

Claims of mobile phone use by Kerala fishermen not supported by fieldwork

*Jacques Steyn
Monash South Africa
South Africa*

*Mohan Das
Monash South Africa
South Africa*

Abstract

Fieldwork was conducted in the fisheries industry of Kerala, a state in India. The purpose of the fieldwork was to investigate the claim, originally made by Robert Jensen (2007), that mobile phones are used to determine market prices and fishermen sell their fish at the best market. Conversations were held with different stakeholders in the fisheries industry: fishermen, boat owners, auctioneers, bidders, vendors, religious representatives and government representatives. Fourteen different fish markets and landing centers were visited on both the south and north coasts of Kerala. Both informal as well as more formal markets were visited. Based on the findings of this fieldwork and supporting literature and ethnographic study, we found very little evidence for the claim that fishermen use mobile phones to determine market prices and locations or sell their fish at markets other than at their home centers. We conclude that research into the use of mobile phones need to consider the bigger picture within which technology as social construct operates to prevent premature claims. No single model, as Jensen proposed, can be applied across all fish landing centers in Kerala, and certainly that model cannot be generalized to apply across the globe.

Keywords

ICT4D, mobile phones, Kerala fisheries, Robert Jensen, ethnography, field work.

A. Introduction

Academic literature as well as mass media reports suggest that the final word has been pronounced about the use of mobile phones by Kerala fishermen to determine the best market prices. Informal "surveys" at ICT4D gatherings and conferences indicate that most players in the field of ICT4D are aware of this claim. The authors of this paper are acquainted with market places in developing regions, and one of us has been particularly intrigued about this claim, which is contrary to our own experiences. In order to investigate the claim, an intensive literature review was begun, and eventually funding was obtained to conduct field work in Kerala. Results of both the literature study and field work yield a different conclusion about the claim. Photo evidence, and important background information, such as geographical features (weather, coastline, bathymetrics, etc.), fish species, and so forth which is important for understanding fisheries in Kerala is presented in a companion website (www.steyn.pro/kerala). This paper reports only on the field work conducted. Results of the literature study, as well as a critical analysis of Jensen's paper still need to be published. The logical analysis based on the literature study alone indicates that the claim cannot be correct. Results from the field work further supports the conclusion that the claim cannot be true.

In this paper we will very briefly consider the origin of the claim, and then report on the field work, which was conducted from an ethnographic perspective.

The claim

The claim that Kerala fishermen use mobile phones to determine fish market prices can be traced back to a 2007 paper by Robert Jensen published in the *Quarterly Journal Of Economics*, particularly to his conclusion: "The identifying assumption for the empirical strategy is that, had it not been for the introduction of mobile phone service, there would have been no differential changes in the market outcomes across these regions over this period." (2007: 903). His research was conducted at a number of fish landing centers on the north coast of the state of Kerala in India, on the Arabian Sea. In the same year, a paper by Abraham (2007) was also published, and supported Jensen's broad conclusions. Abraham also conducted his research in Kerala, but does not mention the landing centers by name where his research was done. Apart from the primary research by Jensen and by Abraham, the only other primary research conducted among Kerala fishermen regarding mobile phones, was by John and Jubi (2013). They claim they did fieldwork in the far south of Kerala at Thiruvananthapuram, but given the poor quality of their paper, their results are suspect (Steyn, 2014). There are thus only two primary papers in support of the claim that Kerala fishermen use mobile phones to determine market prices. A critical analysis of the arguments, logic, and methodology is offered in Steyn (to be published A).

Despite the scant evidence, it is surprising to what extent appeals are made to the claim. Jensen's paper is now the most cited paper in the field of ICT4D, or development informatics, as reported by Google Scholar (Steyn, 2014). At the time of writing, Google Scholar returned 627 citations for Jensen's paper, and 163 for Abraham's paper. In addition, 48 academic ICT4D papers refer to or quote from these two papers, and many others again cite these secondary papers. The list of secondary papers is presented in Steyn (2014).

Although this paper is primarily a report on our fieldwork, it is necessary to very briefly present Jensen's argument.

B. Jensen's argument

A more detailed critique of Jensen's arguments is presented in Steyn (to be published A). Here the following suffices.

The conceptual filter of Jensen's approach is rational economics, particularly neo-liberal capitalism. He gathered market-related data from 14 fishing landing sites on the north coast of Kerala, and conducted interviews with fishermen. The purpose of his paper is as follows: "In this paper, we examine these questions by exploiting the introduction of mobile phones in the Indian state of Kerala as a natural experiment of improved market information." (2007: 880).

His line of thought is as follows:

Market prices differ according to local needs. Some markets have better prices than other. Fishermen should like to sell their fish at the best market prices to make more profit. While at sea they obtain market prices by mobile phone, and then go sell their fish where they will get the best prices. By selling at better prices, they earn more. Thus their economic welfare is improved. In addition, the theoretical market operates more efficiently as there is now also less waste. This line of theoretical argument is then supported by empirical evidence Jensen collected from market prices at landing centers in the north.

His "evidence" for the impact of mobile phones is dependent on four newspaper articles reporting on the benefits of the use of mobile phones. He also noticed an increase in sales of mobile phones during the same period when fish market prices seemed to increase. From this he concludes that the use of mobile phones lead to the increase of market prices.

The paper by Abraham supports the general view of Jensen. The purpose of Abraham's 2007 article is to test the assumption that mobile phones lessen the information asymmetries in markets, which would lead to more market efficiency. He concludes positively about this assumption.

Contrary evidence

Papers by Sreekumar (2011) and Srinivasan and Burrell (2013) come to different conclusions. So did our own field work.

Sreekumar (2011) conducted primary research in Kerala, but also does not say at which landing sites his data was collected. His main concern against Jensen was the cooperative culture among fishermen, which is contrary to Jensen's assumption of individualism. He points out that ICT4D literature is biased toward the use of ICTs for economic activity. The cultural dimension is seldom addressed. In addition, the traditional ethos of Kerala fishermen is collectivist. This implies that they culturally cooperate, rather than being in competition, the hallmark of neo-liberal capitalist economic models, and the premiss on which the models of Abraham and of Jensen depend. Rather than an individualistic device used for economic benefit, mobile phones would be used by Kerala fishermen for collectivist purposes, thus not for market edge. Mobiles are also general communication tools with many different functionalities, rather than primarily business tools. The fact that fishermen have mobile phones does not mean they use them for business purposes. Sreekumar is thus somewhat critical of the economic bias of Jensen's work, although he does not take Jensen to task for the logical and methodological errors.

Srinivasan and Burrell (2013) visited two landing centers, one in northern Kerala (Chaliyam, Kozhikode District), the other in southern Kerala (Vizhinjam, Thiruvananthapuram District). They report several aspects for they could not find corroboration for Jensen's claim. They conducted their research from an ethnographic rather than economic perspective.

Srinivasan and Burrell reached the following conclusions:

1. Different conditions apply to the north coast of Kerala and to the south coast.

2. Only some actors use the phone to determine market prices.
3. Mobile phones are mostly used for purposes other than economic purposes.
4. Welfare is seldom defined by the actors with reference to economics, but mostly to safety, such as risk avoidance and emergencies.
5. The functioning of markets often depends on regulations imposed by government and collectives.

In our own research, we have found very little evidence in support of the claims of Jensen and of Abraham. On the contrary, we found abundance evidence in support of the conclusions of Sreekumar, and of Srinivasan and Burrell. This support comes from both the literature review and the field work.

C. The Kerala fisheries

Before reporting on our fieldwork, a few general remarks should be made about fisheries in Kerala. The most important observation is that one size does not fit all. Generally speaking, harbors in the north function more or less the same, especially the formal markets, while those in the south function differently. Secondly, informal beach markets function differently to formal markets. There are fewer formal markets than informal markets, which implies that Jensen's findings do not necessarily apply to the majority of markets or fishermen. If Jensen's research was conducted only at formal markets in the north, his finding would be skewed regarding generalizations, and at best apply to only markets with similar properties, thus to the minority of fishermen and markets. There is no homogeneous fisheries industry in Kerala. The oceanography, demography, and fish species differ on the north and south coasts. The number of craft by type, and by ownership differ in the two regions. Weather is more severe in the south, with few safe harbors. Especially during monsoon smaller craft are endangered. Some details about these differences are reported in the companion website (Steyn 2014).

Since the Kerala Marine Fishing Regulation Act was introduced in 1980, all fishing vessels had to be registered and obtain a boat license. The Act was introduced to protect fish as well as the fishing areas of traditional low-income fishermen. Licenses restrict fishing to certain zones and landing centers, while boats are able to obtain subsidized fuel at their home landing centers. Note that these official zones are not the same as the "zones" that Jensen introduced in his paper. In the south we were emphatically informed that unsubsidized fuel is too expensive and most fishermen would rather return to their home centre where they qualify for subsidized fuel. Only when bad weather drained their fuel, or because of some mishaps would they obtain fuel at other centers. This means that they will not visit other harbors to sell their product there.

The general population of the north coast (42% of the total population of Kerala, which is 33,387,672) is larger than the south coast (8,058,930 or 34%), but the south has slightly more active fishermen – 52% (75,247) as opposed to the north coast's 48% (70,149). The north also has more fishing villages (55.9%) and fish landing centers (54.5%), which means in the south more fishermen land at fewer landing centers. There are more fishing craft in the north (51.6% or 11'238), but this is somewhat misleading as the regions differ according to type of craft, and by fishing zones. For example, 78% (4'583) of muscle powered craft are found on the south coast, while 78% (3'661) of mechanized craft are found on the north coast. They catch different species of fish at different depths and at different distances from shore. The catch size also differs, as mechanization enables larger catches at a time. The intricate differences are discusses in Steyn (2014, and to be published A).

The implication of this is that even if Jensen's findings proved to be correct for the north, they would not necessarily apply to the south.

It is evident from this background information, reported in detail in the case study, that the views of Jensen and of Abraham are misleading by implicitly suggesting that the fishing industry is homogeneous. Their findings seem to be based on a rational analysis of market prices without any consideration of how markets actually operate, or how the fisheries industry operates in general.

D. Our research

We paid a visit to several locations in Kerala in January 2014, of which 14 were investigated in more detail. Prior to the visit, an extensive literature study was done, while one author, a native of Kerala, paid preliminary scouting visits to some landing centers during a visit to family. This author Mohan Das, also speaks Malayalam as mother tongue, the dominant language in Kerala. While Malayalam is the dominant language in Kerala, Hindi and several other minority languages are also spoken.

Most of what we report here was obtained from participants during our informal conversations. An interview method suggests a structured conversation, led by the interviewer. That was not our approach. Our "interviews" were unstructured, and neither did we lead the conversations. "Conversation" is thus the most appropriate term to describe our method. On occasion we might have initiated conversations, but opportunistically, without any idea where the conversation would lead. By not displaying an interrogative approach, we found that conversationalists were much more at ease, and offered a wealth of information even without being prompted.

Conversationalists ranged from boat owners and auctioneers, to church tax collectors, government auditors, financiers (i.e. individuals or representatives of collectives that give advances to boats), and to fishermen, vendors, and customers. It should be noted that different roles are in several cases played by the same individual stakeholder. There are cases where a tax collector owns shares in a boat, where none of the fishermen on a boat owns it, where the owner of a boat is also a fisherman, where auctioneers own shares in a boat, where advancers or financiers own several boats, also at other landing centers, and where some have other business ventures as well. Almost any individual or cooperative can play any or several roles. We also had conversations with ice suppliers, auto-rickshaw (tuc-tucs) drivers, fish vendors, as well as with customers. In Kochi we also had interviews with representatives from the Central Marine Fisheries Research Institute. What we report in this paper was obtained through conversations and informal interviews with these role players.

Not all of the fourteen fish markets we report on are listed in the official statistics of the Marine Fisheries Census of Kerala (2010). Yet, there is fishing activity and markets at all these locations, even if the market is an informal one held on beach sand.

D.1 Conversation topics, statements and prompts

Our primary research question was simple: *Do Kerala fishermen (or other stakeholders) use mobile phones to determine market prices?* Our basic question was to confirm, corroborate or falsify Jensen's conclusions. Secondary guiding questions that flow from this and were raised not through an interview method, but conversation method, are such as, if they do, do they then visit markets other than their home markets? Do other factors inform the decision to land at other market places? Do people other than fishermen use mobile phones in the fisheries industry? If so, for which purpose? Are phones used for other purposes? And so forth. Our research was originally planned to include a formal questionnaire, which was prepared in advance, as well as informal interviews in conversation style. To ensure that we have an understanding of how real markets operate, we decided to begin with informal conversations. At the first landing centre visited, it was

immediately evident that the formal route would be an overkill to obtain answers to our research questions as stakeholders were generally very friendly, freely sharing their thoughts even often without being prompted. A questionnaire would have been constraining. The communication act would then be more formalized, structured, and perhaps information would not flow as easily as in a conversation. Some crucial information obtained during informal conversations we would have missed had we stuck to the questionnaire. We mingled with different role players at the markets, with whom conversations were had. Conversation starters were opportunistic, depending on what a “normal” (i.e. non-academic) situational question might be. Examples, depending on the fisheries role of the conversationalist, are such as: How is the catch today? How is the market today? Did you get a good price today? How much did you pay for your fish? As we mingled among the market population, in many cases folk began conversations with us. During our first site visit we received abundant information about many aspects of the fisheries from a variety of stakeholders.

We would in some cases steer the conversation to get an understanding of how the market operates, and eventually to how mobile phones are used. If conversationalists do not offer information on the use of mobile phones, we would prompt answers, such as stating that we heard fishermen use phones from their boats. Most conversationalists would offer information such as affirming that some do, and would volunteer information about types of use. Reported purposes of use would be such as to keep contact with family members, such as informing them what time they expect to be home. Or to talk with auctioneers, boat owners or financiers. In not a single case was information offered about the use of mobile phones to determine market prices. We would then explicitly say that we have heard that fishermen use phones to determine market prices, as an open-ended statement, not as a request to be confirmed or denied. Most conversationalists would then spontaneously converse that that is not the case, and would offer various reasons why that would not be possible. At all the southern markets, not a single conversationalist indicated that mobile phones are used for market information. In fact, when pushed further, conversationalists do not even personally know anyone who does that.

In an exceptionally few cases the conversationalists would respond that they have heard that some fishermen use their phones to determine market prices, but that it does not apply to their landing center. Perhaps this is due to urban legends, as almost all interviewees gave several reasons why in principle it cannot be done. Some said it is impossible to go to other markets, for reasons such as zoning restrictions and fuel costs, but also because local networks can be trusted, while at other markets they would need to work with strangers.

From such responses at the first landing center we visited, it was obvious that using the formal questionnaire would be an overkill, and that it would be more informative if the broader picture of the Kerala fisheries is understood. We thus followed an embedded approach, by mingling, hanging around, observing, participating, and just being friendly. In most cases, after hanging around in this fashion every morning at a fish market, stakeholders would start chatting to us. This open-ended approach was much more informative, and we discovered several aspects of how the markets operate that we did not obtain through the literature study, or through the scouting visits the year before. Being made aware of the additional knowledge, further literature searches could be performed on those topics.

D.2 Landing centers visited for our research project

Below follows a brief description of the landing centers where we conducted our fieldwork. The list of places here is alphabetical by north and south coast. Maps and photos of these places are available at the companion website (<http://www.steyn.pro/kerala/>). It should be

noted that most place names are in the Malayalam language, which has its own alphabet. There is no universal standard for translating between the sound-sets, or character-sets of Malayalam and the Western (or Latin) sets. Spellings sometimes vary considerably when written in English. For example, Palakkad is also written Palghat, and Tuticorin is also written Thoothukudi. This can be quite confusing when consulting literature.

North Coast

Beyepore

Beyepore (or Beypur) is the main harbor of Kozhikode. It is 13 km north of the Kozhikode city centre, on the northern bank of the Chaliyar River. Chaliyam (where Srinivasan and Burrell conducted their research) is on the southern bank. Beyepore fishing harbor is about a kilometer north of the Beyepore goods port, which is transported by ship or large boats. The majority of fishing boats are large trawlers with fully mechanized nets. Most of these boats stay at sea for 5 to 10 days at a time and typically stray typically as far as 70 kms into the sea and occasionally even further as far as 200 km and up to Mumbai. There are a few boats with one or two out-board motors. The port is capable of providing services to large buyers who process the fish and export. Hygiene conditions are maintained to prevent contamination on export quality fish. This is very different to the unhygienic markets in the south where fish is sold from the beach sand.

Chavakkad

Chavakkad is a fishing harbor in the Thrissur District. It is on the coast of the Arabian Sea, 27 km east from the city of Thrissur. Craft are mainly *vallams*, powered by one or two outboard engines. Most of the fish landed are locally consumed or sent to nearby fish markets. The boats are in constant contact using mobiles communicating with the owner and other friendly fishermen to exchange useful info. None of our conversationalists use the mobile phone to determine market prices. Fishing boats always land at the mother port.

Kalamukku

The Kalamukku fish landing centre lies north of Gosree Bridge, which connects Vypin Island with Kochi city. The market at Kalamukku is served by mechanized trawlers and the catch is huge compared to most of the markets we visited in the south (see the photographic evidence on the companion website). Auctions are held in a permanent concrete construction with a roof.

Kochi/ Cochin

Kochi (or Cochin) is the second most populated city in Kerala (after Thiruvananthapuram, or Trivandrum). For our research project we used Kochi as the boundary between the north and south coasts, and included its data in the north coast discussions. We visited several fish landing sites in Kochi. On Vypin Island we visited Munambam, Sri Gosreepuram, Nyarambalam, Thoppumpady, and Kalamukku.

The Central Marine Fisheries Research Institute is located in Kochi and granted us access to fisheries census data. The Institute informed us that information about the movements of shoals of fish is collected using satellites. Locations of shoals are distributed to fishermen using a mobile application. Information on wind direction and adverse weather condition is also provided. However, in our conversations with folk on the ground, usage of this system could not be confirmed, and not a single stakeholder we had conversations with at all the ports we visited reported on using this mobile application. In fact, most did not know about it.

The Institute informed us that since terrorist attacks became more frequent, and the

attackers of a hotel in Mumbai entered the country on small boats, registration of all fishing crafts is enforced. The Institute estimates that presently 90% of all craft are registered. There is thus growing control over boats, while the Kerala Marine Fishing Regulation Act, requiring fishing vessels to be licensed, has been in place since 1980.

Responding to our question whether fishermen used their mobile phones to determine market prices, one Institute official affirmed this behavior. But on pressing the matter further, it was obvious that his statement was based on hear-say, and not on any first-hand knowledge, nor on any formal data. The Institute itself has never conducted an investigation into this matter. Concerning mobile phones, they have thus far only collected data on how many fishermen use GPS and mobile phones. The purposes of use have not been investigated.

Kozhikode / Calicut

Kozhikode (also known as Calicut) is a city in northern Kerala on the Malabar Coast. It is 181 km north of Kochi. It is an ancient port, referenced by both Chinese and Arabic merchants, and it is the third largest city in Kerala. Its main harbor is at Beypore (13 km south of the Kozhikode city centre) while a minor port is at Vadakara (48 km north of the city).

Munambam

Munambam is a fishing village on the northern side of Vypeen Island. The Arabian Sea is on the west, and the Periyar river on the east. It is one of the largest and important fishing harbor in this district, 42 km north of the Kochi city centre.

The market is a large permanent construction, and large mechanized trawlers are berthed right next to the market at a permanently constructed dock. They do deep ocean fishing, which means that different fish species are found at the markets here than in the far south. The lots of catches are also huge compared to those at the southern landing centers. Plain observations make it very obvious that these markets cannot be the same as those in the south (see photo evidence, Steyn 2014).

Numerous trucks were waiting to be loaded. Trucks range from small pick-ups, to large trucks with cooling systems. In the south most transport of fish from harbors to other locations was done by tuc-tuc.

Nayarambalam

Nayarambalam is a suburb more or less in the centre of Vypin island of Cochin city (Ernakulam District). It is 23 km north-north-west from the city centre of Kochi.

Sri Gosreepuram landing Centre

The Sri Gosreepuram Fish Landing and Marketing Centre is located on the southern side of Gosree Bridge, directly next to the bridge, and a private centre (not government owned). Trawlers docking here must pay a fee or levy.

Thoppumpady

Thoppumpady is a fishing landing centre just north of the Thoppumpady bridge (also known as Mattancherry Bridge) connecting Willingdon Island with mainland Kochi. Some markets we visited were open until late morning - as late as 11:00, but at Thoppumpady auctions finish by 9:30. Large fish were cut into smaller chunks and packed in ice in large plastic trays. There are mainly trawlers at this port, and they fish in the deep ocean. Boats stay between 5 and more days on the ocean per trip.

Vypin (or Vypeen) Island

Vypin (or Vypeen) is a long, narrow island on the coast of Kochi. The island is about 27 km

long along its north-south axis, and 2.5 km wide east-west. There are several landing centers and villages on the island. Closer to the city of Kochi, trawlers dominate the landing centers on Vypin. Many Chinese nets are found along the seashores of Vypin and Fort Kochi.

South coast

Kollam (or Quilon)

Kollam (or Quilon, formerly known as Desinganadu) is an ancient port 70 km north of Thiruvananthapuram. It is one of the most important fishing centers in Kerala. Neendakara is its most important fishing village. Other important ones are: Cheriakkeekkal, Alappad, Pandarathuruthu, Puthenthura, Thangasseri, Eravipuram and Paravur. There are plans to establish a more prominent fishing harbor at Neendakara.

Kovalam

Kovalam consists of a few beaches: Lighthouse Beach, Hawah or Eve's Beach (which is on the northern side of an outcrop called Edakallu serving as a small viewing point), and Samudra Beach. Ashok Beach and Leisure Beach are north of the Leela Hotel. Kovalam is a popular tourist beach 11 km south of the Thiruvananthapuram city centre, and about 3 km from Vizhinjam. Some fishing occurs here. At night *vallams* from Vizhinjam fish just off shore from Kovalam, and their lights can be seen from Kovalam beaches.

Neendakara

Neendakara is a fishing village of Kollam 9 km north of the city centre. It is a safe harbor, while the market is roofed and has a concrete floor. Neendakara was the headquarters of the Indo-Norwegian Fisheries Community project from 1953 to 1961. Fishing is the major economic activity, while other income is generated by working as migrants overseas. The standard of living is of the highest in India.

Thottappally

Thottappally is a fishing village 21 km south of Alappuzha. It has a safe all weather fishing harbor with access to good road networks. A number of large trawlers were seen anchored outside in the open sea close to the port. Many medium sized vessels were berthed and some were seen unloading fish. The main catch we saw were sardines which was auctioned to resellers who sell it at markets in nearby towns.

Valiathura

Valiathura is a suburb of Thiruvananthapuram, 5 km southwest from the city centre, and in earlier times the only port along the South Kerala coast. Since Kochi became the major port, its pier was no longer used and in poor shape. Its fish market is a beach market, held on the sandy beach when boats land.

Vizhinjam

Vizhinjam is a fishing port of Thiruvananthapuram. Kovalam beach is 3 km by road from Vizhinjam. Vizhinjam is protected by the bay which has a protective wall at the sea edge. The sea bed is deep just beyond the edge. Deep ocean is thus much closer to shore than in the north coast. The port authority of India has recognized the importance of Vizhinjam and there are plans to develop it as a full shipping port. Vizhinjam is the safest port in the far south, and boats often find refuge here when due to poor weather conditions they would be unable to reach their home landing centers. Although there is a constructed area towards the northern side of the harbor that could serve as a market, the market happens on the beach sand on the south side for Christian fishermen, while Muslim fishermen beach near the mosque on the northern side. We only discovered this distinction on our final day at a time when the Muslim market had already closed, so our report here concerns only the southern, Christian part. We are thus unsure whether a religious tax collection, which will be explained below, also applies to the Muslim market.

E. Findings

What follows is a summary of our findings, particularly how they relate to the claim that mobile phones are used to determine market prices. The relevance of some topics might not be immediately obvious, as they do not directly apply to mobile phone usage, or the market. They are nevertheless important as many of the findings indicate that by sheer logical deduction, the claim would be impossible. For example, Jensen bases his argument on communication between fishermen and agents, and he also mentions international sales. However, few fishermen operate through agents. Only the larger trawler operators have agents. Agents are just one type of role player in the market networks. There are many other role players and stakeholders. We have found, that particularly in the south, fishermen are not necessarily boat owners, and in cases where they are indeed boat owners, few can afford the maintenance of the boats. They join forces with financiers who provide advances, who are then the decision-makers. Communication is between fishermen, financiers, owners, shareholders, and auctioneers, not agents - at least not in the south. This diversity in role players and ownership alone enables one to logically conclude that Jensen's claims cannot be true for all Kerala fishermen.

E.1 Boat licenses and subsidized fuel

The Kerala Marine Fishing Regulation Act of 1980 requires that all fishing vessels be registered and licensed. Role players at markets are aware of this and informed us that boats can only sell their fish at the landing sites where they are licensed. We were also informed that some licensed boat owners buy large stock of subsidized fuel, which they then resell to other boats at a margin.

At Vizhinjam we were informed that fishermen who are prepared to purchase fuel and oil at higher prices are from other states such as Tamil Nadu, which is on the south-eastern tip of Kerala, and from Karnataka on the Konkan coast north of Kerala. They are far from their home bases and thus forced to buy locally. Usually fishing boats from other ports land at Vizhinjam for logistical reasons, such as seeking a safe harbor during poor weather conditions, or if boats develop problems.

Non-local fishermen may land their boats and fish at Vizhinjam during seasons when the water is choppy or stormy (mainly between June and September) as it is the safest harbor in the far south. However, they are not allowed to sell their fish at the Vizhinjam market. Their catch is in some cases transported overland to their home landing centers, where the market is then held. One boat owner at Valiathura, another fishing landing centre of the city of Thiruvananthapuram, also owned his own auto-rickshaw (or tuc-tuc) which, when his boat is forced to land at Vizhinjam, is used to transport his fish to Valiathura, his home base, where he is allowed to sell his catch. This was confirmed by other conversationalists at Valiathura. According to boat owners at Vizhinjam, although this is not a law, this custom is enforced by the local police. It is socially and not legally enforced, as the police cannot legally arrest a non-local for selling fish here.

E.2 Boats, ownership and financing

A variety of boat types are used in Kerala. Details of boat types are reported by Steyn (to be published B), and photo evidence is available on the companion website (Steyn 2014). Here it suffices to point out that muscle powered craft (*kattumarans* and *vallams*) constitute 27% of all craft in Kerala. These craft do not veer far from shore into the ocean, and typically stay within site of the shoreline. Even motorized *vallams* do not fish far from the shoreline. These types of craft constitute about 80% of all Kerala craft. Fishermen do not sleep (in the sense of overnighting) on these boats even though they often fish right through the night. They do not do deep ocean fishing, and consequently their catch is not as large as those of trawlers, which stay on the ocean for several days at a time. Jensen's

research was done on trawler-based fishing. His findings are thus based on only about one fifth of Kerala fishing craft, and his conclusions would thus apply to a only a smaller section of fishermen.

At Neendakara, a busy formal landing center in the south, several stakeholders volunteered information that the large trawlers operating from this port have a range much beyond the 20 km range of mobile phones and so mobiles were not very effective to be used for fishing purposes. The boats take provisions for up to 10 days at sea and large quantities of ice blocks to keep the catch fresh. Usually the boat returns to the home base port where the fish are unloaded.

At Thoppumpady in the north, we were told that it is on a rare occasion that boats would dock at other harbors. Here *tharakans* (auction agents) advance 2 - 7 lakhs for the operation of a boat. Fishermen are obliged to return to this location. Commission structures differ between 3% and 6%. At Beypore income is distributed as follows: 40-60% goes to fishermen workers on the boat and to the owner; 6% is paid to the *tharakan*. Although it is possible to go to other ports, the preferred port is the mother port as there exist agreements with financiers such as *tharakan*. Some *tharakan* advance between 2 lakhs and 10 lakhs depending on the size of fishing operation, and expect boats to return to their home harbor.

In Vizhinjam harbor in the far south, we observed only four trawlers, while most of the craft were *vallams* and some traditional *kattumarans*. From a spot near the Christian church of St Mary's, one overlooks the beach, which is adjacent to Vizhinjam harbor on the southern side. We observed a group of more than twenty *kattumarans* about 200 meters into the ocean. Most were manned by two fishermen, who dived for shellfish (see companion website for photo evidence). Several *kattumarans* have small outboard engines with long shafts.

The larger trawlers are mainly found at harbors in the north. In the south we were informed that some locals own trawlers that are stationed at the larger markets (such as Kollam) further to the north. This is mainly because the southern fish species and oceanic conditions do not favor catches that trawlers are designed for, while trawler catches are much larger and generate more profit. Trawlers are also very expensive to purchase and maintain, so the average fisherman cannot afford such an investment.

Fishermen are generally poor, and cannot finance their own boats. Even those who own their own boats often do not earn enough income from fish harvests to generate funds to maintain their boats, nor to afford the running costs. Some form informal cooperatives and club their funds together. Others join formal cooperatives, which often consist of large numbers of participants in a local fishing village. About 49% of all Thiruvananthapuram fishermen belong to cooperatives. Some fishermen fish on behalf of owners who do not fish. Some get a daily advance from a financier. They need to land at the market where the financier resides, which is typically also at their home base. Fishing is financed by a variety of stakeholders. At Vizhinjam we have come across only one fisherman who owned his own *vallam*.

After auctioning a lot, the auctioneer hands over the money to the financier, who pays the fishermen. In cases where financiers serve as commissioning agents, or offer advanced loans for the purchase of a boat, or its maintenance, the profit on the fish sold is regarded as interest, not as payment on capital. This implies that fishermen are perpetually in debt to financiers as it is basically impossible to reduce capital during the lean months. On the other hand, financiers do support their fishermen during lean months, so this is not exploitation.

E.3 Fishing

The oceanography along the Kerala coast is not homogeneous. Bathymetrics differ, resulting in different ecological regions at different distances from the shoreline. The different ecological regions house different types of fish species. Different fish species live in shallower waters than those in deeper waters. Some sardines, such as *Sardinella longiceps*, are caught by all boats as they live at a depth range of 20-200m, thus typically caught by trawlers. The *Amblygaster sirm*, on the other hand, can also live in lagoons, and can thus be caught by smaller craft. More details about fish species can be found on the companion website (Steyn 2014). The really large shoals of fish are not found in the shallower waters. Trawlers fish in the deep ocean, while *vallams* typically stick to around 2 km off shore. This results in different catch sizes and fish species at different landing centers, brought in by different types of boats. The larger boats and larger catches are typically found in the north.

Fish sold at the Valiathura market fetched a much higher price compared to Vizhinjam, even though both landing centers are part of Thiruvananthapuram city. Valiathura boats are not allowed to sell the fish at Vizhinjam. The fishermen were notably much happier and friendly at Valiathura. We saw many more smiling faces than at Vizhinjam. They were also more chatty and willing to offer much more information voluntarily even without being asked.

At Neendakara (near Kollam or Quilon) we observed much more variety of fish species than at Thiruvananthapuram: large prawns, smaller prawns, small fish (*podimeen*), *Ayala*, sardines and other large fish species. Kollam is further north than Thiruvananthapuram.

At Thottappally the fish, mostly sardines, were loaded into large baskets, and sold by auction per basket. The sardines are sold at markets in nearby towns. Fish are generally sold at suburbs and towns close by the landing centre. Mobile phone use are not used to determine market prices.

At Sri Gosreepuram Fish Landing and Marketing Centre we observed small quantities of fish, including sardines, *Ayala* and other smaller fish, which was auctioned in small quantities to private buyers. Customers buy fish for home use or for reselling in small villages away from the market.

From the shore of Kovalam's Lighthouse Beach, one can see the numerous boats fishing throughout the night. Fishermen use lights overhanging their boats to attract fish. One night we counted 20 and on another night we counted 40 *vallam* boats. They anchor close to the shore, typically about 2 km away, and use lights to draw the fish. Most boats do not land at Kovalam's Lighthouse Beach, or Eve's Beach but at Ashok Beach or at Vizhinjam.

At Kovalam we observed shoreline netting. This method involves a net deployed from a boat from Eve's Beach, while ropes attached to it reach the Lighthouse Beach. The net is deployed in the early evening and left overnight. The cooperative culture among fishermen, pointed out by Sreekumar (2010), was evident when about 40 fishermen pulled in the net the following morning. They did not benefit from the catch, and we were told that the fishermen whom they helped pulling in the net, would return favors for them.

The harvest of this net that we observed was extremely disappointing, with rubble such as plastic bags making up the bulk (see photo evidence Steyn 2014). A few measly fish and some crustaceans were the only edible catch. It should be noted that we paid our visit

during the low season. The few measly fish were auctioned off by one of the fishermen at this impromptu, informal beach market.

At Kochi, among other locations, Chinese netting is used. These nets are strung to a triangular shaped frame, while the whole frame is lowered from the shore into the water with a cantilever (see photo evidence Steyn 2014). This method does not yield large harvests, and fishermen sell directly to the public passing by their nets.

There are thus different customs of fishing, using different types of craft and gear, and of different types of fish species. These factors indicate that fisheries is not homogeneous along the Kerala coast. Thus, conclusions based on factors that apply to particular landing centers do not necessarily apply to others. Consequently, any statements about the behavior or customs of particular Kerala fishermen and markets cannot be generalized.

E.4 The fish markets

Fish markets are not homogenous regarding sophistication, property size, buildings, activities, fish species sold, prices fetched, types of craft landing, processes, stakeholder customs, or ownership.

Some markets are held on the beach sand, and may be regarded as informal, although they often have the same role players and stakeholders as formal markets. For example, the markets at Kovalam (at Hawa and Samudra beaches) and Vizhinjam are held on the beach sand, but they have similar stakeholders as the formal markets.

Varkala is a holiday resort, 50 km north of Thiruvananthapuram, but there is a fish market. Small-scale fishermen land here, and sell their fish on a beach market. When we visited Varkala, only *kattumarans* were active, while a few *vallams* were stored on the higher sands of the beach.

Other markets, especially in the north, are more formal, and take place in permanent constructed buildings. In the south Neendakara has a quality market building. Although Vizhinjam is a very important harbor in the far south, markets are held on the beach sand. There is a building construction, which looks like typical Kerala fish market buildings, but it was not used. It is on the northern side of the harbor, thus on the Muslim side, while we visited the Christian marketplace on the southern side. It is unclear whether the non-use of the building is due to this religious friction.

Most markets are held at the landing centers. Most landing centers are government owned. Sri Gosreepuram landing center at Goshree Road Bridge in Kochi is a privately owned center.

The decision to land a boat is made by various role players, but freedom of decision relates more to *when* the boats should land than about *where* the boat should land. Most often it seems to be the financier or boat owner who decides when to land, but often an auctioneer makes the decision. Note that boats have their preferred auctioneers, with whom they have a trusted relationship. It is for the benefit of an auctioneer to get a higher price for a lot, as his income would be higher if a lot fetches a higher price. There does not seem to be freedom of choice where to land. We found that typically it is the financier who decides when to land. This decision depends on a variety of factors, such as how busy the local market is, or whether their preferred auctioneer is available.

Once the boat is landed at the beach market, bidders immediately flock around it. In some cases the auction happens while fish are still on the boat. In most cases the fish are carried in baskets or other containers and the baskets emptied on the sand. At Vizhinjam, and other economically poor landing centers, fishermen carry their own baskets. At more

affluent markets paid carriers do this job. Different fish species are separated into small heaps. Bidders and other bystanders flock around the heap of fish in an informal manner, sometimes even stepping on fish, or between the small heaps - see the photo evidence (Steyn 2014).

In the south there is a lot of spitting of red chewed *paan* on the beach, and one must be careful not to get some on one's shoe when standing next to a chewer. *Paan*, known as *murukkan* in Malayalam, and also known as *parijat*, has four ingredients: betel leaf, Areca nut, cured tobacco and slaked lime paste. The market at Vizhinjam is very informal, and might be regarded as chaotic, as well as unhygienic according to western standards as fish is dumped on the beach sand among bystanders feet, and amidst all the spitting.

At several markets, even at larger ones such as Neendakara and Kalamukku, we observed several cycles of bidding on lots. More affluent bidders might buy a large lot, or several buyers may put their funds together to be able to buy a large lot in the first round of bidding. The winning bidders' lot would remain in place, while typically it would then be subdivided into smaller lots. These divided lots then go for a second round of bidding. On several occasions we have observed a third cycle of bidding on yet smaller lots. The last bidders are usually fishmongers, or public customers. Fishmongers buy directly from the market, typically from the smaller lots. This is not restricted to the small markets. For example, we observed fish mongers at Munambam and Kalamukku markets, which are some of the larger markets.

Once a bid is accepted, the buyer pays the auctioneer in cash. At Vizhinjam, often the auctioneer pays the church tax to the church tax collector, but we also observed financiers paying tax to the collectors and receiving a receipt. Receipts are always issued. There are quite a number of these church tax collectors, and not all seem to operate at the same hours every day. We also observed that the coalface tax collectors, after collecting their cut, handed over the money to the collectors one step up the ladder. Church tax collection only occurs at Vizhinjam.

Financiers and the more affluent tax collectors are easy to spot. By far the majority of people at markets wear traditional Indian clothing, but the financiers and tax collectors are cleaner, well-groomed, and their clothes are of much better quality. Many wear silk shirts, and expensive jewelry. They do not really participate in the market activities, but are mainly there to keep an eye on their interests, and to receive their daily income. They know one another, and within their circle of friendships, might share information such as locations where large shoals of fish could be found. They often stand together chatting and observing, sometimes talking on their mobile phones. When asked if they minded sharing what they were talking about, topics varied from talking with family members, their other businesses, to calling their regular auctioneer to come to the beach as his boat is landing, or to fishermen about the size of the catch or when to land.

One day, while mingling in the market, a man began talking to us in English, wanting to find out what we are doing at the market - as we were obviously not buying fish. He told us he lived about 12 km from the landing centre and visits the market every day to buy fresh fish for his family, except Sundays. He prefers to buy directly at the market than at a shop. He spends about 1 to 2 hours at the market every day. He does not use his mobile phone for this activity, and travels all the way on a small motorcycle.

At Kalamukku we interviewed *tharakan* (or auction agents). We told them we heard that fishermen could sell fish at markets where they could get better prices. They responded that in their case that would not be possible. They finance large numbers of fully mechanized trawlers, which then have to return to them. Such vessels cannot sell fish at other market places. Perhaps fishermen who owned and operated their own trawlers and

are not tied to *tharakan* are able to sell their fish at any port. This contradicts Jensen's claim. As we begun our field trip from the south, moving northward, we first thought when not finding any support of Jensen's claims that perhaps mobiles are used at the larger northern markets. The response from *tharakan* at Kalamuku (which is in the north) made it clear that Jensen's claim does not even apply to all northern markets.

After the cycles of bidding, at Vizhinjam most fish end up with fishmongers. Some have their "stalls" at the market, or in the nearest street. Their stalls consist of a crate or stone to sit on, and their fish is kept on ice in basins - all this in the open air, either on beach sand or in the street (see photo evidence, Steyn 2014). Some rent auto-rickshaws to take their fish to neighborhoods where they sell their fish either at fixed locations, such as street corners, or by going door-to-door. Some have regular customers, and they might keep fish apart for their special customers. What was interesting to note is that the trusted networks, discussed below, also apply to vendors and regular customers. The vendors know how much their regular customers would pay for a particular fish, and if on a particular day that fish is too expensive, they do not buy. On the other hand, when they indeed do pay more for the fish, their customers would nevertheless buy from them, as they trust that their vendor would be fair. This custom, observed in the south, is quite different from how liberal capitalist markets operate. This custom stresses how cooperation and trusted networks influences the operations of the markets in Kerala. As Sreekumar (2010) pointed out, the markets do not operate according to individualistic principals as implicitly claimed by Jensen.

Markets are often by-passed through direct selling. At Kovalam some restaurants serving fresh fish have arrangements with fishermen, who let them know about the catch. The main chef at the Cafe Spice Garden restaurant informed us that the fishermen with whom he has relationships phone him about the nature of their catch, and he places his order accordingly, collecting later when they land, and by-passing the market. If they do not have the fish he wants, he might visit the market. Note that mobiles are indeed used by fishermen in these cases - but not to determine market prices.

The menu price of fish varies. Large fish are usually cut into smaller pieces, but on occasion a whole fish is sold to patrons. On one occasion we observed negotiations on the price of a large fish between the restaurant owner and a group of about ten patrons. Negotiations stopped regularly, to be resumed a few minutes later. A deal was eventually clinched after about half an hour of bartering and the chef prepared the whole fish for the group.

Kattumaran fishermen often sell their catch directly to consumers. At Vizhinjam, we observed fishermen with *kattumarans* beaching about 20m away from the activities of the market place, selling their catch, which included shell fish, directly to the public, and by-passing even the church tax collectors. They seemed to be nervous, as they were not only by-passing the market, but also the church tax custom. They sold their catch immediately upon landing, and then took off as quickly. Direct selling is true not only of ocean fishing, but also for fishing on Vembanad Lake (known as the Backwaters of Kerala). Fishermen sell their fish directly to houseboats, which are like floating guest houses.

Landing at markets other than the home base is thus done not because of market prices, but because of safety or logistics. Other markets are only visited when weather does not permit safe passage, or when fuel is too low to reach the home base, or when the boat develops problems, or some other reasons than market prices.

E.5 Role players and stakeholders

Stakeholders at markets were generally very friendly and loved chatting with us, and in conversations gave us valuable insight into the operations of the fish markets. None of this

information contradicted what we have found in the literature study, except about the claim of the use of mobile phones used to determine market prices, and the freedom of choice to land at any market.

A variety of role players and stakeholders are found at markets, and not just fishermen and agents. In some cases role players are also stakeholders, but there is no necessarily one-to-one relationship between role players and stakeholders. In some cases different roles are performed by the same individual. Apart from fishermen, the following roles depend on activities at the fish markets:

- Fishermen. They are the harvesters and catchers of fish, but they are not necessarily boat owners. Neither are they necessarily the decision-makers about where to catch fish, nor where and when to land their boats. They operate on the production-side, and few are involved on the market-side.
- Boat owners are not necessarily fishermen. Anyone with money to invest in a boat can do so. As boats are expensive, ownership is often shared, either in informal trusted networks, or formal cooperatives.
- Financiers supply funds for purchasing boats, or for maintenance and running costs. Arrangements regarding interest rates, payback schemes, and so forth can be quite complex (see Steyn 2014 and to be published B).
- Auctioneers handle the bidding at markets. Financiers and owners have their own preferred auctioneers. Even after a boat has landed, they would wait for their auctioneer to arrive (sometimes from home) before unloading. Some auctioneers are also financiers, and some even own shares in a boat.
- Agents. In some cases at the large trawler-dependent markets in the north agents are used, especially for international selling of fish, but also by large bulk buyers based in Kerala. Agents typically have relationships and fixed contracts with bulk buyers and boat owners. These fixed contracts force boats to land at the fixed landing center. We have not come across agents at the smaller markets, not even at the important ones, such as Vizhinjam. Auction agents (or *tharakan*) finance large numbers of fully mechanized trawlers, which then have to return to them, and do not land at other centers.
- Church tax collectors. They are found only at Vizhinjam. They collect the tax from the sale of each individual lot directly after the sale, and issue receipts.
- Bidders. After landing, fish are divided into lots on which bidders bid. Bidders could be individuals buyers, or buyers who buy on behalf of other parties (including groups of vendors who club together). In the north these lots are huge. In the south they could be very measly, consisting of literally only a handful of fish. The more affluent bid on the first assigned lots. At some markets the lots are subdivided for another round of bidding. In some cases the second lot is again sub-divided.
- Resellers. They buy larger quantities of fish, sometimes in bulk, transport their stock to other locations where it is resold at those markets, typically in the interior. The size of "bulk" here is relative. In the south a reseller might buy a basket full of fish. In the north several trucks might be needed to transport the bulk stock.
- Vendors. They are female fishmonger selling to the public. Some sell their fish right next to the market, either also on the beach sand where the bidding took place, or the nearest road. Others use auto-rickshaws to transport their fish to other locations. They often club together to bid on a lot.
- Public. At most markets the public could buy directly by bidding. They are typically regular buyers who buy for household purposes.
- Carriers. Except at the poorer markets, paid carriers move the fish from boats to the market in baskets, and after the sale to trucks. They also add ice to the baskets. They are paid for each basket they carry.

- Ice-men. At smaller markets these ice men would buy blocks of ice from ice plants, and then crush the ice at the landing center to be sold to fishermen and to vendors. Ice is used to keep the fish fresh.
- Knife-sharpeners. They sharpen knives used by fishermen and vendors for a small fee.
- Fuel sellers. They buy subsidized fuel in bulk, and resell to boats at a small profit. Some also have other business interests, such as shares in a boat.
- Maintenance and repairs. Fishermen do not fix engines or the boat itself. There are maintenance and repair shops even at all the small harbors.
- Tuc-tucs, or auto-rickshaws. At most markets there are informal ranks where tuc-tucs are waiting to offer their services. It is obvious that participants in the markets require transport to get to the markets. At smaller markets, even the more affluent financiers and owners use tuc-tucs rather than their own transport. Tuc-tucs are also used by vendors to transport their fish to other sites.
- Other vendors. At most smaller markets other vendors sell their wares too, such as fruit, vegetables, refreshments, and basically anything that would sell.

This list of role players indicates that there are many types of roles important for the functioning of fish markets. Relationships between role players depend on trusted networks, built on the cooperative culture among fishermen. Time and again we were informed that fishermen would not go to other landing centers, as they are not familiar with the role players at other locations, and do not know if those could be trusted. The interdependence and close-knit communities of role players and stakeholders shed suspicion on views that claim that fishermen could land their boats at any market of their choice, especially with the aim to sell their fish at those foreign markets.

At Valiathura, one day during our visit there were six smartly dressed auctioneers. One came to talk to us as he was the auto-rickshaw driver who drove us to our hotel from Valiathura the previous evening. He works as auction agent in the mornings and then drives his auto-rickshaw during the rest of the day. He has about 15 boats for which he acts as auction agent. He deducts 3% of money of winning bids. This is split as follows: 1% for his commission, 1% for maintenance of the boat and 1% for welfare of the workers on the boat. No levy is paid to the church, and that 1% is kept to support fishermen during lean months. Another auctioneer said that he takes 5% cut from the catch. This 5% is divided as follows: 1% for his commission, 1% towards fishermen (workers) union for the care of the welfare of the fishermen, and 3% goes to the boat owner. The remaining 95% is divided or shared by all workers on the boat. On another occasion, someone else informed us that their share is calculated as follows: money is divided into 4 equal shares; 2 shares go to the two fishermen (1 share each, as there are two fishermen) and 2 shares for net and boat maintenance.

In our conversation with this group of auctioneers at Valiathura, they said that Valiathura port does not operate during about four months of the year when weather is bad. Boats then land at Vizhinjam, but they all confirmed that they are not allowed to sell fish there. Fish is transported to the Valiathura market by road. They guessed that 60% of the boats are owned by fishermen. Data from the Marine Fisheries Census (2010) indicates that 78% of craft in the Thiruvananthapuram are owned by fishermen.

Other stakeholders are ice suppliers for both fishermen and vendors. At Vizhinjam an individual has an ice crushing machine. He buys ice from ice manufacturers, and sells crushed ice at a small profit. Factory price for a 20 kg ice block is Rs60, while at the fishing

port, crushed ice costs Rs100 for the same weight. Ice deliverers also take a small cut. Compare this small-scale ice supply at Vizhinjam with the truck-load of ice delivered to a trawler at Beypore, and ice transported from the truck into the trawler by a mechanized conveyor belt. The scale of operations differ hugely between southern and northern ports. Also at the Vizhinjam harbor we observed a man selling his services as a knife sharpener. Photo evidence is available (Steyn 2014).

At some markets, such as Thottapally and Kollam (or Quilon), there are unionized carriers who carry baskets of fish from the boats to the market building. At markets such as Vizhinjam and Valiathura, fishermen carry their own baskets. At Vizhinjam the catch in a basket was often divided into smaller lots before being auctioned. At Neendakara baskets were auctioned without emptying them. Unionized loaders in uniform were present and they charged Rs40 for each basket they serviced. This means that they carry the basket, mixing the contents with crushed ice and load it onto delivery trucks. Carrying baskets to trucks costs Rs30 per basket. At Thottapally a service fee of Rs40 per basket for loading and Rs35 for stacking was charged by handlers. No other charges (such as religious tax) apply.

This division of labor implies that should boats go to better markets at other locations to sell their fish there, on that particular day none of those involved in the complexities of the home market would have an income. Fish markets involve many stakeholders, and they are closely networked in local communities. Trust is an important value in these networks, and role players prefer to operate within their own networks. Operating outside one's network is to be avoided, which implies that landing at other sites is not a regular occurrence.

E.6 Religion and church tax

The majority of fishermen in Vizhinjam are Christian (84% - according to the Marine Fisheries Census 2010), but there is also a strong Muslim community (14% of fishermen are Muslim). The Vizhinjam harbor is divided in two sections. Christian fishermen occupy the southern part, while Muslim occupy the northern part. There are three mosques on the northern side of the harbor. The Christian St Mary's is a few hundred meters inland on top of the hill on the southern side, and its tower can be seen from the beach market. There is a small Christian chapel right next to the Christian beach market.

The reason for the division of the harbor is historical. In 1995 a dispute broke out between Christian and Muslim fishermen. About ten people were killed. At that stage fishermen from other villages could land at Vizhinjam and sell their catch there. The Christian church then brokered a deal between the factions, after which fishermen from other villages were not allowed to land or sell their fish at Vizhinjam. Note that this happened before Jensen's research was conducted. In cases of bad weather boats from other centers are allowed to use the port, but they are not allowed to sell their catch at the Vizhinjam market.

The Church offers financial loans for various fishing activities, while it collects 1% of all activities at the fish market. The tax is used to support standard religious activities of the church and for humanitarian work, and also for schools it runs for the community. The church also supports fishermen during lean seasons. There is an information center where Internet computers are accessed by the community for educational and for search activities. The facility was closed at the time of our visit, as it was being prepared for a function. We were informed that fishermen can use the facilities for searching areas where fish can be caught, but it was not explained exactly how this works. Fishermen usually learn their trade on the job from a young age, including known areas and signs where fish are typically found. As far as we can tell, there is no online service reporting the movement of fish, so we are unsure how to interpret the use of the internet by fishermen. We were not able to visit the church official again to get clarity on the matter.

Licensed tax collectors act on behalf of the Church. The license is very expensive. We were told by license holders that the license costs one crore thirty lakhs (Rupees Rs13'000'000, or more than USD200'000). We could not verify this, and we are rather skeptical about this statement. From the poor catches we observed during the days of our visits to the Vizhinjam harbor, we find it hard to believe that the expenses of one percent plus tax collector commissions could provide enough profit to pay back the loan of more than USD200'000, especially given the poor prices fetched at the market, and the fact that more than one license is issued. Most fish lots we observed at Vizhinjam represented the total catch of the day for a boat, and sold for around Rs1000-Rs2000 (USD16-USD32). We never counted the number of lots sold per day, but the total certainly did not approach three digits, although admittedly, our visit was during the lean season.

As the tax collecting license is so expensive, cooperative groups are formed to tender for the few licenses that are issued. There is an annual tender process. None of the primary license holders collect the tax directly from sales. Collection is sub-contracted. Some of these contractees sub-contract again to collectors on the ground. We have found three layers of sub-contracting.

Church tax only applies to Vizhinjam. Fishermen at Valiathura - about 8 km from Vizhinjam - pay no church tax. They are supported during lean months by their financiers or boat owners.

These different local customs at Vizhinjam argue against any attempt to generalize findings about the fisheries in Kerala. The market at Vizhinjam operates very differently from the markets in the far north, where Jensen's research was conducted.

E.7 Use of mobile phones and other ICTs

A wide range of ICTs are used in the fisheries industry, ranging from landline phones, mobile phones, the internet, broadcast radio, two-way radio, GPS, sonar, electronic boards, loudspeakers, and others. Details are discussed in Steyn (to be published B).

The most glaring omission from Jensen's paper is not considering the use of these other ICTs in communications between boats and the shore. Attempts to justify the use of mobile phones by referring to the longer range of later mobile technologies are not supported by our findings, several years later, when technologies should have improved even more. But range is not the major issue of concern. It is strange that Jensen does not address the role of two-way radio, which all trawlers use (at least all the trawlers we encountered). If it were indeed important for fishermen to communicate about where to land with their fish, why is the use of radio not considered? And regarding the claim that fishermen share knowledge about where fish is found, this would typically happen in the deep ocean, far beyond the reach of mobiles. If this sharing indeed happens, fishermen would need to use radio, not mobiles. We found that ICTs typically used by Munambam boats are GPS, depth sonar and radio. Mobile phones are not used while out at sea, and certainly not to determine market prices.

The use of mobiles would apply to the smaller *vallam* type craft that fish about 2 km off shore. They are within reach of signals. Yet not a single of our conversationalists confirmed that mobiles are used to determine market prices, nor to share information about where fish can be found. In the few cases where such information is shared, it is between boat owners on the shore (and obviously owners within particular trusted networks), not as much between boats.

Fishermen with whom we had conversations confirmed that they use mobile phones while at sea. They are in constant touch with the owner or financier and exchange information

such as the nature of fish caught and how to maximize the catch. They also contact family. But not a single conversationalist self-reported using mobile phones to determine market prices. When prompted about this, responses include those already mentioned - that it is either impossible, not worth it, too expensive, or that there are prior local arrangements (such as with particular and preferred auctioneers or financiers or even clients). Unlike trawlers that are used for deep ocean fishing, *vallams* fish along the shallower seabed about 2 km off shore, so mobile communication from the boats to shore is much more likely than from trawlers. If Jensen's claim is true, one would thus expect fishermen on *vallams* to be the ones who use their mobile phones to determine market prices. But they do not. More devastating to Jensen's claims, neither do trawler fishermen use their phones while at sea, as they are generally too far out, out of reach of the signal. Although they use radio, none of them use radio to determine market prices.

As there is not much of a market at Kovalam, it comes as no surprise that mobile phones do not really feature to be used for business purposes, except between some fishermen and local restaurants. But here the relationship is on first-name basis, and not the cold, anonymous impersonal market of highly developed market places. Mobiles are used by fishermen to inform regular clients, while clients phone known fishermen to find out if they do not perhaps have some or other kind of fish species in their nets. The market place does not play a large role in such contexts, while the majority of small, independent fishermen do their business in this manner.

At Valiathura we had a long conversation with a fishermen with very good command of English. During the conversation, when discussing the claim that fishermen use mobile phones to exchange information about where shoals of fish could be found, he responded that they would often deliberately give the wrong coordinates to such inquiries as they do not wish to share their catch. Contrary to this, a boat financier said that owners or financiers often shared such information, and then phone their boats to tell them where to go fish.

Several *tharakan* at Kalamakku said that there is no mobile contact with land while deep at sea. It is impossible as it is beyond the range of the phones. When boats return and get into reach, fishermen contact the owners by mobile phone to inform them of the arrival time and an estimated quantity of fish. Market price or search for better markets do not feature at all in their conversations.

At Bepore we were informed that mobile phones are rarely used as the boats fish in areas beyond the range of the phones. Two-way radios, depth sonar and GPS are commonly used on all trawlers.

Mobile phones are not used by Thoppumpady fishermen as these trawlers travel too far out into the ocean. ICTs used are GPS, depth sonar and radio.

Mobile phones are indeed used by fishermen to communicate with people on shore. Conversations, however, are not about determining market prices, or where to land because of better prices elsewhere. Apart from topics such as the weather and locations of possible better harvests (communicated only within the circle of the trusted network), the timing of landing is discussed. Where phones are indeed used, it is about *when* to land; not *where* to land.

One morning when we arrived at Valiathura at 6:00 in the morning, we were puzzled about the number of boats waiting just off shore at the end of the pier, not fishing, but also not beaching. There were few people at the beach market. About an hour later when the waiting crowd grew larger, suddenly boats began to beach one after the other in quick

succession. We discovered that if boats land when there are few bidders, prices are low. So the owners, financiers, or auctioneers, who are in constant communication with one another, make the decision when they boats may land. Mobile phones are used for this communication. It must be emphasized that none of this communication involves sending off boats to other landing centers. Mobiles are used for communication between fishermen, but not to determine market prices. Mobiles are also used by those on land to warn fishermen of approaching bad weather. We were told that police drive around the area using loudspeakers to warn the villagers about approaching bad weather, who then phone their family or friends on boats to warn them to make a run for land. These boats fish close to shore, well within reach of mobile phones. Communication with owners or financiers and family rather than for market use, are the most common uses of phones.

In cases where mobile phones are used to communicate about landing at a center, the purpose of use is about the timing of the landing, not the location. The concern of a better market price is at the same landing center, not one geographically removed, as Jensen claimed.

F. Conclusion

There is much diversity in conditions, customs and practices between different landing centers and markets. Not even commission and profit sharing practices are the same. Differences are found on many different levels: oceanography, fish species, weather patterns, infrastructure, market practices, and more. These differences show that research findings that might apply to one locality cannot be generalized to others, as Jensen has done.

None of our conversationalists used mobile phones to determine market prices at other markets, and when they use their phones it was to communicate with their home landing centers about practical or personal matters. In cases where activity in the market leads to the decision for boats to come in, they applied to their own home market. In these cases it was more about timing than about other markets -- it was about *when*, not *where*. There were isolated cases who mentioned that some fishermen might phone for market prices at other landing centers. But such calls seem to be just for interest's sake. Also, counter-examples were given in almost all cases why those interviewed did not or could not take their fish to other markets. Reasons given varied and include the following. Local customs, such as at Vizhinjam, might allow boats from other landing centers to use the harbor for safety and other purposes, but they are not allowed to sell their fish there. Fishermen are often financed in advance, and are expected to return to the harbors where their financiers are waiting for them. Boat licensing enables fishermen to obtain subsidized fuel at their home landing base, and as their profit margins are small, they would not go to other harbors where they would need to buy un-subsidized fuel.

What we did find is the use of mobile phones for calls between financiers and boats. Financiers and other stakeholders inform the boats when to land, but not where to land. The time of landing is important as one would typically fetch higher market prices when the market is busy, and by implication when there is more competition. At Valiathura we observed a large number of *vallams* waiting for almost an hour just off shore, obviously not fishing but waiting for something. This was early in the morning, and the market was still quite empty. People trickled in, and then, suddenly, boats began streaming in. We were told that financiers do not want to have their fish sold when the market is too quiet. In cases where agents, such as auctioneers or financiers phoned friends at other markets to find out about their prices, it was more about determining how well their market was doing comparatively speaking than to make the decision to rather land at another market.

The importance of trust and cooperation are traits that do not show up in mere statistical analysis. Fishermen have relationships with auctioneers, with their financiers, and with local suppliers of supplies and ice, or mechanics to do engine maintenance. Going to "foreign" harbors would mean dealing with strangers, which they would rather not do. Srinivasan and Burrell (2013) found the same: that fishermen are hesitant to deal with those whom they do not have a trusting relationship. Fatigue was another reason given why fishermen prefer to return to their home base. This was also reported by Srinivasan and Burrell (2013). Fishermen are much more interested in getting rest than increasing their profit by going to a different market.

Given the diversity of customs at fish markets within the state of Kerala, we suspect that Tamil Nadu, which is also in the south and with just slightly less fish production than the state of Kerala, and located in the Bay of Bengal, will certainly be different to Kerala. So will the top three fishing states: West Bengal, Andhra Pradesh (both in the Bay of Bengal) and Gujarat (at the Arabian Sea). Fish markets in other parts of the world will also differ; and so will other industries. Local contexts differ. The contexts within which mobile phones are used differ, and if a particular use was found in one location, it does not mean that that particular use will be found in other contexts. Over-generalization is not only a logical fallacy. Our fieldwork also indicates that it is not possible in practice to generalize from one particular instance. In his paper Jensen committed the logical fallacy of over-generalization.

In addition to over-generalization, Jensen also confuses correlation with causation, as pointed out by Steyn (to be published A). Jensen regarded the growth of mobile phone sales as causation of the increased fish market prices, but there are several other factors that could have lead to market stabilization. Moreover, the sources on which Jensen bases his claims about mobile phones are suspect. They are mass media newspaper articles, not based on proper research methodologies.

Given all these problems with Jensen's paper, and the results of our fieldwork study, we conclude that there is little support for Jensen's claim that mobile phones are used to determine market prices, and that boats could land anywhere where prices are better, which in turn supposedly leads to better welfare in developing regions.

For all these reasons, we are skeptical about Jensen's claims that it is possible to visit any harbor of a fisherman's choice. In fact, there is overwhelming evidence that his conclusions are just plain wrong.

Acknowledgements

1. The Principal Secretary to Government (Fisheries & Ports), Government of Kerala for granting permission to undertake research among Kerala Fishermen.
2. Central Marine Fisheries Research Institute (CMFRI), Kochi, Kerala for providing valuable information which assisted us in our research.

G. References

A comprehensive list of consulted literature is available at Steyn (2014). Here only referenced literature is listed.

Abraham R (2007). Mobile Phones and Economic Development: Evidence From the Fishing Industry in India. *Information Technologies and International Development*, 4(1): 5–17.

Jensen R (2007) The Digital Provide: Information (Technology), Market Performance, And Welfare In The South Indian Fisheries Sector. *Quarterly Journal Of Economics*, CXXII(3): 879-924.

John, B.T., Jubi, R (2013). Impact of mobile phones on the life of fishermen in Kerala -a study with reference to Thiruvananthapuram district. *Intercontinental Journal of Marketing Research Review*, 1(7): 47- 51.

Kerala Marine Fishing Regulation Act (1980). Available at http://previous.wiego.org/informal_economy_law/india/content/fw_kerala_1980.pdf, last accessed February 2014.

Kerala Marine Fishing Regulation (Amendment) Bill. (2013). Available at , last accessed February 2014.

Kumar, P.S. (1999). Technology and labour process: a case study on fishing industry in Kerala. PhD dissertation, Cochin university, available at <http://shodhganga.inflibnet.ac.in/handle/10603/1508?mode=full>, last accessed February 2014.

Marine Fisheries Census 2010. Kerala. Central Marine Fisheries Research Institute, Kochi. Part II: 6.

Sreekumar, T. T. (2011). Mobile Phones and the Cultural Ecology of Fishing in Kerala, India. *The Information Society: An International Journal*, 27:3, 172-180.

Srinivasan, J., Burrell, J. (2013). Revisiting the Fishers of Kerala, India. International Conference on Information and Communication Technologies and Development 2013. Cape Town, South Africa.

Steyn, J. (2014). Mobile phones and the Kerala fishing industry. Available at <http://www.steyn.pro/kerala/>.

Steyn, J. (to be published A). A critique of Jensen's claims about mobile phones and Kerala fishermen.

Steyn, J. (to be published B). A case study of Kerala fisheries and the use of mobile phones.