.

As an alternative to motorising the traditional dugout canoes, the INP introduced from Norway, a smaller flat-bottom boat, motorised with a small 5 HP engine.

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2 For details of the context and the socio-political background against which the INP was established and operated see (Kurien, 1985).
Although as many as 67 of these boats were constructed between 1956-57 and distributed to fishermen at a highly subsidised cost of Rs.2000 (1953 prices), they did not "take-off". The most important reason for this non-diffusion seems to have been associated with the fact that fishermen were not convinced of the economic superiority of these boats over their own traditional canoes. Assessments of the economics of operations of the INP boat as compared to the small and big dugout canoes of the area provide clear evidence that, despite the marginally higher annual fish catch (8.8 tonnes for the INP boats as compared to 8 and 8.6 tons for the small and big canoes respectively), due to the higher running costs (fuel, engine repair etc) of the INP boat, its net returns were lower than what was obtained on the big canoes (Kurien, 1985:A-83).

Yet, an important contributing factor to the non-diffusion of these boats could have been that the surf conditions were rough, making the operation of a mechanised boat risky. It was reported that many of those who got these boats began to use them to run ferry services in the backwaters nearby. Mooring facilities for such boats were ready only by 1959.

It was only after 1959 that INP began to introduce the larger type of mechanised boats with more powerful engines which began to prove more "efficient" than the traditional craft in terms of the reduction in time taken to reach the fishing grounds as well as the ability to operate at greater depths with a smaller crew size. Consequently, the benefits of mechanisation began to be perceived gradually. Three more models were introduced, which were larger in size and higher in their HP rating. Apart from the 67 boats initially introduced of 22 ft length and 23 boats of a slightly modified version, the INP was responsible for the construction of another 62 more mechanised boats by 1963. (See Table 3.3).

The boats of 25 ft and more were clearly outside the reach of the investment capability of the traditional fishermen considering that they cost between Rs 30,000 and Rs.45,000 (1963 prices), well over ten to twenty times the cost of traditional canoes. However they presented a major technological leap in terms of fishing craft.
design and operations. These boats could operate in deeper waters, took less time to reach the grounds, and used gear (such as bottom trawls) which could be mechanically released out and hauled into the boat. They could be used very effectively to catch the higher value demersal species of fish, even when they were considered to be "out of season".

Table 3.3

<table>
<thead>
<tr>
<th>Length (ft)</th>
<th>Horse Power Rating</th>
<th>Number Constructed</th>
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<tbody>
<tr>
<td>22</td>
<td>8</td>
<td>67</td>
</tr>
<tr>
<td>23.5</td>
<td>8</td>
<td>23</td>
</tr>
<tr>
<td>25</td>
<td>8 to 16</td>
<td>48</td>
</tr>
<tr>
<td>30</td>
<td>36</td>
<td>10</td>
</tr>
<tr>
<td>36</td>
<td>48</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: Bhushan, 1979: 47

From 1963 onwards, the activities of the INP located in Quilon were handed over to the Department of Fisheries, Kerala. Aspects of the projects that remained were then renamed as the Integrated Fisheries Project (IFP) and came under the control of the Government of India. The focus of IFP's activities shifted to exploratory fishing, fish processing and marketing, and these were based in Cochin. Thereafter efforts at the mechanisation of fishing craft in India and Kerala were made without any foreign help under the auspices of the Central Institute of Fisheries Technology (CIFT) also based in Cochin.

During the period 1963-1967, the CIFT standardised the designs of four new mechanised fishing boats. The first was a 30 ft vessel (based on the Ziener/Gurtner FAO model) fitted with a 30-35 HP diesel engine that could fish up to a depth range
of 15 fathoms with a crew of six and stay at sea for 20-24 hours. The other three belonged to a class of vessels which could be used for a variety of fishing operations, stay out at sea for 3-7 days and fish at depths beyond 25 fathoms.

Factors Inducing the Diffusion of Mechanised Trawlers

In 1963 there were only the 150 odd mechanised boats in Kerala introduced by the INP. By 1967, this number increased to 1055, over half of which were of the 30 ft model developed by the CIFT and about 20 per cent of the larger models introduced by the INP.

It was a combination of seven factors which led to a rapid diffusion of these boats used for bottom trawling. First, the location of rich shrimp grounds off the Quilon area and the lucrative price for this shrimp offered by the U.S market. In 1961, the price of shrimp was below the price of mackerel but, by 1967, the price of shrimp was double that of mackerel. Secondly, the devaluation of the Indian Rupee in 1966 which provided the impetus to an export drive. Thirdly, the availability of over 800 fishermen who had been trained to use mechanised boats by the INP and the Department of Fisheries. Fourthly, boat building facilities set up by the INP, the Department of Fisheries and quickly taken up by private persons, given the relatively easy availability of good timber for boat construction in Kerala. Fifthly, the greater availability of marine engines made in India. Sixthly, the interests of a merchant-entrepreneur class keen to enter the shrimp export trade and consequently willing to finance the investment cost and running expenses of mechanised boats which would fish for shrimp. And finally, the completion of breakwater and mooring facilities at the INP site in Neendakara.

Traditional Boat Designs: Survival Despite Official Neglect

A "pink gold" rush had set into the fishery sector of Kerala which pushed aside all other priorities that existed in the late 1950s and early 1960s.(For details of this see Kurien, 1985). The whole orientation of planned fisheries development in Kerala State from then on was guided by the compulsions of the export drive. The major casualty of this was the "gradualist approach" to technology development -- the process of
building-up from the strengths of what existed, rather than rejecting it for its weaknesses. Thereafter, all attempts to improve or sustain the traditional technologies in the harvesting and processing of fish were abandoned.

However, despite the "official" neglect of the traditional fishing boat designs, their numbers increased. (See Table 3.4). These designs which had been in use over the centuries continued to be constructed and used.

**Table: 3.4**

<table>
<thead>
<tr>
<th>Year</th>
<th>Kattumarams</th>
<th>Plank Canoes</th>
<th>Dugout Canoes</th>
<th>Others</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1957/58*</td>
<td>8280</td>
<td>3173</td>
<td>8774</td>
<td>-</td>
<td>20,227</td>
</tr>
<tr>
<td>1973/74#</td>
<td>9690</td>
<td>3837</td>
<td>8191</td>
<td>-</td>
<td>21,718</td>
</tr>
<tr>
<td>1980#</td>
<td>11480</td>
<td>4376</td>
<td>10415</td>
<td>-</td>
<td>26,271</td>
</tr>
<tr>
<td>1991@</td>
<td>15090</td>
<td>4950</td>
<td>8486</td>
<td>1933</td>
<td>30,459</td>
</tr>
<tr>
<td>of which</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NM</td>
<td>15090</td>
<td>1680</td>
<td>3734</td>
<td>-</td>
<td>20,504</td>
</tr>
<tr>
<td>M</td>
<td>-</td>
<td>3270</td>
<td>4752</td>
<td>1933</td>
<td>9,955</td>
</tr>
</tbody>
</table>

NM = Non-motorised M = Motorised

*Government of Kerala, 1959
# Central Marine Fisheries Research Institute, 1978
@ South Indian Federation of Fishermen Societies, 1992

Only in 1991 do we get the first indication of the character of the changes which began to take place in the traditional boat designs in the post-1981 period. The motorisation of traditional crafts, the sharp decline in the overall number of dugout canoes and a significant increase in the number of crafts under the "others" category need to be noted. The decline in the dugout canoes points to the inability to construct
new ones following the dire scarcity of tree trunks of such massive size following the rapid deforestation that took place in Kerala in the post 1970 period. The observed increase in the number of kattumarams between the 1980 and 1991 period hides the fact that similar scarcities in the post-1985 period have affected them also. The "other" craft are primarily the new genre of plywood boats.

The main area chosen for our detailed study of the diffusion of new plywood boat designs is located in Kerala and Tamilnadu and has the highest craft density in India. It comprises the districts of Quilon and Trivandrum in Kerala State and Kanyakumari District in Tamilnadu with a combined coastline of 185 kilometres (3 per cent of the country’s coastline) and a craft population of 27870 (20 per cent of the country’s craft population) making for a density of 150 craft/kilometre -- over six times the national average. This implies that for every six to seven metres of coastline there was one fishing craft on the beach! Surely this was a sign of the richness of the fishery and the tenacity and innovativeness of the fishermen who fished here.

The task of diffusing a new boat design in this area, which can be owned and operated by the thousands of artisanal fishermen who eke out a livelihood here, has always been a formidable one. The reasons for this have also been very varied as we have shown earlier. But that these seemingly "unchangeable" fishing boat designs have been altered in a matter of a decade is, therefore, a phenomenon which merits investigation. We embark on this task in the next four chapters of this study.

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3 Data for the year 1988 (SIFPS, 1992) showed that in Trivandrum District (which accounts for 95 percent of the kattumarams) there were 19,928 kattumarams which declined to 13,527 in 1991. It must be noted that while the count of one canoe (plank or dugout) indicates the presence of 3 to 4 fishermen, in the case of the kattumarams the relationship is in the reverse: for 2-3 kattumarams there is one fisherman. This is primarily because a single kattumaram cannot be used year-round. Moreover certain kinds of fishing require the use of a pair of kattumarams.

4 The craft density for India as a whole in 1980 was only 24 crafts per kilometre of coastline. Taking Kerala State and Tamilnadu as the whole the densities were 45 and 43 respectively.