FAUNA & FLORA INTERNATIONAL

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Bay of Bengal
Large Marine Ecosystem Project

SOCIO-ECONOMIC BASELINE ASSESSMENT

Thayawthatangyi and Langann Islands
Myeik Archipelago, Myanmar

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The Tanintharyi Conservation Programme is an initiative of Fauna & Flora International's (FFI) Myanmar Programme, implemented in collaboration with the Myanmar Forest Department and a number of local, national and international collaborators and stakeholders. FFI Myanmar operates the programme under a MoU with the Forest Department specifically for marine and terrestrial conservation activities in Tanintharyi Region.

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Cover image

Discussing marine resource use patterns with community members in Myeik Archipelago. Credit: FFI Myanmar.

Table of contents

List of tables

List of figures

ACRONYMS

BOBLME	Bay of Bengal Large Marine Ecosystem
CDMA	Code division multiple access
FAO	Food and Agriculture Organization
FFI	Fauna & Flora International
GEF	Global Environment Facility
HH	Household Questionnaire Survey
KII	Key Informant Interviews
LMMA	Locally Managed Marine Areas
SocMon	Socio-economic Monitoring

EXECUTIVE SUMMARY

This report details the methodology and results of a 2014 socio-economic baseline assessment of 4 villages in the Myeik Archipelago, Myanmar, undertaken as part of a programme of work to build local stakeholders' capacity to use socio-economic data to inform marine resource planning and management. This initiative is part of a programme of work using funding support from the FAO-GEF Bay of Bengal Large Marine Ecosystem (BOBLME) Project to enhance capacity to carry out Socio-economic Monitoring (SocMon) and generate SocMon information. The assessment is intended to improve understanding of the different socio-economic conditions within and between studied communities to help set objectives and design relevant activities, alongside local actors, in pursuit of sustainable coastal and marine management and biodiversity conservation. It also provides an initial baseline, alongside biophysical data, against which to monitor and evaluate the impacts of future management interventions on these communities' lives and livelihoods, and on the biodiversity of their marine resources.

Data reveal that there are significant differences both within and between the communities studied. This finding has implications for design of management interventions given that evidence from around the globe indicates that community-based sustainable natural resource management and equitable common pool resource governance are harder to achieve where resource users are heterogeneous. Approaches will likely need to be tailored to the characteristics of different groups, with particular care taken with the traditionally nomadic Moken community due to their distinctive culture, language and vulnerability to marginalisation.

The populations of all 4 villages are young and growing with implications for increased future pressure on natural resources unless young people have other livelihoods options. However, young people may be more open to new ideas and ways of working which can provide opportunities to encourage more sustainable marine resource use practices. In-migration does not appear to be a major source of population growth but it does seem to be changing the ethnic composition of the Langann Island community which was originally a Moken settlement but has in recent years attracted largely Bamar migrants who provide services to 'outside' fishers, some of whom are engaged in unsustainable fishing practices.

Household survey data indicate low levels of diversification - often an indicator of vulnerability to socio-economic and environmental change, including climate change impacts. However, no occupation is recorded for over a third of adult household members in most locations – indicating either under-reporting or under-employment. Most marine and agricultural produce is reportedly sold, rather than consumed at the home, suggesting that subsistence use is under-reported and/or people are heavily reliant on 'imports' from the mainland and therefore dependent on a cash economy. Marine products are largely sold on landing or to traders at village level with reports of inequitable client-patron relationships in which fishers have little or no power. Both these factors also have implications for livelihoods vulnerability, resilience and adaptive capacity.

Perceived decline of all important commercial species catch is potentially a suitable issue around which to encourage mobilisation of local stakeholders. The high proportion of respondents lacking knowledge on resource conditions and trends, and on existing rules and regulations, as well as low levels of participation in resource management decision-making all

indicate the need to support deliberative processes through which local stakeholders themselves can start to identify and explore the causes, effects and mitigation strategies for resource threats and degradation.

INTRODUCTION

Fauna & Flora International is working with a range of state and non-state actors in Myanmar to improve their capacity to establish co-managed marine areas for the benefit of local fishers and the conservation of coastal ecosystems and associated species of high commercial, subsistence and biodiversity value.

This report details the methodology and results of a socio-economic baseline assessment of 4 villages in the Myeik Archipelago, Myanmar, undertaken as part of a programme of work to build local capacity to analyse and use socio-economic data to inform marine resource planning and management. It constitutes the principle output of 3 main activity streams:

- An initial training workshop on socio-economic assessment of coastal communities held at Mawlamyine University in Myanmar in January 2014, attended by 20 participants[1]
- Fieldwork to conduct the assessment in target communities in June and September 2014
- A further training workshop to analyse the data and draft this report in October 2014

This initiative is part of a programme of work using funding support from the FAO-GEF Bay of Bengal Large Marine Ecosystem (BOBLME) Project to enhance capacity to carry out Socio-economic Monitoring (SocMon) and generate SocMon information.

OBJECTIVES

The objectives of this socio-economic assessment are to:

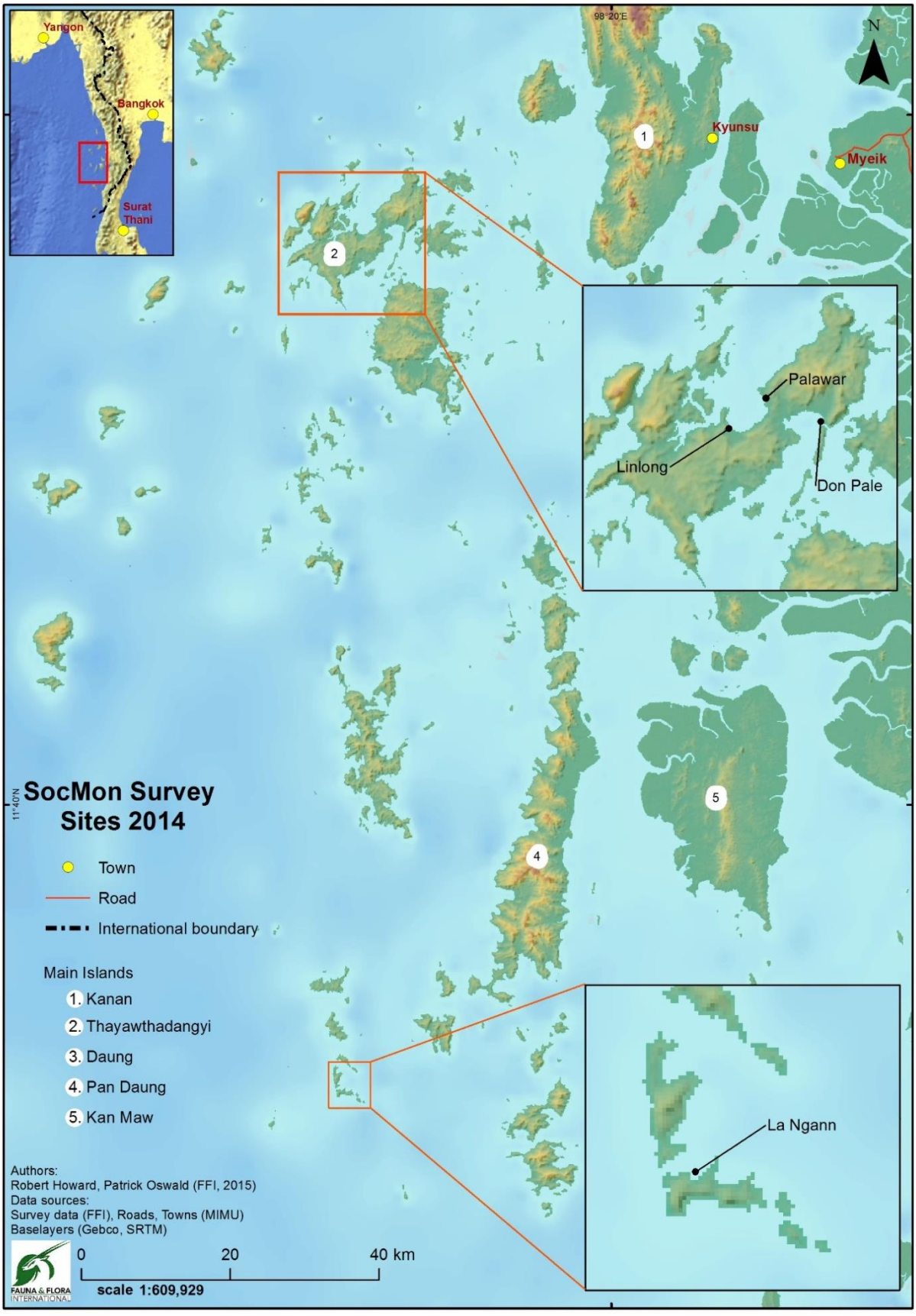
- improve our understanding of the socio-economic context of the target island communities
- determine if there are any significant correlations between location/demographics and respondents' livelihood strategies and their marine resource use, knowledge, attitudes and perceptions
- explore how such socio-economic data can inform appropriate programme strategies/ management interventions and activities
- highlight remaining knowledge gaps
- identify the most appropriate indicators for monitoring and evaluation, including being able to measure differentiated impacts on different groups within the communities

LOCATION OF RESEARCH SITES

Of the study sites, 3 villages – Don Pale, Palawar and Linlong - are located on Thayawthatangyi Island in the northern half of the Myeik Archipelago approximately 30 nautical miles from Myeik township. By ferry from Myeik, it takes approximately 5 hours to reach Don Pale, the main village on the island. The 4th site, Langann, is situated further south, about 12 hours travel by fishing boat from Myeik township (Figure 1).

[1] See http://www.boblme.org/meetingDisplay.php?eventDisplay=2243 for workshop materials and report

Figure 1 Location of studied island groups and communities within the Myeik Archipelago



METHODOLOGY

Following an initial reconnaissance visit in December 2012 (Saw Han Shein et al 2013), a socio-economic survey of the communities of Palawar, Linlong and Don Pale[2] was undertaken from 3rd to 28th June 2014. The survey methodology combined semi-structured key informant interviews (KIIs), field observation, secondary data collection and household questionnaire survey (HH) using predominately SOCMON[3] indicators. A small number of additional indicators were added to the household questionnaires to try to better understand the cultural ties to fishing as a way of life and to identify trusted sources of information within the community. A similar survey was undertaken in Langann village, Bok Pyinn township, from 24th to 30th September 2014.

The household surveys were conducted using random sampling and key informant interviews were held initially with village leaders and then other key informants identified from those conversations (the so-called 'snowball method'). Sample sizes for household survey are given in Table 1. Data from the key informant interviews, secondary sources and field observation notes were used to understand basic demographics (population size, ethnic composition, mother tongue, religion and adult literacy rates), primary occupation (categorised as fishing, agriculture or other), basic services and infrastructure. Additional information was gathered on the characteristics of the Moken ethnic group – the original nomadic fishing communities of the archipelago – and on the history of settlement and in-migration to the area by members of other ethnic groups. Household questionnaire survey data were analysed using SPSS v.19 and the results validated by cross-reference with the other data sources wherever possible.

Table 1 Household survey sample sizes

	Don Pale A	Don Pale B	Linlong	Palawar	Langann
No. households surveyed	35	22	43	15	23
Sample as % total households	18.5%		35%	24.6%	28.8%

RESULTS

Infrastructure and basic services

Infrastructure and basic public services are limited in all studied locations. Don Pale is the best served with 2 pre-schools, 1 of which is exclusively for Moken children to enable them to learn in their mother tongue. Don Pale also has a combined primary and middle school. Linlong and Palawar both have primary schools and Linlong also has a pre-school. Langann has a primary/middle school originally established with private investment about a decade ago but officially adopted and staffed by the state from 2014. The nearest high school for all communities is on the mainland in Myeik township.

[2] Don Pale is officially recognized as a single village and secondary data sources are only available for the whole village. However field observation and key informant interviews identified that it comprises two separate settlements with very different household demographics. Hence household survey data have been analysed separately for each of the 2 settlements arbitrarily coded Don Pale A and Don Pale B.

[3] Bunce, L. and B. Pomeroy (2003) Socioeconomic Monitoring Guidelines For Coastal Managers In Southeast Asia: SOCMON SEA

Only Don Pale has government health facilities (clinic and nursing staff) while Langann has a single private health clinic. Water supply in all Thayawthatangyi villages is from wells or streams. Langann has a small storage dam but residents often run out of water in the dry season and have to collect fresh water from neighbouring islands. In all communities the only electricity supply is by individual household generators. In terms of communication channels only Don Pale and Langann have CDMA telephones but all communities have at least some households with access to radio and (fewer) to satellite TV. All communities have teashops and grocery stores, as well as places of worship (church and/or monastery depending on religious mix of the community). Don Pale and Langann each have a library and Don Pale also has a football field.

Community demographics

Village records, field observation and KII data show that Don Pale is the largest village of those studied in terms of total population and number of households, followed by Linlong and then Langann. Palawar is the smallest settlement (Table 2). Household survey data reveal the mean age of all respondents across all locations to be 22.3 years old (σ=16.22). There is no significant difference in mean age of the population, mean age of household head (41.7 years) or age cohort distribution by location. Village records show a high proportion of the population is made up of children and youth. This is borne out by survey data which reveal that 55.2% of the total sample population is under 21 years old (44.2% under 17).

Mean household size according to village records varies between 4.8 and 5.6 but household survey data suggest these figures should be slightly higher – with a mean across all sites of 5.76 (σ= 2.197). Analysis of household data demonstrates no significant correlation between household size and either location or ethnicity. There are however weak but significant correlations between household size and both educational level and age of household head: the better educated the head, the smaller the family size and the older the head, the larger the family size.

Table 2 Basic population data for all communities

		Don Pale	Linlong	Palawar	Langann
Population	Total	1650	689	316	381
	Adult	849	387	n/a	210
	Under 18	801 (48.5 %)	302 (43.8 %)	n/a	171 (44.9 %)
Sex ratio M:F Total pop. (%)		49.5 : 50.5	n/a	51.3 : 48.7	51.4 : 48.6
	Adult	51.5 : 48.5	49.4 : 50.6	n/a	n/a
	Under 18	47.5 : 52.3	n/a	n/a	n/a
Number of households		308	123	61	80
Mean household size		5.4	5.6	5.2	4.8

Source: KII 2014 and village records (n.d)

Table 3 clearly shows that the primary language composition varies between communities. This finding is borne out by survey data which demonstrates a highly significant, strong correlation between language[4] and location (C = .648; p <.001).

Table 3 Community composition by primary language group

	Don Pale	Linlong	Palawar	Langann
Karen	60 %	97 %	37 %	0
Bamar	28 %	2 %	2 %	35 %
Moken	12 %	1 %	61 %	65 %

Source: KII 2014 and village records (n.d)

As illustrated in Figure 2, survey data reveals that, when analysed as 2 separate settlements, Don Pale A and B have significantly different ethnic composition. Moken constitute nearly 72% of the population in Don Pale B but only around 1% in the larger settlement of Don Pale A which is dominated by Bamar and Karen people (49% and 45% respectively). The picture for Langann is less clear with undated village records showing a majority Moken population (65%) but household survey data suggesting that Burmese speakers now make up the majority as a result of in-migration and intermarriage[5].

There is also a strong relationship between ethnicity and religion for the Karen (Christian) and Bamar (Buddhist) people but those Moken who have converted from their traditional belief system appear to adopt the religion of the majority of their neighbours i.e. in the villages on Thayawthatangyi the Moken convert to Christianity but in Langann to Buddhism (Table 4).

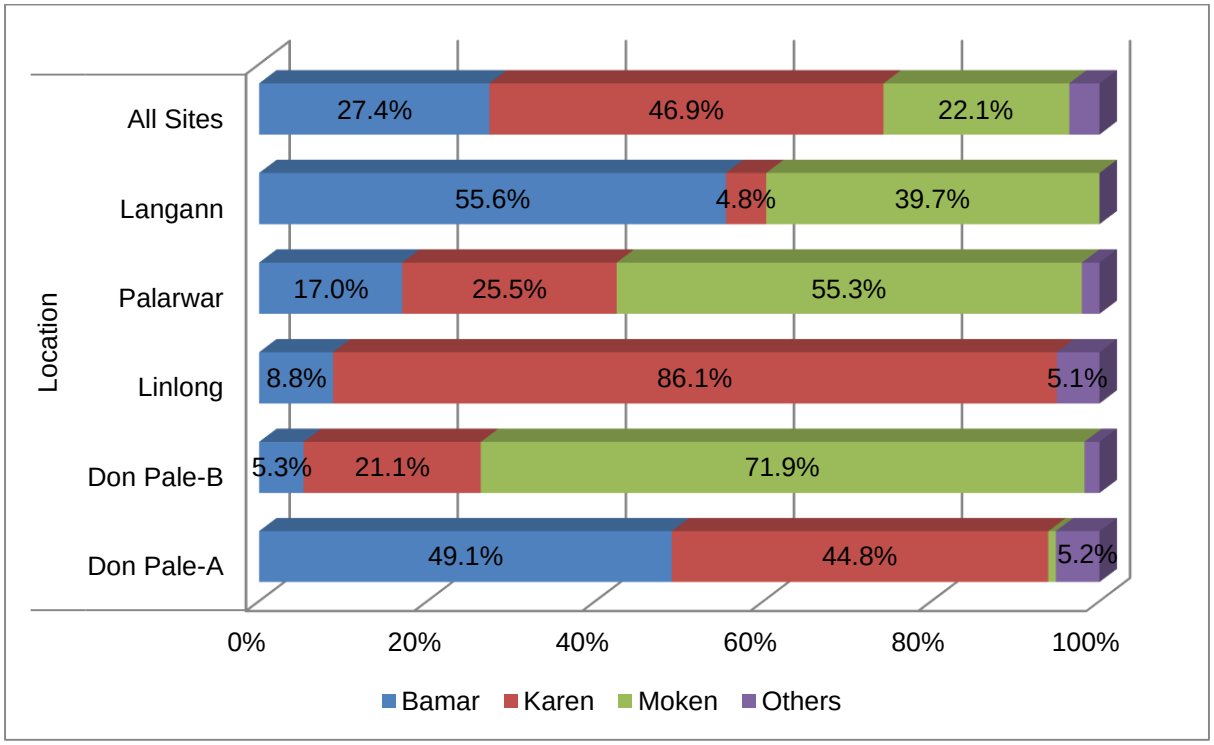
A note on the Moken people

The Moken 'sea nomads' were traditionally seafaring people, who travelled great distances in small boats to access a range of marine resources. It is hard to establish their exact origin or how long they have lived in Myanmar waters, but records suggest that they have been living in the Myeik Archipelago since at least the 18th Century. Their range stretches the whole length of the archipelago down to the south of Thailand in the Andaman Sea. In the past 20 years, they have become more settled with most living at least part of the year in 10 permanent villages while still maintaining their dependence on marine resources and many of their other traditional cultural practices.

[4] Given the strong correlation between primary language and ethnicity and the challenges arising with coding ethnicities within inter-ethnic households, language is used as a proxy for ethnicity in the analysis of household data presented in this report.

[5] See subsequent section on in-migration for further analysis.

Figure 2 Household members' primary language by location



Source: household survey 2014 (n=420)

Table 4 Religious composition of communities

	Don Pale	Linlong	Palawar	Langann
Christian	62.2 %	97 %	98 %	0
Buddhist	27 %	2 %	2 %	99 %
Muslim	0.8 %	0	0	0
Animist	10 %	1 %	0	1 %

Source: KII 2014 and village records (n.d)

In-migration

The surveyed sample of residents in Don Pale A and Linlong includes significant first generation in-migrants (51% and 28% respectively) whereas the majority of respondents in Don Pale B – and to a slightly lesser extent Palawar - were born there.

The first recorded permanent settlement at Langann was by 15 Moken households in 1999; previously Moken families had only sheltered there in the rainy season. It was formally recognised by the government as a village in 2005 by which time it had grown to 40 households. The number of households has since doubled to 80 at the time of this survey.

Household survey data analysis indicates that there are significant differences in migration status across the different sites (C=.328; p=.002). Based on the sample population across all sites, there has been a doubling of in-migrants every decade from 1980 to 2009 but this trend now appears to be slowing – or at least stabilising - in the first half of the current decade. Most respondents cited the search for better livelihoods opportunities as the reason for moving to the islands. Household data reveal that while 43% of recent migrants state their primary

occupation as fishing (by net, diving or longline), the same proportion engage in livelihoods activities, such as commerce, which are not directly exploiting marine resources but do provide goods and services to fisher – and other - families. A minority of recent migrants moved due to marriage or posted by the government as civil servants, health workers or teachers.

Education levels

Key informant interviews and village records show a marked difference in adult literacy rates across the population with literacy in Palarwar and Langann being particularly low as illustrated in Table 5.

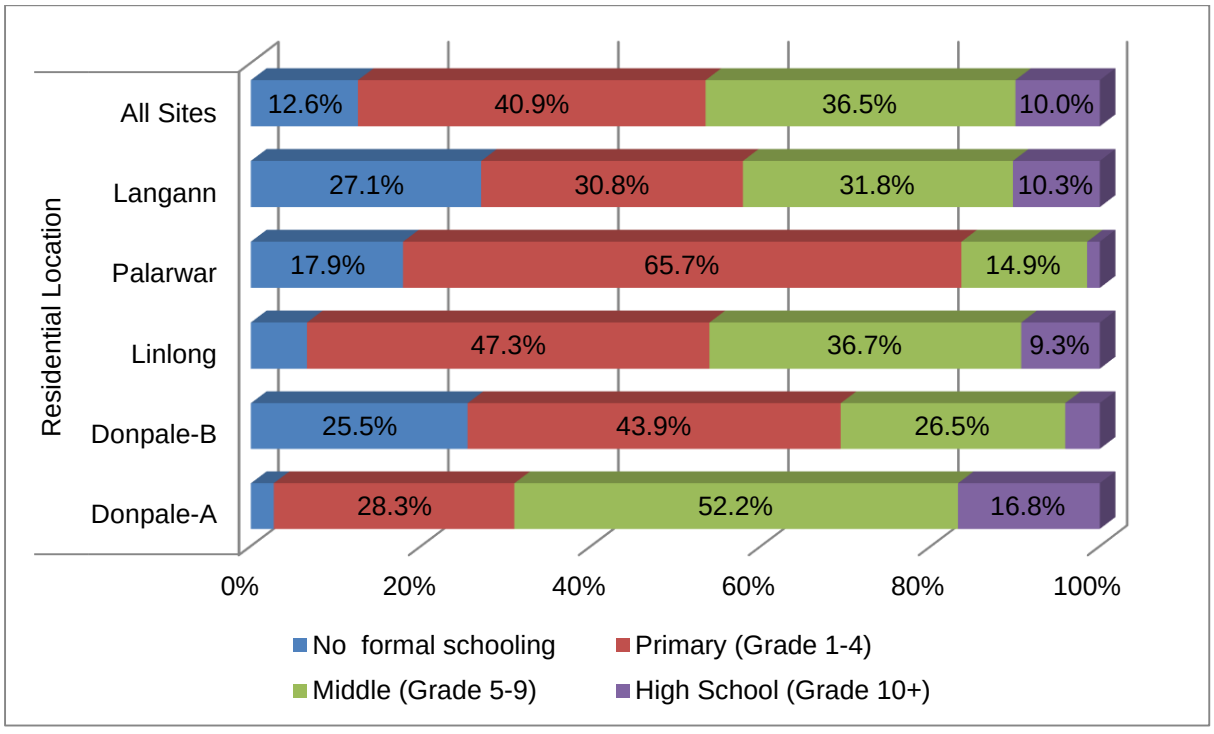
Table 5 Literacy rates by location

	Don Pale	Linlong	Palawar	Langann
Literacy rate	70 %	75 %	10 %	20 %

Source: KII 2014 and village records (n.d)

Figure 3 illustrates levels in educational attainment and reveals that less than half of total sampled population over 5 years old have proceeded beyond primary education[6]. The differences in educational attainment between locations are statistically significant (C=.382; p=.000) as might be expected given the geographical distribution of educational facilities. The communities with the highest proportions of Moken households – Palawar, Don Pale B and Langann - have the lowest rates of education.

Figure 3 Educational attainment by location (all household members over 5 years)



Source: household survey 2014 (n = 682)

[6] This analysis includes the high proportion of the population still of school age – who may or may not still be enrolled. Hence some of those with access to middle school in Don Pale A and Langann may have potential of achieving higher levels of attainment in the future.

Food and income security and relative wealth

68% of respondents report struggling to meet their households' basic needs throughout the year. Of those experiencing difficulties, 90% report the period June-September as being the most difficult, corresponding with the rainy season. The remaining 10% are chronically poor i.e. cannot meet their household needs at any point during the year.

Table 6 illustrates the distribution of households according to 3 broad 'wealth' classes or categories derived from cumulative analysis of house construction materials. The differences in wealth distribution across the sites are strong and statistically significant (C=.496; p-value =.000). The same is true of differences across ethnic groups (C=.309; p-value =.006): Moken households are the most likely to fall into the poorest category (59.4%), characterised by houses made of bamboo with nipa leaf roofs. Bamar households tend to be better off with 69.8% falling into either the middle or wealthiest class. Of the Karen households surveyed 38.7% are found to be in the poorest and 48.4% in the middle class. There are also weaker but still significant differences between migrants and non- migrants (C = .207; p-value =.05) with just under half of migrants in the middle class and the remainder approximately equally divided between the other 2 classes. Non-migrant household wealth distribution is skewed more to the lower categories (46.2% poorest; 16.1% wealthiest).

Table 6 Relative wealth distribution across locations

Wealth Class	Donpale-A (n=35)	Donpale-B (n=22)	Linlong (n=42)	Palarwar (n=15)	Langann (n=23)
Poorest	8.6%	77.3%	47.6%	66.7%	26.1%
Middle	54.3%	9.1%	47.6%	33.3%	39.1%
Wealthiest	37.1%	13.6%	4.8%	0	34.8%

Livelihoods strategies

Primary occupation

Key informant interview data describe 3 categories for primary occupation: fishing, smallholder agriculture and 'other' (commerce, civil servant/government employee, skilled and unskilled labour). These data show that fishing is the primary occupation for the majority in each village but the proportions of fishing and agriculture vary between villages as shown in Table 7, with Langann having the highest proportion of fishers and no agriculture.

Table 7 Primary occupation by location

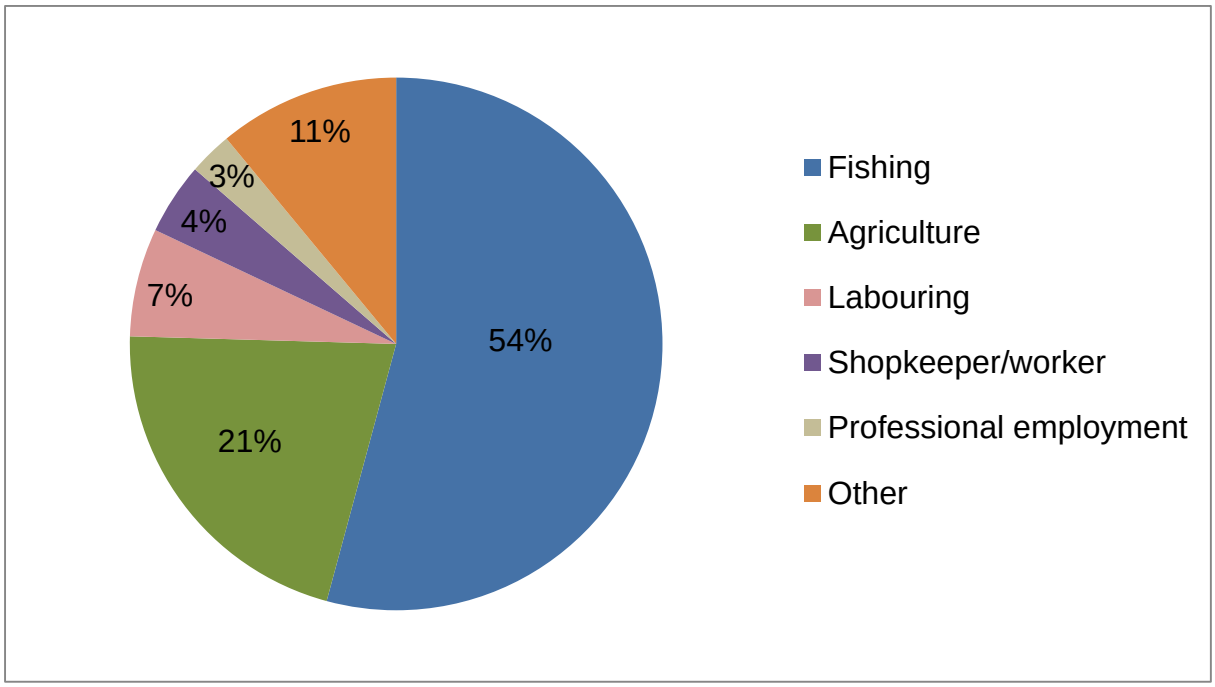
	Don Pale	Linlong	Palawar	Langann
Fishing	60 %	70 %	80 %	90 %
Smallholder agriculture	25 %	28 %	15 %	0 %
Other	15 %	2 %	5 %	10 %

Source: KII 2014 and village records (n.d)

However, survey data from across all sites reveal that only 53.6% of household heads report their primary occupation as fishing with 21% citing agriculture and the remaining a combination of other employment or business (Figure 4). The apparent discrepancy may be due to key informants estimating proportions of all people thought to be fishers (not just household

heads), including those for whom fishing is a secondary occupation and/or including other people involved in the fisheries value chain not just fishers. Alternatively it could be due to recent changes in the occupation profile of communities, in the case of Langann particularly due to influx of non-Moken migrants who are less likely to engage directly in fishing but often work in fisheries related businesses. A further explanation could be sampling error due to the difficulty of finding fishers at home during the dry season.

Figure 4 Primary occupation of household heads across all locations



Source: household survey 2014 (n = 136)

Further analysis of survey data again demonstrates lower – but still significant – proportions of adult household members reporting fishing as a primary occupation in each location. However, it should be noted that no occupation is recorded for over a third of adult household members in most locations[7].

Table 8 Primary occupation of all adult household members

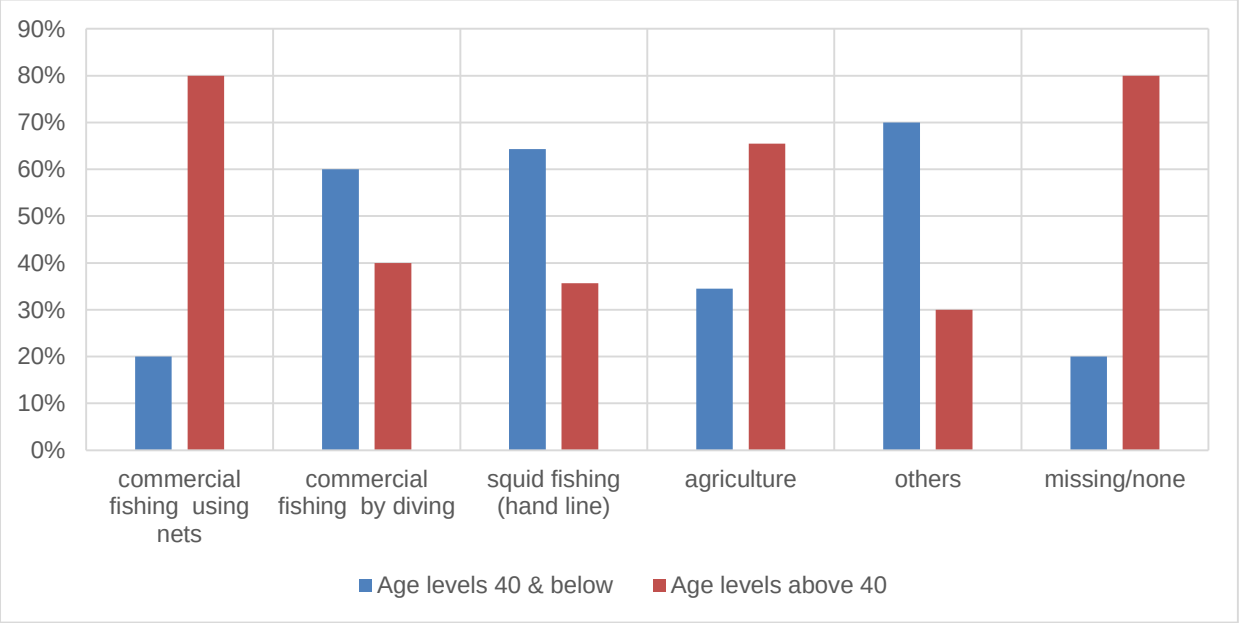
	Donpale-A (n=116)	Donpale-B (n=57)	Linlong (n=137)	Palarwar (n=47)	Langann (n=63)
Fishing	21.6%	36.8%	32.8%	38.3%	38.1%
Agriculture	17.2%	5.3%	16.8%	14.9%	0
Commerce/business	12.1%	7.0%	10.2%	2.1%	14.3%
Employment/other	6.9%	8.8%	5.8%	4.3%	20.6%
Sub-total	**57.8%**	**57.9%**	**65.7%**	**59.6%**	**73.0%**
None/missing	42.2%	42.1%	34.3%	40.4%	27.0%

Source: household survey 2014 (n=420)

[7] There are a no. of possible explanations for this including un(der)-employment and a range of reasons why household heads might under-report livelihoods activities of younger household members and particularly of women.

The age profile of primary occupation of household head varies as shown in Figure 5 with dive fishing, squid fishing and other business/employment generally involving younger household heads and net fishing and agriculture involving older people.

Figure 5 Primary occupation of household head, by age group



Source: household survey 2014 (n=138)

There is a highly significant, strong correlation between ethnicity and primary occupation of household head. The Moken are mostly involved in diving and squid fishing. The primary occupations of Karen-headed households are more varied with the majority split between commercial fishing and agriculture. The Burmese are involved in all types of fishing and also in business but not usually in agricultural production. There are also significant differences in household head's primary occupation and migrant status: in-migrants make up the majority of those not working directly as fishers or farmers.

Table 9 illustrates the limited diversification of livelihoods strategies reported at the household level with 31.9% of those surveyed reporting specialisation in only one type of fishing (net, diving, hand- or long-line). A further 23.9% rely on a combination of fishing and agriculture for their livelihoods. The limited agricultural production is focussed on cash crops, primarily betel, coconut, cashew and vegetables. Few fisher households use more than one type of gear, or also engage in other forms of employment or business. Unfortunately it is not possible to discern from the data, what proportion of households have more than one economically productive household member. Additionally, the data on economic activities of women are missing.

Table 9 Diversity of livelihoods strategies at household level (all locations)

Livelihoods strategies	No.	%
Fishing with 1 type of gear	44	31.9
Fishing with more than 1 type of gear	6	4.4
Fishing and Agriculture	33	23.9
Fishing and Employment/others	8	5.8
Agriculture (1 crop)	21	15.2
Agriculture and Employment	5	3.6
Agriculture (more than 1 crop)	1	0.7
Employment/other (1 job/business)	19	13.8
Employment/other (more than 1 job/business)	1	0.7
Missing/no response	3	2.1
Total	**138**	**100.00**

Source: household survey 2014

Marine resource use

Key informant interviews and field observation reveal more detail on target species, their relative value, subsistence use and trade (Table 10). Sea cucumber and lobster are the highest value commercial species with all produce destined for outside markets. Medium value species such as mullet and prawn may be consumed or traded locally or to outside markets. The produce from seaweed mariculture is sold to outside markets including directly to seaweed processing and export companies. Chiton (from Thayawthatangyi) and cuttlefish and squid (largely from Langann) are also considered medium value species, the vast majority of which is sold to outside markets. Only low value produce such as trash fish (mixed small size fish), shells and sea urchins are targeted largely for local consumption. While key informant interviews suggest that fishing for most medium and low value target species is undertaken year round, compressor diving for high value species such as lobster and sea cucumber is generally only undertaken in the dry season (October to April).

A range of gear types and methods are used according to the target species and location. Compressor and free diving is practised on reefs and in bays while net fishing is largely confined to bays and coasts to target sand crabs (bottom net), shrimp/prawns (3-layer gillnet) and mullet (drift net). Grouper and snapper are targeted in reefs and bays by trapping and spear fishing as well as use of nets. Squid/cuttlefish are caught using a variety of methods including light-fishing, trapping and hand-line. More detailed information on target species and gear used by fishers on Thayawthatangyi (and nearby Daung Kyun) island can be found in Saw Han Shein et al (2013).

Key informant interviews and field observation in Langann village shed more light on local gear and target species for commercial and household use. The main livelihoods strategy for the Moken here is fishing for cuttlefish/squid using hand-lines. The total catch of these species is for sale rather than subsistence. The same is true for chiton which is obtained by gleaning. Both cuttlefish/squid and gleaned species are generally only targeted by local people, not outside fishers. Other important commercial marine resources include pelagic fish caught by hook-and-line (90% for sale, 10% for subsistence) and mullet and trash fish caught by net (80% sale, 20% subsistence). Gleaning for shells and other species is the main subsistence

activity with 95% of harvest for household consumption and only 5% for sale. Other species observed in catch during the (end of rainy season) survey include shrimp/prawns, eels, rays and sea cucumber. In Langann those who are not themselves fishers are usually involved in businesses such as tea and grocery shops and providing other goods and services to fishers, including to those from outside the community.

Of note from the surveys is the lack of information given on shark fishing within the archipelago in all surveyed villagers. Targeted shark fishing is illegal in Myanmar and two shark protected areas were established in 2004 within the archipelago by Department of Fisheries (Order no. 2/2004) (Holmes et al 2013). Although how these protected areas differ from the overall ban is unclear. It is believed that because of the ban interviewees were less forthcoming in regards to information of shark or even ray fishing. However informal meetings with villagers by members of the survey team did reveal some qualitative information of shark fishing in the area.

In Thayawthatangyi only one or two villages actually target sharks while most shark fishing is conducted by fishers from Myeik. This is undertaken by longlining with hooks designed specifically for sharks. The catch is reportedly sold at 'secret' markets in Myeik or Ranong (Thailand). Local fishers report not to target sharks as they don't have links to these markets. They are aware of the ban but not of the shark reserves. Local fishers do use longlines but given the small size of the hooks sharks are rarely caught. Most fishers use nets for mullet and crabs or undertake diving, as such there is little by-catch of sharks or rays and those that are caught are usually eaten or sold within the village. Divers do see sharks during their dives but are never bothered by them, they do however notice a decrease in sightings.

In Langann villagers report that the market for sharks in Ranong (Thailand) is decreasing and so no one targets them. Long-lining is used, however like Thayawthatangyi, the hooks are designed for species like mackerel and so sharks are rarely caught. Any that are caught are usually small individuals which fetch a low price at the market so often just eaten. There is however an active ray fishery with five boats from Myeik targeting devil rays within the islands for the past 8 years. These are caught in nets and sold in Myeik for between 20,000-50,000 MMK (approx. $20-50 USD) per individual. Thirty *Mobula thurstoni* (Near Threatened) individuals were seen in one boat in December in Langann. Like Thayawthatangyi people are aware of the shark ban but very few know of the protected areas. Shark sightings have become much rarer, although villages note that following the use of dynamite on a reef sharks can be seen coming in to prey on the dead fish floating in the water column.

Table 10 Marine resource use, value and market orientation

Activity	Goods & Services	Fishing Gear & Method	Habitat	Season	Use by outsiders	Value	Sale/consumption	Market orientation
Fishing	Sea cucumber	compressor diving, gleaning	reef, bay	Oct-Apr	medium	high	100% sale	outside village
	Lobster	compressor diving	reef, bay	Oct-Apr	medium	high	90% sale	outside village
	Sand crab	bottom net	bay, coast	Jan-Dec	med-high	medium	sale	outside village
	Mullet	drift net	bay, coast	Jun-Sep	medium	medium	60% sale	within & outside village
	Shrimp/prawn	3-layer net	bay, coast	Jan-Dec	medium	medium	sale/consumption	within & outside village
	Grouper	net, diving/spear, trap	reef, bay	Jan-Dec	med-high	medium	Sale	within & outside village
	Snapper	net, diving/spear, trap	reef, bay	Jan-Dec	med-high	medium	sale	within & outside village
	Porcupine fish (Diodontidae)	compressor diving	reef, bay	Jan-Dec	medium	medium	sale	outside village (curio trade- Chinese market)
	Cuttlefish/Squid	trap, hand-line, light-trapping	reef, bay	Jan-Dec	low	medium	100% sale	outside village
	Trash Fishes (mixed small size fish)	net	bay, coast	Jan-Dec	med-high	low	sale/consumption	within & outside village
Gleaning	Chiton	picking from coral/rocks	reef, shore	Jan-Dec	low	medium	100% sale	outside village
	Sea urchin	picking from coral/rocks	reef	Jan-Dec	low	low	consumption	within village
	Shells	picking from coral/rocks	reef, shore	Jan-Dec	low	low	90% consumption	within & outside village
Mariculture	Seaweed	floating raft	bay	Jan-Dec	medium	medium	sale	outside village

Source: key informant interviews 2014

Attitudes and Perceptions

History and future aspirations of fishers

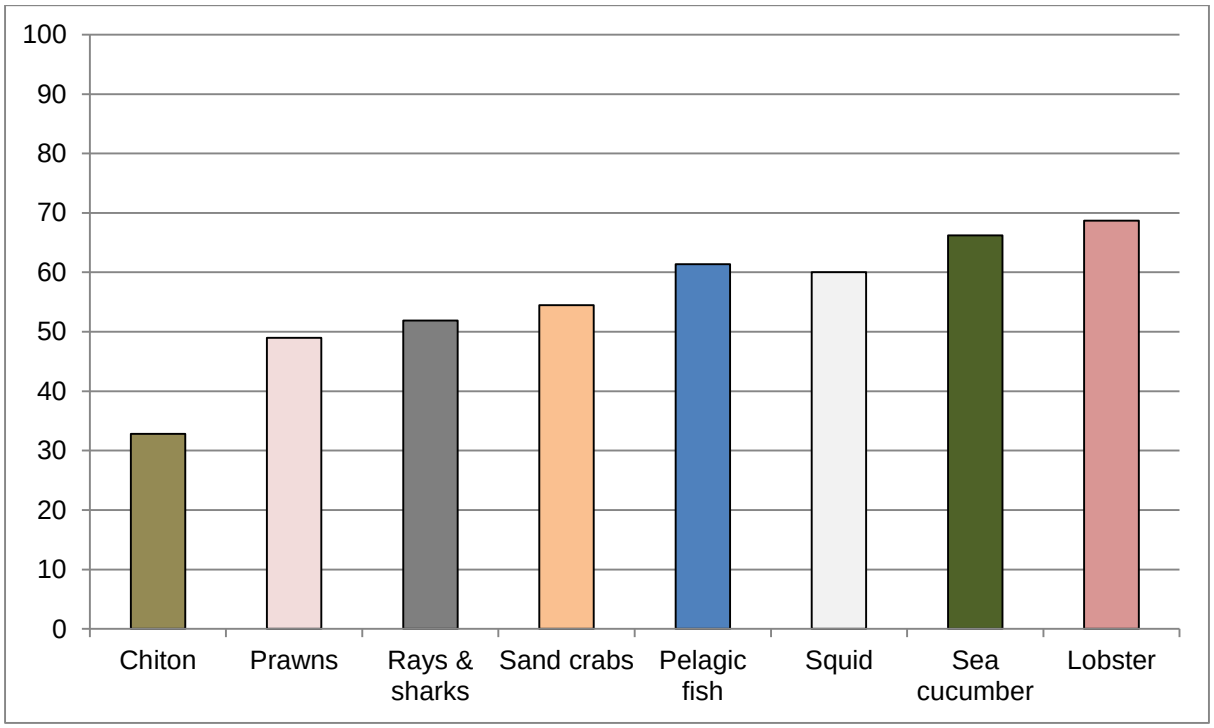
In order to try to ascertain how readily fishers in the studied locations move in and out of fisheries, the survey asked some questions on history of fishing and attitudes towards fishing as a livelihood for future generations. Of the 94 household heads who say they engage in fishing (not necessarily as primary occupation), 80% have always been a fisher and 20% have moved into fisheries (the majority since 2000). The Moken are most likely to have an intergenerational history of fishing. The key reason for moving into fishing is that it is seen as the most viable livelihood strategy available to them. Seven (7) respondents report ceasing to fish due to age (2), poor health (2) and low returns (3).

Attitudes to fishing as a livelihood option for future generations are found to be statistically correlated with fishing history within the family i.e. those households within inter-generational fishing traditions are more likely to hope that their children will be able to earn a decent living from the sea (X^2 = 27.64, df = 1; significant at the .05 level). Of those who provide a reason for not wanting their children to be fishers, 46% cite declining catch trends and 30% consider it too risky or dangerous. Those who report an expectation that their children be fishers largely base their choice on the desire to continue a traditional lifestyle including maintaining fishing skills within the family (although it is unclear whether this is largely due to lack of other skills and therefore other options).

Catch trends

Figure 6 illustrates the percentage of household heads who report perceived decline in catch trends for different species. The majority of others are unsure of trends or prefer not to answer. No-one reports increases in catch over the last 5 years.

Figure 6 Percentage of household heads who report perceived decline in catch trends over the past 5 years (all locations)



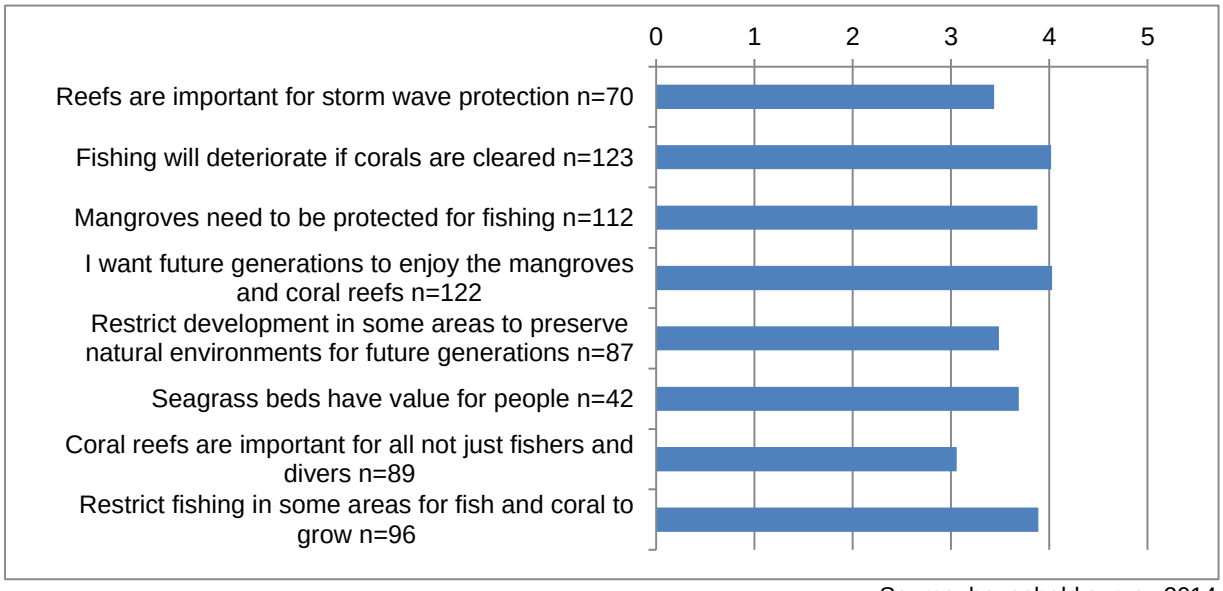
Source: household survey 2014

Non-market and non-use values

Non-market and non-use values of natural resources are measures of how people think about the value of those resources not traded in the market and the value of resources to those who do not use them. The SOCMON methodology used in this survey asks respondents to rate the extent to which they agree or disagree with a series of statements designed to elicit information on these otherwise hard-to-measure values. A rating of 5 indicates strong agreement with the statement; 3 denotes an ambivalent (neither agree nor disagree) response; and 1 means strong disagreement[8].

As shown in Figure 7 mean scores for all valid responses across all sites are generally between 3 and 4. However, as the numbers of valid samples (n) demonstrate, many respondents are unable to provide a response or admit to not knowing. This was particularly the case for the statement regarding seagrass beds where 70% of those questioned say they don't know, indicating low awareness of the value of these habitats, perhaps partially due to the geographical location of the beds which may not occur close to settlements or major fishing grounds. In most cases there is no statistically significant difference in mean scores by ethnicity although the ethnic group with the highest proportion of 'don't know' responses is most commonly the Moken (with the exception of the statement linking coral clearance to fishing decline where 93.8% of all Moken respondents agree). Of note is the finding that while nearly 77% of Bamar people agreed with fishing restrictions to allow fish and coral recovery, only 40% of Moken did (with half saying they didn't know if it was a good - or bad - idea). Opinion also seems divided over whether coastal development should be restricted in some areas in order to leave some natural environments for future generations (bequest value), particularly amongst the Bamar population (27.9% against, 51.2% in favour). The importance of reefs in providing protection from storm waves is also apparently contentious among the Bamar (24.4% say no, 48.8% say yes, with just over a quarter not knowing) while substantial proportions of the Karen (43.3%) and Moken (53.1%) 'don't know'.

Figure 7 Mean scores for non-market and non-use values (all locations)



Source: household survey 2014

[8] Note that some statements were asked in the negative to reduce likelihood of strategic response but these scores are all for positive statements (i.e. those asked in the negative have been reverse scored in this figure)

Mangrove condition and threats

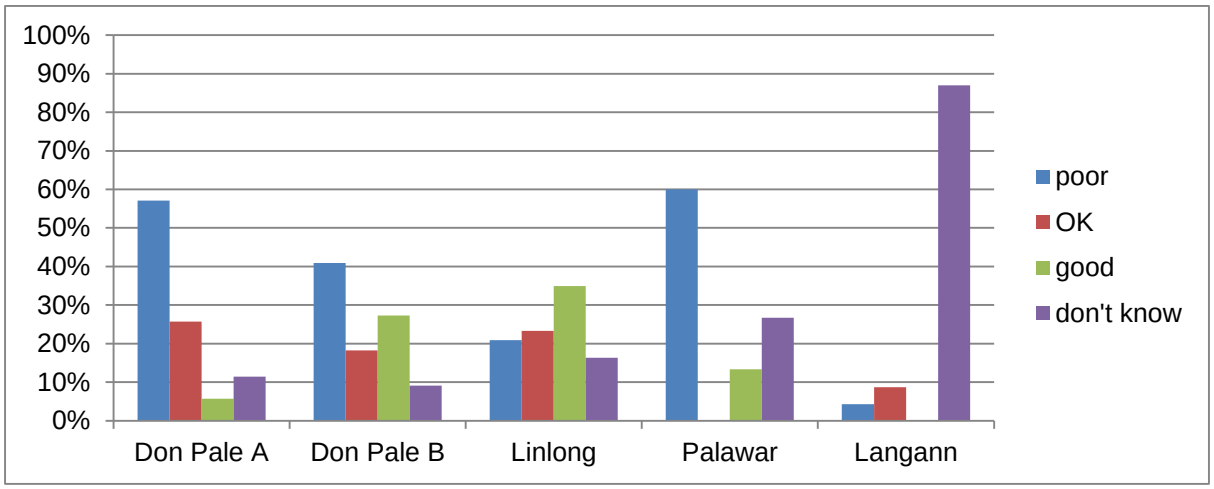
Respondents were asked to score the condition of a range of natural resources on a scale of 1 to 5 (where 1 is 'very poor' and 5 is 'very good') and identify major threats to those resources. Mean values for mangroves suggest that respondents perceive some mangrove degradation – with the exception of Linlong where perceptions are slightly more positive (Table 11). However there is considerable variation in response within each community (Figure 8). The large number of 'don't knows' for Langann can largely be explained by the near absence of mangrove around this island group.

Table 11 Perceived condition of mangroves

Resource	Residential Location	N	Mean	Std. Deviation	ANOVA Statistics
Mangroves	Donpale-A[a]	31	2.35	.709	F = 4.25
	Donpale-B	19	2.89	.994	df = 4, 93
	Linlong[a]	34	3.12	.946	p-level = .003
	Palarwar	11	2.18	.982	significant**
	Langann	3	2.67	.577	

Source: household survey 2014 (n=98)

Figure 8 Perceived condition of mangroves



Source: household survey 2014 (n=138)

The most commonly identified threat to mangroves is **cutting for household use**, including charcoal making (42% of 138 respondents across all sites).

Coral reef condition and threats

Coral reefs are to be found around both island groups with the settlements of Linlong, Palawar and Langann particularly being close to reefs. As with mangroves, mean values indicate some perception of reef degradation although individual responses within communities vary considerably and, again Linlong respondents are generally more positive. As might be

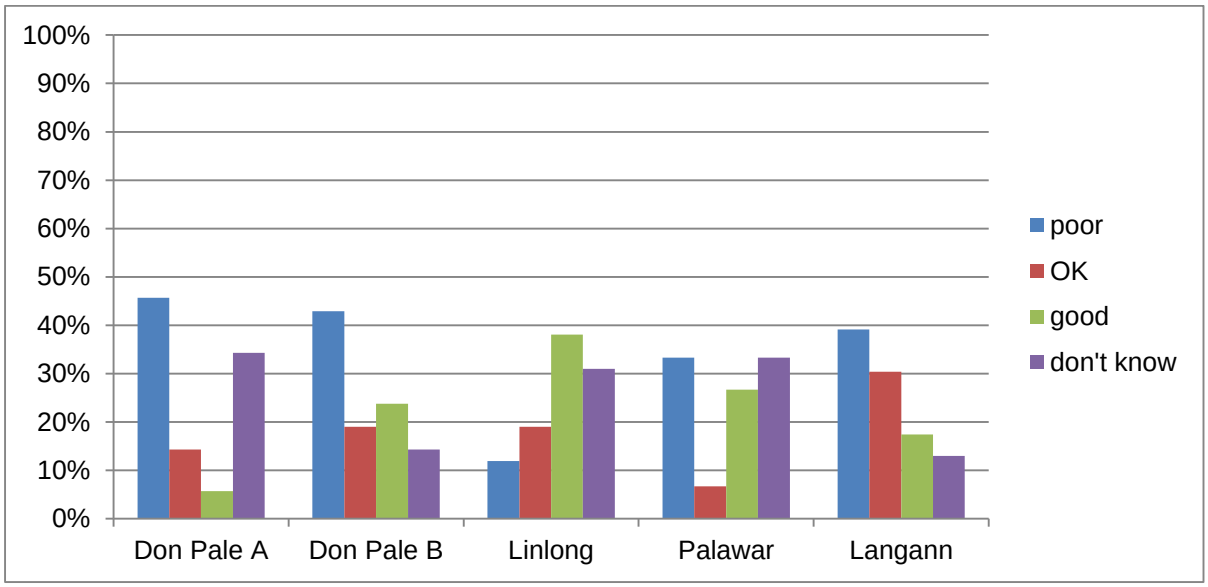
expected, Langann respondents appear to be much more aware of the condition of coral reefs than of mangroves.

Table 12 Perceived condition of coral reefs

Resource	Residential Location	N	Mean	Std. Deviation	ANOVA Statistics
Coral reefs	Donpale-A[a]	23	2.30	.765	F = 3.41
	Donpale-B	18	2.78	.878	df = 4, 95
	Linlong[a]	29	3.31	.930	p-level = .01
	Palarwar	10	2.90	.994	significant**
	Langann	20	2.65	1.348	

Source: household survey 2014 (n=100)

Figure 9 Perceived condition of coral reefs



Source: household survey 2014 (n=138)

When asked about major threats to reefs, 26.1% of all 138 respondents mention **dynamite/blast fishing**. Only Langann residents (8 out of 23) also identify other illegal fishing methods/gear such as trawling. A small number of respondents across all sites mention 'natural' threats such as disease, coral bleaching and storm damage. Don Pale A is the only place where tourism activity is considered a threat (6 out of 35 respondents)[9]. Only 1 respondent (in Langann) identifies rubbish or pollution as a threat. Similarly only 1 or 2 people mention direct coral collection or mining as an important threat.

Beach condition and threats

Mean scores suggest that the beach at Don Pale B and Langann is considered to be in reasonable condition, although again responses within communities varied. In Don Pale A and

[9] This is assumed to be domestic tourism as international tourists to date have not been permitted to visit this area

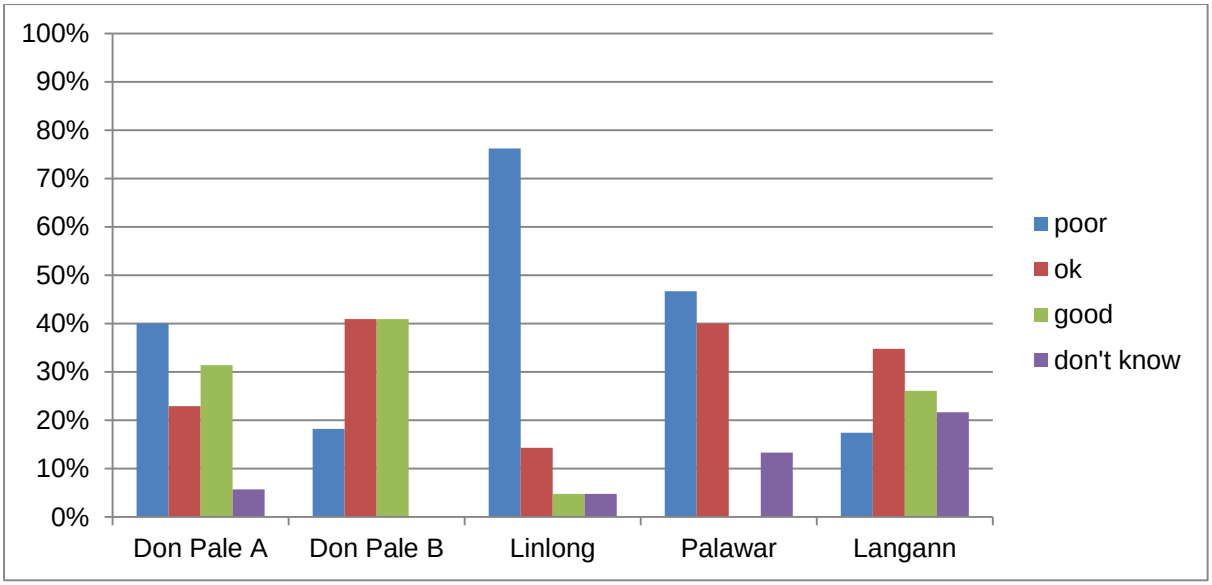
Palarwar at least 40% of respondents consider the beach condition to be poor with this figure rising to more than three-quarters of respondents in Linlong (Figure 10).

Table 13 Perceived condition of beaches

Resource	Residential Location	N	Mean	Std. Deviation	ANOVA Statistics
Beach	Donpale-A[a]	33	2.91	.980	F = 8.83
	Donpale-B[bc]	22	3.27	.827	df = 4, 121
	Linlong[abd]	40	2.10	.709	p-level = .000
	Palarwar[c]	13	2.46	.519	significant**
	Langann[d]	18	2.94	1.056	

Source: household survey 2014 (n=126)

Figure 10 Perceived condition of beaches



Source: household survey 2014 (n=138)

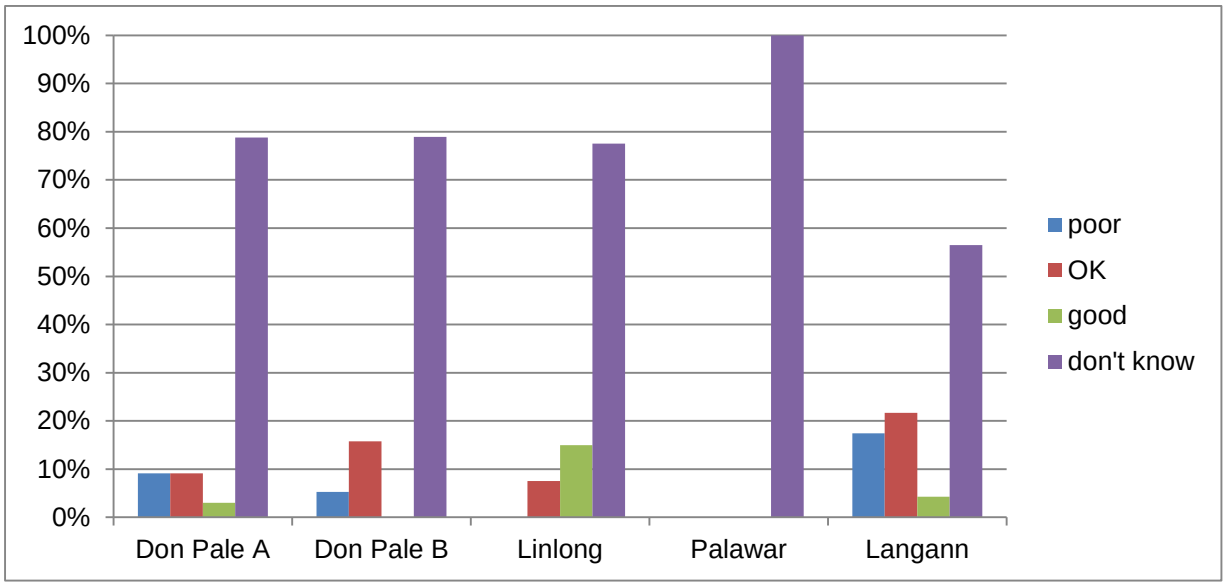
A major threat mentioned by 45.8% of total respondents is **beach erosion/sea-level rise**. Highest levels of concern are in Linlong where 41 out of 43 respondents report this as a major threat. Three (3) out of 23 interviewees in Langann also mention 'natural phenomena' such as storms. Rubbish/pollution is identified by 5 people in Langann (21.7%), 2 in Don Pale A and 1 in Don Pale B. Only 1 person in each of these villages mention residential expansion on the beach as a threat. Sand/pebble quarrying is only identified by 1 person each in Don Pale B and Langann although field observation suggests this is an increasing threat in Langann where beach sand/pebbles are used as ballast in large commercial fish traps.

Seagrass condition and threats

Seagrass beds are only to be found around the Langann island group, hence the majority of respondents from settlements on Thayawthatangyi were unable to answer the question regarding the condition of this resource (Figure 11). 17.4% of Langann respondents perceive seagrass beds to be in poor or very poor condition while a further 21.7% consider them to be

'OK' and only 4.3% think they are in good condition. Despite the proximity of seagrass beds to Langann village, over 55% of respondents are unable to comment on their condition.

Figure 11 Perceived condition of seagrass beds



Source: household survey 2014 (n=138)

As might be expected given low awareness of seagrass beds, very few interviewees are able to identify threats to these resources (1 in Don Pale B and 3 in Langann). Of these, the Don Pale respondent mentions drag-netting/gleaning which is also identified by one Langann respondent. The other two respondents report other illegal fishing gear and rubbish/pollution respectively.

Forest condition and threats

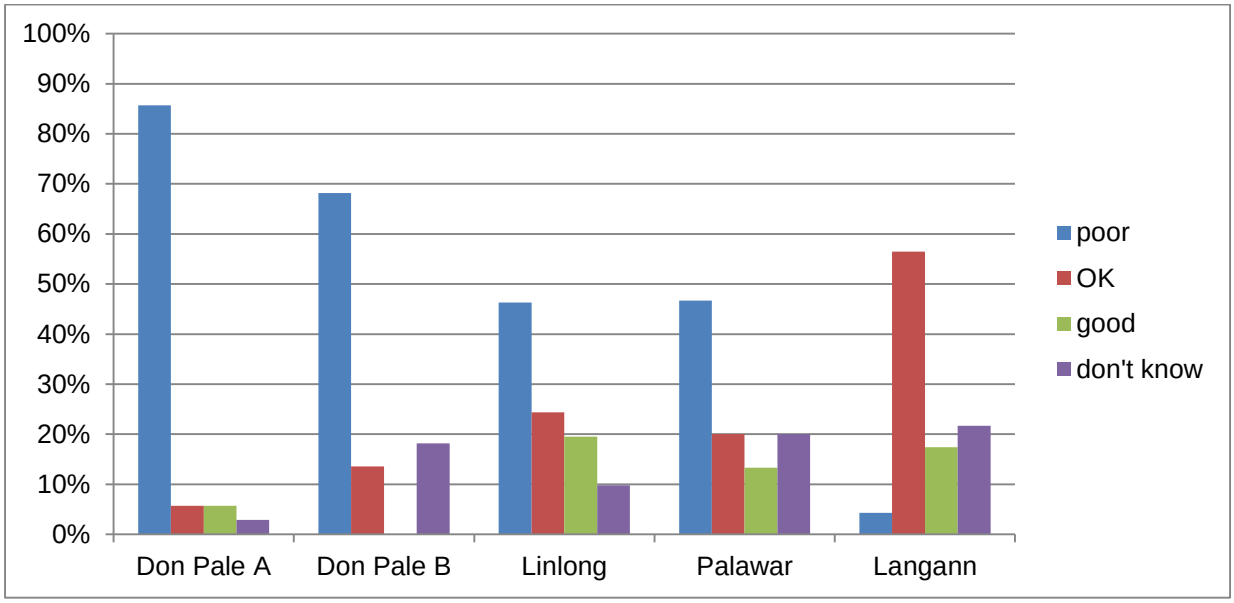
The condition of forests around Don Pale is generally considered to be poor by the majority of residents interviewed. Mean scores for Don Pale are significantly different to those for Linlong and Langann with the majority of respondents in the latter settlement reporting forest condition to be 'OK' or good.

Table 14 Perceived condition of forests

Resource	Residential Location	N	Mean	Std. Deviation	ANOVA Statistics
Forests	Donpale-A[ab]	34	2.03	.674	F = 8.82
	Donpale-B[cd]	18	2.11	.471	df = 4, 114
	Linlong[ac]	37	2.65	.889	p-level = .000
	Palarwar	12	2.42	.996	Significant**
	Langann[bd]	18	3.33	1.029	

Source: household survey 2014 (n=119)

Figure 12 Perceived condition of forests



Source: household survey 2014 (n=138)

Deforestation/tree-felling activities – for both residential and commercial use – are identified by the majority of respondents from both Don Pale settlements and Linlong as shown in Table 15.

Table 15 Major perceived threats to forest resources

Major Perceived Threats	Don Pale-A		Don Pale-B		Linlong		Palarwar		Langann		Total	
	n=35		n=22		n=43		n=15		n=23		n=138	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Cutting of trees for residential use	32	91.4	15	68.2	26	60.5	7	46.7	1	4.3	80	59
Illegal logging	30	85.7	7	31.8	24	55.8	3	20	2	8.7	66	47.8
Cutting of trees for commercial use					1	2.3					2	1.4
Charcoal making					1	2.3					1	0.7

Surface water condition and threats

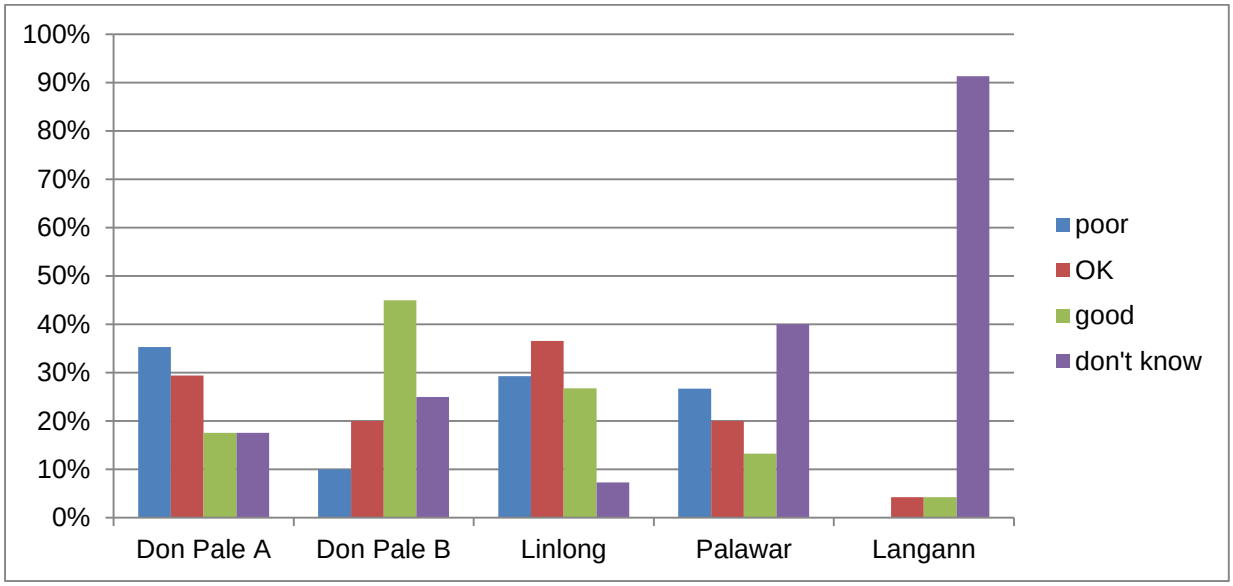
Table 16 shows no significant differences in mean values for perceived conditions of rivers and streams between respondents from different villages. However, there are some differences amongst inhabitants of individual settlements. Overall, residents of Don Pale B are the most positive about the condition of their watercourses while over one third of those interviewed in Don Pale A think that rivers and streams are in poor condition. The high percentage of 'don't know' responses from Langann can be explained by lack of surface water on the island: residents are reliant on springs and rainwater for their water supply.

Table 16 Perceived condition of surface water supplies

Resource	Residential Location	N	Mean	Std. Deviation	ANOVA Statistics
Rivers and streams	Donpale-A	28	2.79	.787	F = 1.95
	Donpale-B	15	3.47	.743	df = 4, 87
	Linlong	38	2.84	1.001	p-level = .11
	Palarwar	9	2.78	.833	Not significant
	Langann	2	3.50	.707	

Source: household survey 2014 (n=92)

Figure 13 Perceived condition of surface water supplies



Source: household survey 2014 (n=138)

Response rates regarding threats to rivers and streams are relatively low. Of the 35 interviewees who do provide a response to this question, 34 identify **deforestation/tree-felling** and 1 mentions soil erosion.

Groundwater condition and threats

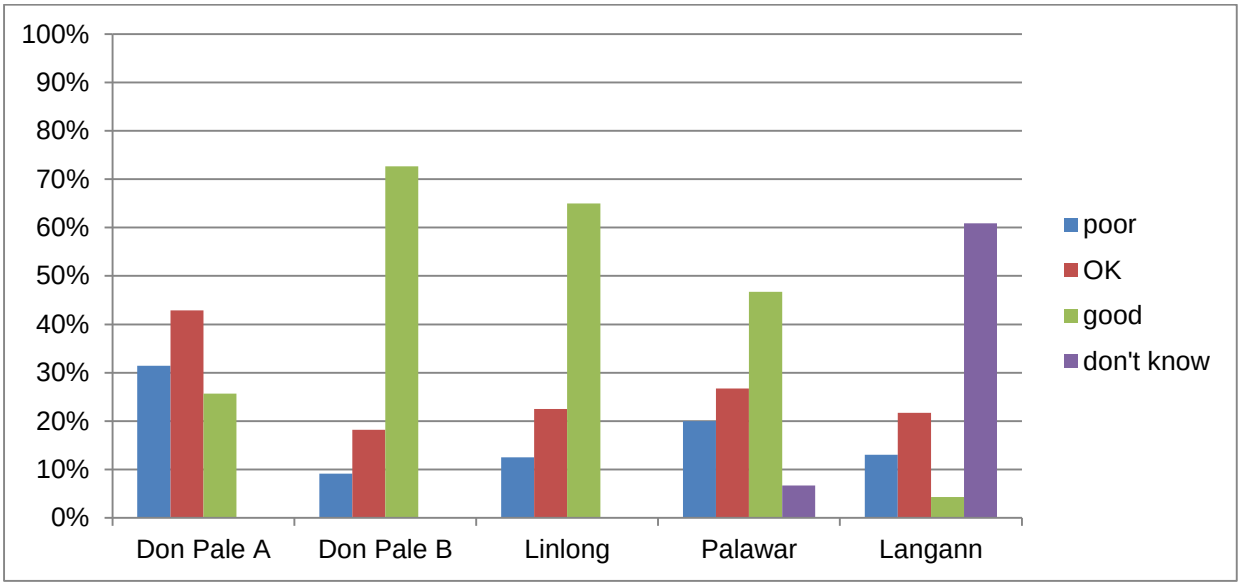
The condition of groundwater resources does not appear to be of great concern to most residents of studied settlements with a slight exception in the case of Don Pale A. Just over 30% of Don Pale A respondents perceive these resources to be in poor condition and the lower mean score for this village is statistically significant different to the mean scores from Don Pale B and Linlong. As with surface water resources, the levels of awareness of groundwater resource condition in Langann as reported in household survey are low (60.9% respondents say 'don't know'). However key informant interviews indicate that demand often exceeds supply on Langann in the dry season – a situation that they have attempted to mitigate by construction of a small storage dam.

Table 17 Perceived condition of groundwater

Resource	Residential Location	N	Mean	Std. Deviation	ANOVA Statistics
Groundwater (wells and springs)	Donpale-A[ab]	35	2.94	.765	F = 5.30
	Donpale-B[a]	22	3.73	.767	df = 4, 115
	Linlong[b]	40	3.50	.784	p-level = .001
	Palarwar	14	3.21	.975	significant**
	Langann	9	2.67	.866	

Source: household survey 2014 (n=120)

Figure 14 Perceived condition of groundwater



Source: household survey 2014 n=138

Saltwater intrusion is the most common threat to groundwater resources as reported by 55.1% of respondents in Don Pale A, 22.7% in Don Pale B, 30.2% in Linlong and 20% in Palarwar. Only 2 people in Don Pale A and 3 in Linlong make a connection between deforestation and groundwater resource condition.

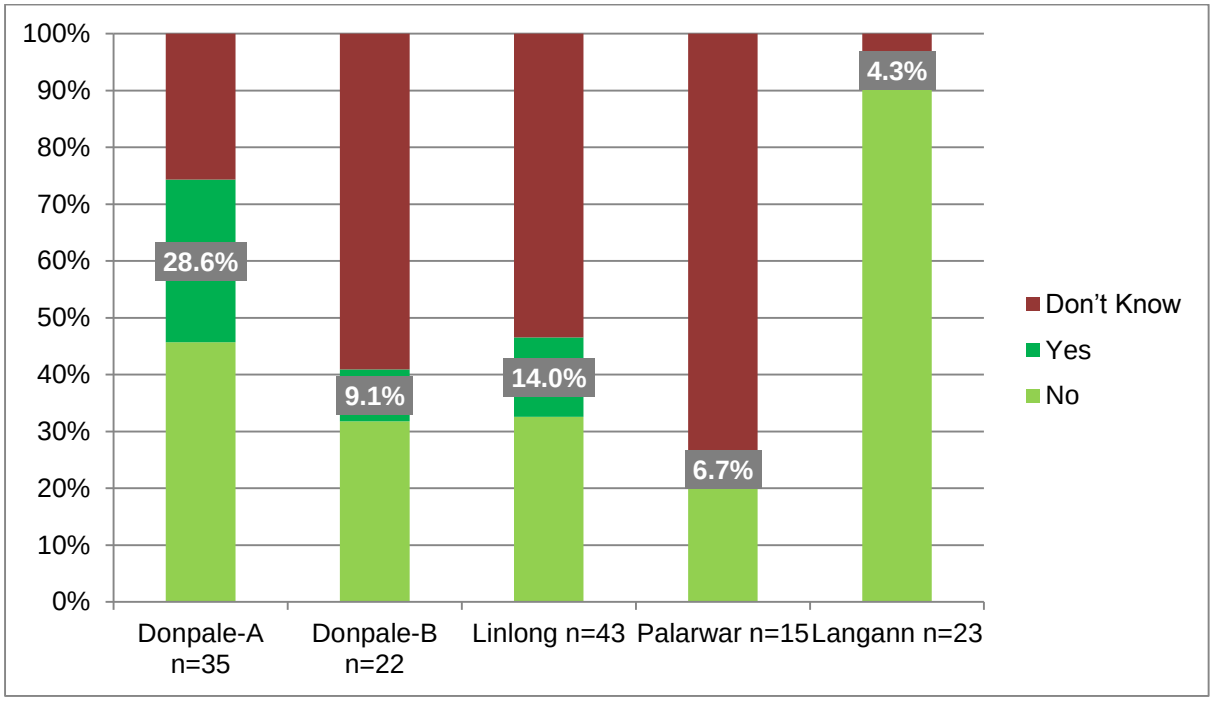
Governance

Aspects of marine and coastal resource governance that were explored in this research include people's awareness of rules and regulations; current and desired participation in decision-making over these resources; and trusted sources of information within the community.

Awareness of rules and regulations

Awareness of existing fishing rules and regulations is generally low across all locations with Don Pale A showing the highest proportion of aware respondents: 28.6% of the 35 respondents (Figure 15). In Palawar and Langann only 1 respondent each know of the existence of regulations; in Don Pale B only 2 interviewees respond positively.

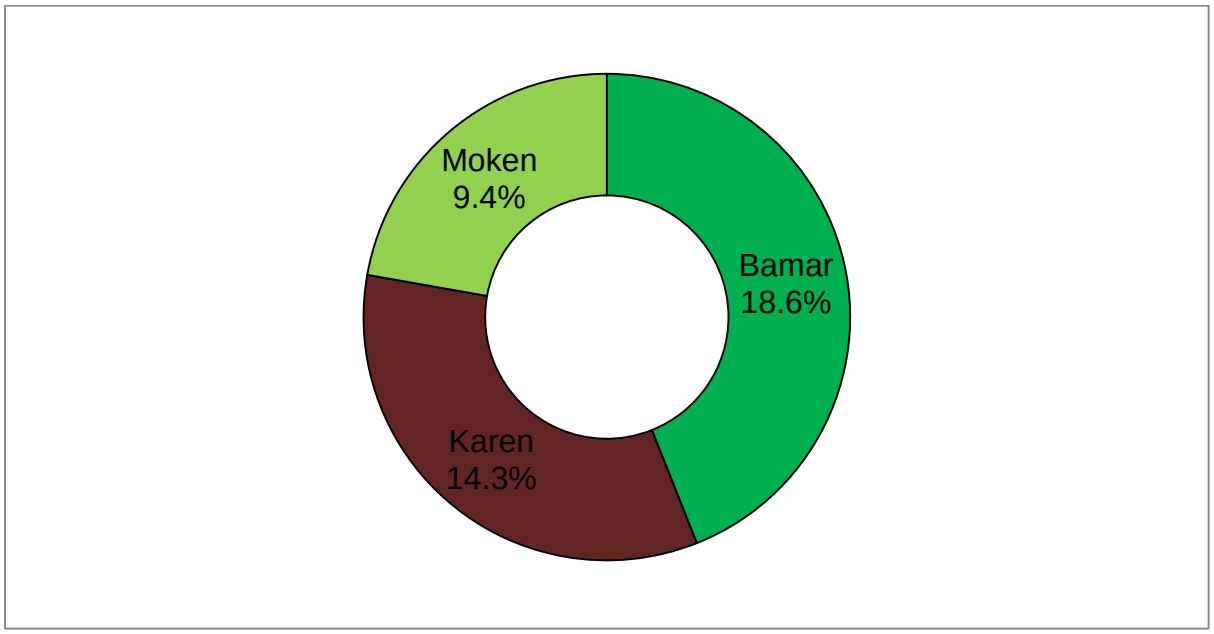
Figure 15 Awareness of existing fishing rules and regulations, by site



Source: household survey 2014 (n=138)

Awareness of fishing rules and regulations varies between ethnic groups, being highest among the Bamar and lowest among the Moken (Figure 16).

Figure 16 Percentage of respondents aware of the existence of fishing rules and regulations, by ethnicity



Source: household survey 2014 (n=138)

Awareness of rules and regulations regarding mangrove use is also low: only 2 respondents each in Don Pale A and Linlong report being aware of the existence of regulations; only 1 in Don Pale B; and none in Langann.

Participation in decision-making

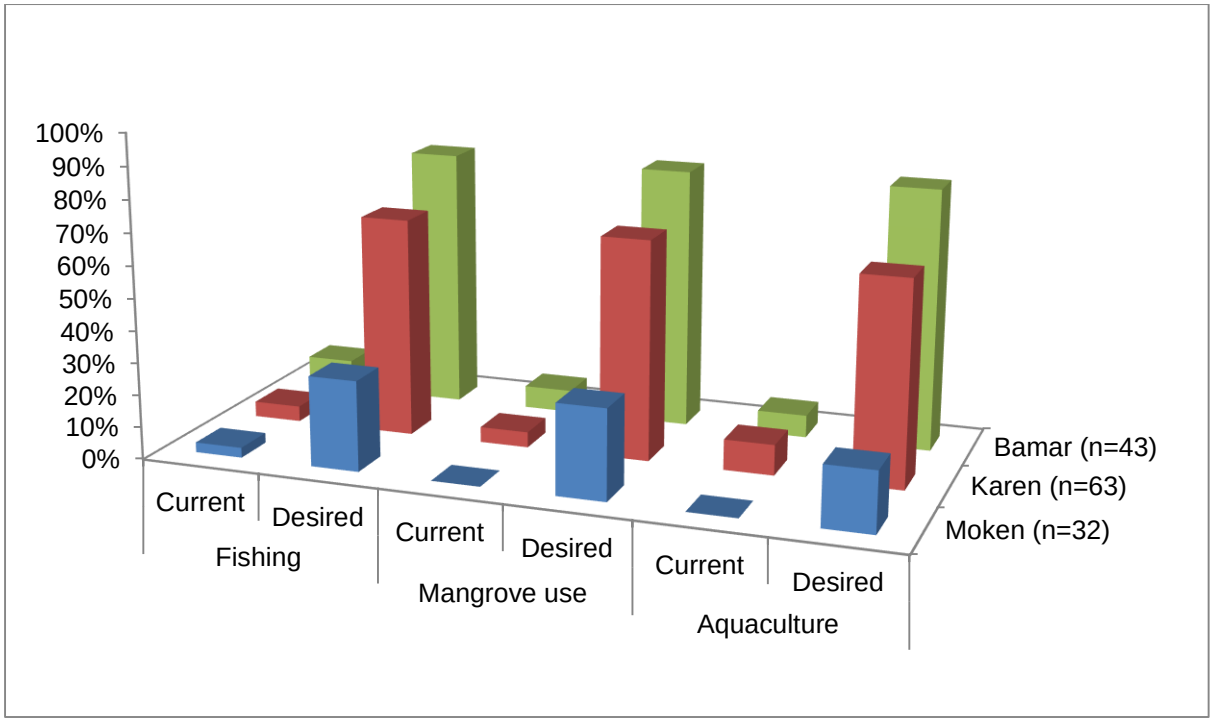
Household survey data show that current levels of participation in decision-making on marine resource use are very low across all locations but desire to participate is relatively high with the exception of respondents in Palarwar and, to a lesser extent, Don Pale B (Table 18). There are notable differences according to ethnicity; levels of both current and desired participation are particularly low among Moken respondents (Figure 17).

Table 18 Current and desired levels of participation in coastal/marine resource decision-making, by site

		Donpale-A (n=35)	Donpale-B (n=22)	Linlong (n=43)	Palarwar (n=15)	Langann (n=23)
Fishing	Current	14.3%	0	4.7%	6.7%	0
	Desired	85.7%	40.9%	65.1%	20.0%	73.9%
Mangrove use	Current	11.4%	0	4.7%	0	0
	Desired	82.9%	40.9%	60.5%	20.0%	65.2%
Aquaculture	Current	11.4%	4.5%	9.3%	0	0
	Desired	74.3%	36.4%	67.4%	20.0%	65.2%

Source: household survey 2014 (n=138)

Figure 17 Current and desired levels of participation in coastal and marine resource decision-making, by ethnicity



Source: household survey 2014 n=138

Trusted sources of information

Understanding which sources and channels of information are most trusted by community members can help co-management facilitators in the design and implementation of communication strategies. Table 19 illustrates the importance of community leaders and radio in communicating information to studied communities. Neighbours and friends are also trusted sources of information for many people, particularly in Don Pale and Langann. Interestingly, government officials and religious leaders generally do not rank very highly in this role. Analysis by ethnicity illustrates that radio is the most commonly mentioned trusted source by Bamar and Karen (74.4% and 66.7% respectively); whereas for Moken it is community leaders (62.5%).

Table 19 Trusted sources of information, by location (majority responses highlighted)

Information Source	Donpale-A (n=35)	Donpale-B (n=22)	Linlong (n=43)	Palarwar (n=15)	Langann (n=23)	All sites
Community leader	31.4%	45.5%	48.8%	73.3%	60.9%	48.6%
Government official	17.1%	0	2.3%	0	26.1%	9.4%
Religious leader	5.7%	18.2%	25.6%	0	0	12.3%
Neighbours/friends	45.7%	59.1%	34.9%	6.7%	52.2%	41.3%
Other people	0	0	11.6%	0	13.0%	5.8%
Radio	97.1%	63.6%	62.8%	6.7%	30.4%	60.1%
TV	42.9%	18.2%	44.2%	0	52.2%	36.2%

Source: household survey 2014 n=138

IMPLICATIONS FOR FFI'S APPROACH TO FISHERIES CO-MANAGEMENT DEVELOPMENT

The results of this initial baseline assessment provide a better understanding[10] of some key aspects of the socio-economic context of the communities studied as well as providing some useful pointers to how to work with these communities in the process of facilitating co-management of marine resources. FFI is looking to use the LMMA (locally managed marine area) model, which is a form of co-management used throughout the Indo-Pacific (Tan 2011) and involves an arrangement whereby local communities and the state work in partnership with NGOs and scientists to jointly manage marine resources (Van Beukering et al. 2007). LMMAs are known to have increased the role of local communities in coastal resource management in such countries, resulting in high levels of compliance with locally agreed rules, and a range of well-being benefits (Goven et al 2012).

Heterogeneity of communities

The samples surveyed show strong and highly significant correlations between location and ethnic composition. Ethnicity and location also appear to be correlated with educational attainment and literacy rate, relative wealth, key livelihood strategies and associated resource use patterns. Similarly, history of fishing within the family – and attitudes to fishing as a way of life now and as a livelihood for future generations – differ from one household to another. We therefore cannot consider all communities – or even all groups within a particular community – to be homogenous. Evidence from around the globe indicates that community-based sustainable natural resource management and equitable common pool resource governance are harder to achieve where resource users are heterogeneous. Approaches will likely need to be tailored to the characteristics of different groups, with particular care taken with the Moken community due to their distinctive culture, language and vulnerability to marginalisation[11]. Efforts will also need to be taken to ensure that monitoring and impact assessment captures the differentiated impacts of LMMA development on each group, including on women as well as men. This will help enable LMMA facilitators and other stakeholders to adapt management practices to ensure that equitable distribution of risks, costs and benefits.

Population structure and migration trends

Demographic data indicate that the populations of all studied settlements are young and growing. Such a population structure suggests that pressure on natural resources may increase in the future unless young people have other livelihoods options – something that is likely to be influenced by their access to education and skills, financial capital and mobility. One positive factor is that young people are often open to new ideas and ways of working which may provide opportunities to encourage more sustainable marine resource use practices. The presence of primary/middle schools in most of the villages could potentially provide spaces for environmental education (as well as literacy, numeracy and formal

[10] Care should be taken in some conclusions given small sample sizes which mean that, while correlations within the samples are statistically significant, they may not be representative of the total populations from which the samples were taken.

[11] Difficulties with language, low education levels and suspicion of outsiders may well have biased responses from Moken in particular, for example with regard to attitudes to marine resources and non-market, non-use values.

qualifications), although the reach of such a communication strategy depends on enrolment and retention rates which may well vary by ethnicity and wealth.

Household survey data suggest that in-migration doubled every decade from 1980 to 2000 but appears now to be slowing. In-migration has both costs and benefits: it may increase pressure on natural resources through population increase; or be a cause for conflict and marginalization where the ethnic composition, wealth or education of in-migrants and the original population are different. For example, in-migration to Langann seems to be changing the ethnic composition of the community which was originally a wholly Moken settlement. Our data appear to show that in-migration results in increased availability of goods and services on the islands which is likely to benefit at least some residents. In the case of Langann, key informant interviews suggest that Bamar in-migrants are providing services to 'outside' fishers, some of whom are engaged in unsustainable fishing practices. Compared with the Moken, a higher proportion of Bamar respondents expressed a desire to be involved in decisions over fishing rules and regulations. Given that Bamar tend to be better-off and better educated than Moken, it will be important to take proactive steps to avoid marginalisation of Moken in LMMA development. Economic development elsewhere in Myanmar and opening up of international connections may in future result in a decrease in in-migration – or even net out-migration - as other opportunities become available on the mainland and overseas.

Livelihoods diversity and vulnerability

In general, households with only one productive member, a single specialised livelihood strategy and/or target species (or crop) tend to be more vulnerable to shocks and stresses than those with more diverse livelihoods strategies. The household survey results presented here (Table 9) appear to show a high degree of specialisation and low levels of diversification within the samples studied. However, it is notable that no occupation is recorded for over a third of adult household members in most locations – indicating either under-reporting or under-employment. Under-reporting, particularly of the livelihoods roles of women and youth, is very common in household surveys where only the (usually male) head of household is interviewed. However, these roles may be very important in terms of household vulnerability – or resilience – and of resource use, and therefore need to be better understood. Survey responses that indicate that most marine and agricultural produce is sold, rather than consumed at the home, suggest that subsistence use is under-reported and/or people are heavily reliant on 'imports' from the mainland and therefore dependent on a cash economy with similar implications for vulnerability.

Marine resources are said to be largely sold on landing or to traders at village level with some reports of inequitable client-patron relationships in which fishers have little or no power. This suggests that they are probably not getting the best price for their produce and are therefore by default being incentivised to catch as much as possible in order to make a living. There may therefore be opportunities to work on value chain governance to enable fishers to secure higher prices per unit catch as an incentive for more sustainable fisheries management.

Stakeholder mobilisation

Perceived decline of all important commercial species catch (as reported by many respondents) is potentially a good issue around which to encourage mobilisation of local stakeholders. Similarly, the perceptions on the condition of other resources and habitats can be good starting points for such discussions, taking into account that these vary by location.

The high proportion of respondents lacking knowledge on resource conditions and trends, and on existing rules and regulations, indicates the need to support deliberative processes through which local stakeholders themselves can start to identify and explore the causes, effects and mitigation strategies for resource threats and degradation.

RECOMMENDATIONS

While this initial assessment has helped improve understanding of the current socio-economic context at a household level, there are a number of other key issues that need to be further explored, using more participatory, deliberative processes. These include:

- **Spatial aspects** of marine resource use, including gleaning
- Whether **traditional and informal institutions** currently exist (or previously existed), their roles and responsibilities, governance mechanisms (including methods to ensure compliance and manage conflict), benefits and challenges, and whether there is interest in revitalising such institutions in the context of marine resource management
- Most appropriate **methods and channels** for surfacing and increasing awareness of the importance of key ecosystems, the services they provide, threats faced and strategies to address them (including existing and potential rules and regulations, rights and responsibilities), **combining traditional and scientific knowledge**, including the results of biophysical surveys.
- Knowledge, attitudes and roles of **women, youth and other marginalised groups**
- **Fisheries market systems**/value chains - and, where appropriate, for other sub-sectors with potential to support diversification to reduce marine resource dependence
- **Stakeholders' visions** for the future of marine resource management and associated wellbeing issues, including potential strategies to achieve aspirations by addressing challenges and taking advantage of opportunities and strengths.

Such a process would help stakeholders develop relevant objectives for each LMMA and thence enable identification of appropriate socio-economic and governance indicators for monitoring and impact assessment.

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