Introduction and Review of Research on the Gulf of Mottama: Environment and Fishery

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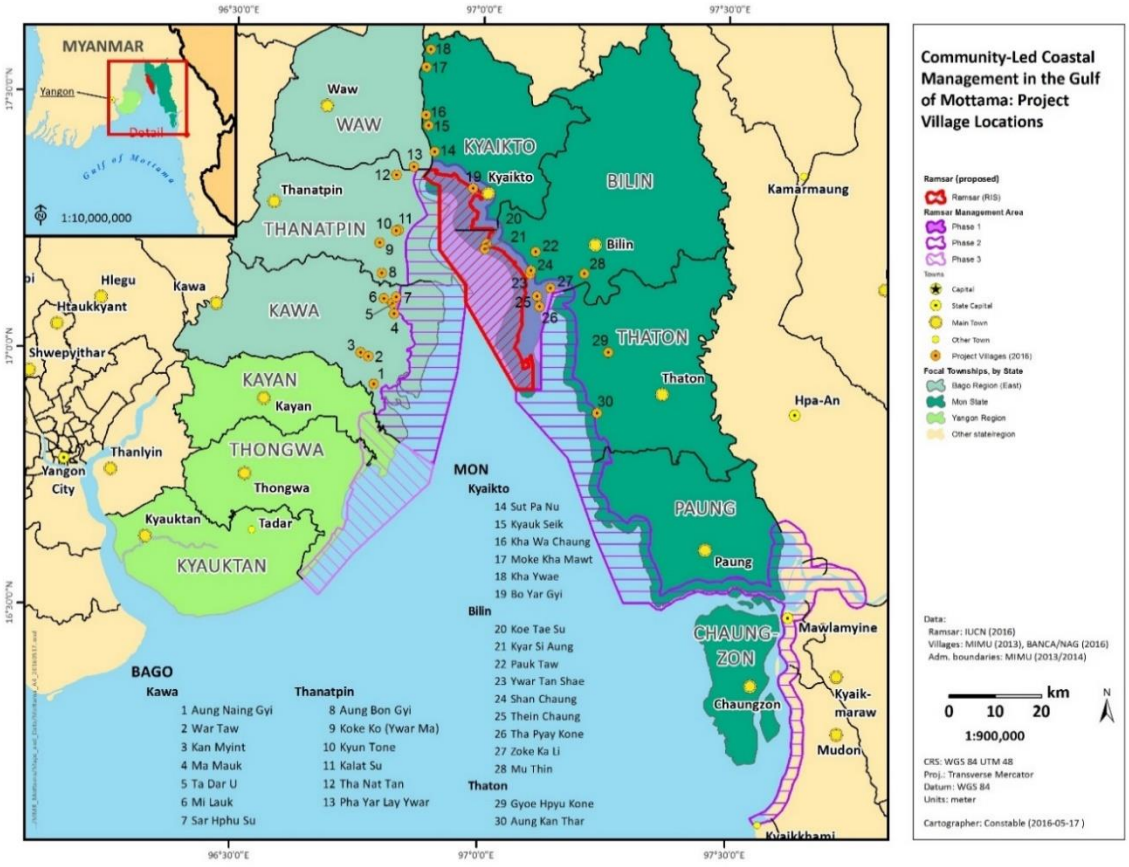

Figure 1: Map of Project Villages and Ramsar Site

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Introduction

At the inception of the Community lead coastal management Gulf of Mottama Project (CLCMGoM) very little was known about the Gulf of Mottama (GoM).

Sedimentation and the Oceanographic Circulation: Ramaswamy et al (2004); and Robinson et al (2007) conclude that there is a very high turbidity due to sedimentation in the Gulf being kept In suspension by very high tides 4-7 m. Sediment from the Ayeyarwady River system also contributes due to oceanic circulation that travels from west to east across the Gulf. The turbidity front (vividly visable in the Google maps) varies from 15,000 km^2 to 45,000 km^2 due to changes between neap and spring tides, rather than changes in Monsoons and rain pattern. The resultant high suspension load has resulted in extensive mud flats, the 4000km^2 of mud flats [are] some of the largest in the world. There are no published reports of the erosion in the Gulf, although there are considerable anecdotal reports of substantial erosion especially on the Western side (Bago Region).

Migratory birds: Considerably more information is available on the importance of the Gulf to migratory birds. Zochler et al (2014) summarises surveys from 2008-2013 that indicates the extensive mud flats of the Gulf of Mottama are critical wintering feeding habitat for the critically endangered Spoon Billed Sandpiper (50% of the world estimated population) and six other global threatened bird species. There have been up to 150,000 water birds reported on the mud flats.

Fisheries: There has been only one report on the fisheries in the GoM (Tin Wai et al 2014), unfortunately it was not available to the project team until May 2016. While there has been extensive research on marine ecology of Mon State through MSc and PhD thesis work at Department of Marine Science, Mawlamyine University, this has focused on the area from the Thalwin estuary at Mawlamyine and south to Thanintharyi Region, where the marine environment and fishing practices are quite different than the upper GoM. Thus there was little systematic information available on the fishery and ecology in the GoM.

The scoping missions and baseline surveys carried out during the inception phase identified villages where coastal fishing was a major activity, identified fishing gears and prepared village seasonal calendars but they were not detailed enough to give a clear indication of fishing activity. Some additional data was added during the Value Chain Survey particularly on the local market system.

However, at the start of the first phase in September 2015 there was not sufficient information available to allow development of fisheries co-management plans and have input to the Ramsar Management Plan. In order to increase the knowledge on fisheries and fish ecology the Fisheries Advisor, has work closely with GoM project staff especially the Fisheries Officer, Mawlamyine University and IUCN Staff to increase the knowledge. To this end the following activities have been undertaken:

- Liaison with other organisations working on fisheries in Myanmar including Pyoe Pin, WorldFish, World Conservation Society, University of Washington, University of Michigan, Myanmar Fisheries Federation, Mawlamyine Holdings, Mawlamyine University, plus Union Region and State Departments of Fisheries;
- Assist in developing a definition and understanding of co-management in the GoM;
- Visits to all most all project Villages & discussion with fishers;

- Initiation of survey of fisheries Inns (leases) in Bago region;
- Training of Project staff & DoF in collection of indigenous fisheries ecological knowledge;
- Survey of 11 fishing villages for indigenous fisheries ecological knowledge;
- Survey of township fish markets;
- Initiation of collection of catch data from seven fish and crab collectors and data analysis;
- Collection of information on small scale wild fish aquaculture in Bago region;
- Initiation and co-supervision of three student MSc thesis projects at Mawlmyine University;
- Assistance in development of two research plans with Mawlmyine University staff for 2017 research projects;
- Organisation of a research meeting to summarise the 2016 research;
- Planning for a similar research meeting in November 2017.

Results

The results reported here are a synthesis of information collected from the above activities. The report was initially prepared in December 2016 and updated to June 2017. It is anticipated that the updating will occur annually.

Some of the most useful information has come from the collection of indigenous ecological knowledge. The training and summary of preliminary results from the indigenous survey have been reported previously (Win Ko Koe & MacKay 2017) and is available on the Research Dropbox.

Environment

Tides: The tides are up to 7 metres and some of the highest in the world. There is also during Spring Tides a Tidal Bore of 1-2 m. BANCA has recently combined with an extreme sporting group to have the bore surfed opening up the possibility of adventure tourism. The tides along with the monsoons rains are very influential on salinity, temperature and turbidity of the Gulf.

The Gulf & Sittaung River environments are not only affected by the daily high and lows but also by the 14 day fluctuation between Spring Tides (highest associated with full & new Moons) and Neap Tides (lowest). While there are no tide tables available for the upper Gulf of Mottama, the tables for Mawlamyine are available (https://www.tide-forecast.com/locations/Moulmein-Myanmar/tides/latest)

As an example the tides for Mawlamyine on two dates in 2016, 6 days apart (30 May and 5 June), illustrating Neap and Spring Tides. The difference between high and low tides vary from 2.26 m(7.4 ft) during the Neap tides on 30 May while during the new moon spring tide on 6 June the difference between the tides is 4.67m (15.2 ft.) and the highest tide is over 1.5m higher than the Neap tide. These differences affect the mud flats in the river such that there is considerable variation to their exposure. They can be divided into three categories:

1. High- covered by tide 2-3 days during tidal cycle
2. Mid covered by tide 6-9 days during tidal cycle
3. Low covered by tide every day

In addition to influencing when and where fishermen can fish in the Gulf or collect crabs on the mud flats these changes in exposure will also affect the fish and invertebrate populations inhabiting the mud flats.

Salinity: The tides and monsoons also affect the salinity particularly of the upper Gulf and river mouths (e.g. Bilin & Palaung Rivers). There are limited reported salinity measurements but they range is from 0 to 24 ppt. We are just starting to measure salinity along the river to get a more exact picture but interviews with fishers suggest the following pattern. In the upper Gulf from Sut Pa Nu Village up past the Sittaung bridges the river/Gulf has fresh water through all tidal cycles during the five months of the monsoons (May to October). As the river flow drops after the monsoons, the tide pushes in saltier water from the Gulf but during daily low tides and Neap tides the area is still fresh water. As the tides increase toward high spring tides the salinity will change daily from fresh water at low tide to higher salinity at high tide reaching just above the old bridge. The seasonal and daily changes in salinity will also affect the fish distribution and spawning cycles. This picture does suggest that the upper Gulf is much more a fresh water environment than we had previous considered.

Temperature: Sea surface temperatures (SST) are available from NOAA. Table 1 gives the monthly averages of SST in the GoM at Kyeikhto. Temperatures vary from 26.1 in January to a high of 29.9 in May. Temperatures recorded in the Sittaung River near the bridges on March 21-22, 2017 were 29.4 while temperatures at Sut Pa Nu 25 March, 2017 were 28.

Table 1: Monthly Kyaikto water temperature chart

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
°C	26.1	26.9	27.9	29.2	29.9	29.1	28.6	28	27.9	29.1	29.1	27.4

Environmental Change & Damage

Erosion: Project staff have reported considerable erosion on the western bank of the Gulf of Mottama in Kawa Township, Bago Region. Recently work by NAG GIS staff member (Tun Tun Thein, 2016) has systematic documented this erosion based on 20 years of Landsat satellite images. This shows a shift of 18km in the river bank westward with a loss of over 37,000 hectare of land on the Bago side (Fig 2). On the eastern side (Mon State) of the Gulf there has been deposition of about 27,000 ha of new land.

An analysis of possible causes suggests that the changes may have been influenced by clearing forest land in the Sittaung watershed for rice production.

Figure 2: Sittaung River Bank near SarPhySu Village, Kawa Township, Bago, September 2016 (photo: Tun Tun Thien, NAG)

A recent project meeting in Kawa identified over eight villages that had been washed out and another 22 who were in danger, (since then two more villages have been evacuated), this represents about 30,000 potential climate refugees.

In addition to the incredible erosion occurring on the west bank of the River and new land being created on the east there also appears to have been a number of other environmental changes. There is bank erosion in the upper Gulf on both sides of the river from the bridges on up. The river channel in the vicinity Moke Kha Mawt and Kha Ywae villages (near the northern border of Mon State) has changed drastically, some Islands have disappeared and what once was Mon farm land is now the western river bank in Bago. The Google view of this area shows a number of former river channels as closed and are essentially oxbow lakes. At Kyauk Seik, Kyeikhto Township just up the river from Sut Pa Nu half the village has been eroded and half the population relocated.

Numerous fishers indicate that the river channel between the two bridges and down to Sut Pa Nu has silted up and become shallower. As a consequence some types of fishing can no longer be carried out (e.g. Stowe net leases above Sut Pa Nu can no longer fish, mullet, Ka Ba Lu used to be a major fishery near the bridge but there are now very low catches).The salt water wedge used to come further up the river and fishers indicate sharks used to come up to the bridge. They blame the construction of the new bridge for this as the bridge pilings create whirl pools rather than a straight current thus allowing increased sedimentation, the bottom is shallower and the tidal current does not come as far up the river as before. These changes have also affected the fish species and may be affecting spawning areas.

These massive changes in the morphology of the Gulf present enormous challenges to the project in achieving the project outputs.

Additional Environmental Problems:

1. Sand dredging in the vicinity of the Sittaung Bridges during spawning seasons for Croaker and Mango fish may damaging spawning and nursery areas, and be sucking eggs from the bottom. Once we determine spawning season and areas we could try to address a moratorium on sand dredging in these areas and during the spawning season.

2. There has been a Pulp and Paper Plant located adjacent to the old bridge on the Mon State side. It closed in 2013 and may not open again. There are reports (based on comments from fishers and a former mill employee at Kha Wa Chaung village) of large fish kills due to pulp and paper wastes from this mill and that overflow from the storage ponds release bleaching chemicals and resulted in fish kills each December. There were 2-3 treatment ponds but they were too small and overflowed when they joined the river. The mill used caustic soda and chlorine to beach the pulp.

3. Further down the river in the Bilin River an alcohol distillery dumps waste into the river also resulting in fish kills.

4. Use of poisons for Macrobrachium especial in the upper Gulf & Bilin River

5. Agriculture pesticide & fertilizer run off, however, we do not know the extent of the use of agricultural chemicals in the GoM watershed.

Ecological Zones

It is become clearer that there is not just one Gulf but a number of separate ecological zones that will have to be managed separately and will require different co-management approaches.

1. ***Bilin Mud Flats***: The mud flats are found on both sides of the Gulf in Mon State (Kyeikhto & Bilin Townships) and southern Bago Region and Yangon District particularly Kayan Township. The mud flats on the Mon State side are the major area for the newly declared Ramsar site (Fig 1). This area is an important wintering area for the shore birds but is also very important for mud crab harvesting, nursery area for fish, and is the site of the illegal fishing using the Than Za Gar Pike nets.

2. **Bago Shore High Erosion Zone:** This is an area of rapid changes where villages are being washed away and having to relocate, and fishing grounds are being lost. The major issues here are social related to the relocation and livelihoods.

3. **Upper Gulf Sut Pa Nu to northern border of Kyeikhto & Bago Region**: This zone has freshwater most of the year with saline waters only reaching here during high tides during the dry season. It is a critical habitat for spawning and juvenile nurseries for three species Mango Fish, (Nga Ponnar /Nga Mway); Croaker, Nga Poke Thin; and River Hilsa, (Nga Tha Lauk). The fishery is exclusively nets (gill and trammel) with some fixed Stowe nets in the river above the bridges. A more detailed report on this zone is being prepared.

4. **Southern Zone- southern Thaton and Paung Townships:** This is a more estuarine system with a fresh water influence during the monsoons, mangroves are present on the coast and creeks, marine and estuarine fish species predominate and in general the fishery is larger scale and some bag nets are used along with gill and trammel nets.

Fishing

Fishing grounds: There is considerable variation in fishing grounds from village to village and from season to season. Some villages only fish close to their village Fig. 3 B, while others fish close to their village during some seasons and then move down the Gulf particularly during the dry season Fig.3 A. Some villages in Bago Region indicated that because of erosion and changes in the river channels they now had to fish further from their home village. In one village (Sut Pa Nu, Kyeikhto Township) there was a seasonal movement of about 50% of the boats from the home village from the mouth of the Sittaung to fish south of Mawlamyine where they land their fish in Mu Don Township, Mon State during November to February. The significance of this wide ranging fishing grounds is that co-management will have to take into account the fact that most fishing areas are fished by fishermen from different villages. Thus any attempts at allocated exclusive fishing zones or other co-management approaches will require negotiations across villages, townships and even Regions/States.

Figure 2 Examples of fishing grounds in Gulf of Mottama; (A) Fishing ground covering the whole Gulf from Sittaung Bridge to Mawlamyine; (B) Fishing grounds close to village

(A) **(B)**

Fishing gear: Fishing boats vary from 3-10 m (10-35 ft) with most of them in the 6-10m (20-35 ft) range. Motors are in the 4.5-25 hp. range. Normally there are two to three fishers per boat often family but sometimes paid crew members. Fishermen may be at sea for a few hours to at least 6 weeks.

Fishing gear varies from village to village and most fishermen use a number of nets or gear depending on season, tide or fish availability. Table 2 lists the most common gear and a more detailed description of the common gear is found in Tin Wai et al (2014), and Thazin Htet (2017). In general the fishermen

on the west (Bago) side of the Gulf use smaller fishing gear and fish closer to their village than on the east (Kyaikhto) side.

The Trammel net (composed of three layers of nets) is the most common type of fishing gear with the inner mesh sizes normally varying from 3.8 to 8.6 cm (1.5-3.4 in) and length from a few 100 metres to 2-4km. The legal sized mesh in Mon State is 1.0 in (2.5 cm). Small scale fishermen often cannot afford the trammel nets and use small mesh drift gill nets (some below 1 "), some of the small scale gear does not require a license from DoF. Large Bagnets are the most common fishing gear from Paung Township south but only a few are used in the GoM project villages, while smaller bag nets are often used at the mouth of rivers and creeks. A few fishermen in Belin and Kyaikhto use beach seines. The most contentious gear used in the GoM are staked nets (Than Za Gar Pike) using illegal small mesh (6mm, 0.24in), that are 1-5 km long and set on the mud flats. More details of this fishery is given in (MacKay et al 2017).

Table 2: List of Common Fishing Gears used in the Gulf of Mottama

Gear Name	Burmese Name
Trammel Net	(သုံးထပ်ပိုက်) Thone Htat Pike
Drift Gill net	(မျှောပိုက်) ရေပေါ် Hmaw Pike (Htaung Pike)
Gill net	(ကွင်းစူးပိုက်) Gwin Shu Pike
Set Gill net(Small Gill net)	(ကွင်းတားပိုက်) Kwin Tar Pike
Illegal (6 mm mesh) Stake Net	(ချောင်းပိတ်ပိုက်) (Than Za Gar Pike)
Beach Seine Net	(သောင်ဝိုင်းပိုက်) Thaung Waing Pike
Small Bag Net	ကျားလုံး/ဂျမ်းကျား Kyar Lone/Gyun Kyar, (Kyar pa zat pike)
Large Bagnet	(ကျားပါးစပ်ပိုက်) Kyar Pa Sup (Taing Htaung Kyar)
Crab Trap	(ကဏန်းမြုံ) Ganan Hmyone
Crab Hook	(ကဏန်းချိပ်) Ganan Chake

Fish Species: The fish species caught in the GoM are primarily estuarine and represent fewer species than found in other fishing grounds in Myanmar, The most common species are shown in Table 3 with about 10 common species. Tin Wai et al (2014) records 35 species and Thazin Htet (2017) reports 40 species, this is much less than the over 70 species caught in the bagnet fishery in southern Mon State (Thin Swe, 2011).

One of the major surprises of the village surveys was the importance of mud crabs particularly to small scale fishers, landless and women. This had been missed in earlier project surveys. The crab catching is primarily on the Belin mud flats in the same habitats that are important to the migratory water birds including the spoon billed sandpiper. This fishery is under taken from about 30 villages from both Bago Region and Mon State (and also South-east part of Yangon Region).

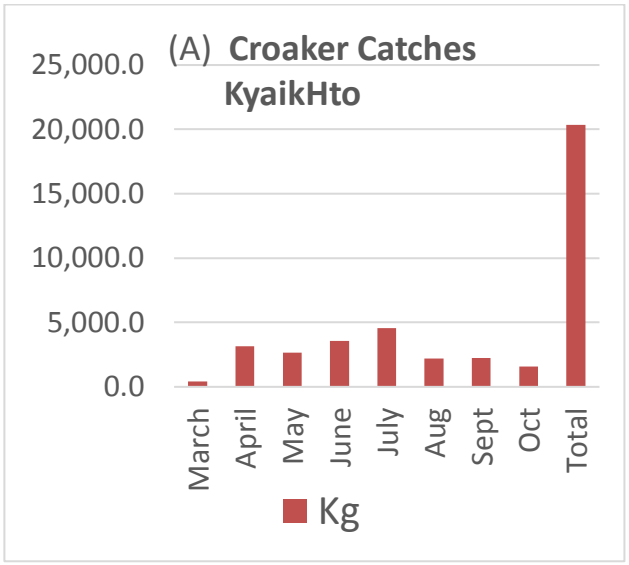
Table 3: Common species caught in the Gulf of Mottama fishery

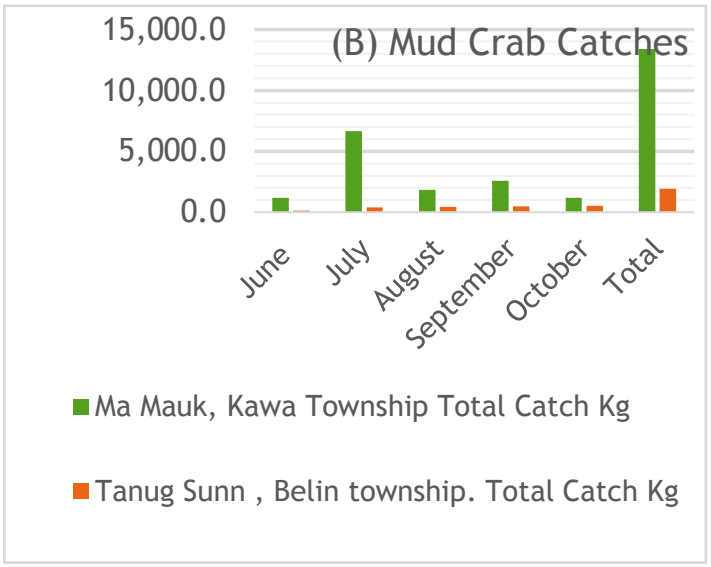
Abundant Fish Species in Kyaikhto Township		**Abundant Fish Species in Belin Township**	
Fish Species Myanmar	**Fish Species English**	**Fish Species Myanmar**	**Fish Species English**
ငါးပုဏ္ဏား Nga Ponnar	Mango Fish	ကဘီလူး Ka Ba Loo & Nga Zin	Mullet
ငါးပုတ်သင် Nga Poke Thin	Croaker	ငါးပုတ်သင် Nga Poke Thin	Croaker
ငါးသလောက် Nga Tha Lauk	River Hilsa	ငါးပုဏ္ဏား Nga Ponnar	Mango Fish
ငါးဇင်ရိုး Nga Zin Yaing	River Cat Fish		Mud Crab
ငါးယောင် Nga Gyaung	Giant River cat fish	Nga Pa Lway	Silago
ငါးဘတ် Nga Bat	Wallago	ငါးသလောက် Nga Tha Lauk	River Hilsa
ကကတစ် Ka Ka Tit	Sea Bass	ငါးသလောက် ယာက်ဖ Par Mae	Toli Hilsa
ကဘီလူး Ka Ba Loo & Nga Zin	Mullet		Freshwater Prawn
Nga Dan	Butter fish (Pangasius)	ငါးဇင်ရိုး Nga Zin Yaing	River Cat Fish
ငါးဖားမား Nga Phar Mar	Smiths barb	ငါးယောင် Nga Gyaung	Giant River cat fish
ငါးလိပ်ကျောက် Nga Lape Kyauk	Whipray		

Catch Data: The project is collecting catch data from: Myanmar Holdings Kyaikhto Sub-Station on Croaker (Rosy Jew Fish) Catch; two Fish Collectors from Sut Pa Nu Village, Kyaikhto Township; and three Crab Collectors from Kawa Township, Bago Region and Belin Township, Mon State

Preliminary data is given in Figure 4. What is significant is that the mud crab catches are almost as large as the Croaker catches, which had previously been suggested as the largest catches in the GoM.

Figure 4: Examples of catch data collected for 2016 from (A) Croaker and (B) Crab Collectors





Additional detailed catch data has been obtained from one Sut Pa Nu from on fish collector. The data is shown in Figure 5 and Table 4 The total annual catch from this one fish collector is about 5000 Viss (8000kg). The top four species account for about 70% of the catch and three of the species are anadromous (migrate from salt water to spawn in fresh water).

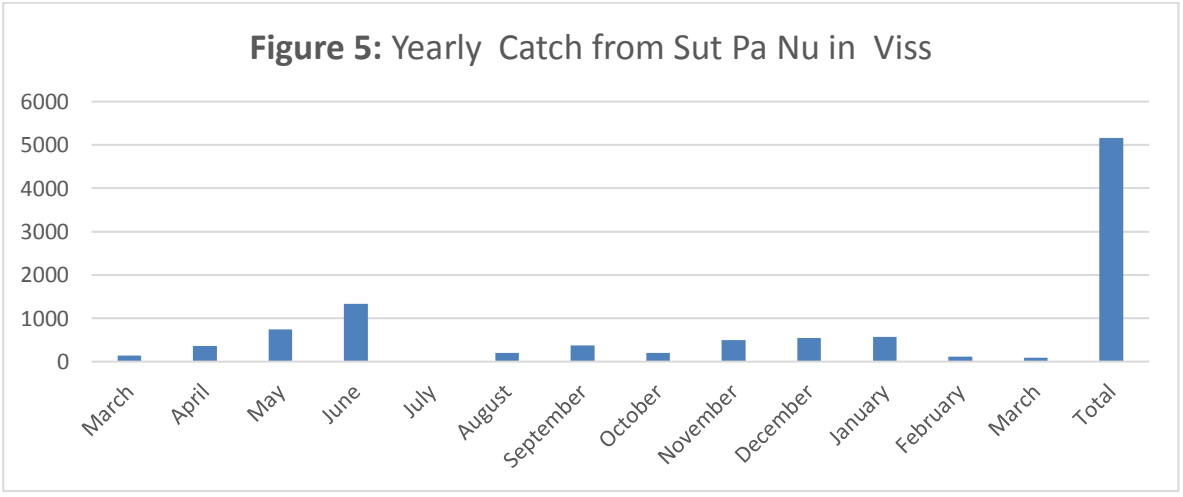


Table 4: Fish Catch from Sut Pa Nu, Kyaikhto Township, Mon State, March 2016 to March 2017

Fish Species		**Weight**		
English	**Myanmar**	**Kgs**	**%**	**Peak Catch**
Mango Fish	Nga Ponnar	3,013.7	35.8	May June
River hilsa	Nga Tha Lauk	1,378.3	16.4	August –January Peak January
Toli Hilsa	Nga Tha Lauk Yauk Pha	32.6	0.4	January
Croaker	Nga Poke Thin	858.1	10.2	Most of year May & September
Wallago	Nga Batt	572.9	6.8	November-December
Various small fish	Various small fish	451.5	5.4	April
Prawn	Pa Son Htoke	375.8	4.5	May-June most of year
Barb Osteobrahma	Nga Pham Ma	334.7	4.0	September
Snakehead	Nga Yant	248.5	3.0	November-December
River Catfish	Nga Zin Yaing	223.7	2.7	April May
Other catfish	*Nga Gyaung*, Nga Eike, Nga Dan, Nga Khu	195		
Whipray	Nga Lape Kyauk	195.1	2.3	March-April
Scaly Hairfin anchovy	Nga Pyar	122.5	1.5	January
Catla	Nga Thain Gaung Pwe	111.0	1.3	August-November
Mrigal	Nga Gying Phyu	71.9	0.9	August-Nov Peak September
Seabass	Ka Ka Tit	79.4	0.9	September
Mullet mixture	Ka Ba Lu, Nga Zin Sauk	109.5	0.9	December-January
Misc		49.2	0.6	
Total		**8,423.9**		

Ecological Information: Information on fish spawning and nursery areas for seven fish species, mud crab and freshwater prawn was collected from 10 Villages in Kyaikhto and Belin Townships, Mon State. Table 5 gives a summary for four species and Figure 6 gives examples of locations on specific spawning sites. A follow up was initiated in March 2017 to areas in the Sittaung River and a separate report is in preparation.

Table 5: Summary of spawning information for four species of fish in Gulf of Mottama

		Month			
Species	**Number of Villages**	**Spawning**	**Presence of juveniles**	**Location of spawning**	**Map Location**
River Hilsa ငါးသလောက် Nga Tha Lauk	5	April-May	April-June	Sittaung River Above Bridge in freshwater	yes
Croaker ငါးပုတ်သင် Nga Poke Thin	7	July-August	September-October	Sittaung River Above Bridge where fresh & saltwater meet	no
Mango fish ငါးပုဇွန်း Nga Ponnar	7	April-June	April-October	Sittaung River Above Bridge	no
Mullet ကဘီလူး Ka Ba Loo	4	March-June	May-June	Sittaung River Above Bridge & Belin River, & associated small creeks	Yes both Sittaung & Belin Rivers

Figure 5: Examples of spawning sites for Mullet ကဘီလူး Ka Ba Loo

(A) Sittaung Bridge area; (B) Belin River area

Co-Management: One of the major goals of the CLCMGoM Project is the equitable and sustainable management of the natural Resources of the Gulf of Mottama particularly the fisheries resources. This is to be achieved through a process of **Co-management.** However, there has been lack of clarity on what is meant by co-management, both within the project and also with stakeholders. The Fisheries Advisor has worked closely with the NAG project coordinator and international experts to refine the approach to co-management for the GoM.

The approach suggests an initial strategy of Identifying a major issues or hotspots, some of which may be site (village) specific. Then developing co-management models for the key issues involving the key actors and stakeholders (SSF, township level government officials (DoF, GAD, etc), State or Region officials, local fish collectors (buyers), MFF, etc.). The project is as a first step focusing on organising fisheries groups at the village, tract, township and State/Region level and then moving on to interstate cooperation. This could provide models of how co-management approaches can address diverse fisheries issues. This approach will involve organising, capacity building and training at all levels some achieved with the new Fisheries Development and Research Collaboration Centre. A detailed draft document is currently being finalised.

Market

Survey of township fish markets: A number of surveys where made of township fish markets in Thanatpin, Bago Region, Kyaikhto and Thaton Townships, Mon State. The fish markets are busy places with 30 to 50 fish venders per market, primarily women. The initial surveys attempted to determine the source of the fish in the market and assist in the identification of GoM species. In all markets about 75% of the fish had been purchased from Yangon in some cases bough by a broker and then distributed to local venders. About 65% of the species were from aquaculture with another 10% being marine species caught in the wider Bay of Bengal and sold to Yangon. About 20% were locally caught fish from both freshwater and the GoM. We were also surprised to discover about 5% were reported to have come from Myawaddy on the Thailand border suggesting cross border trade. This included marine shrimp, tilapia, large climbing perch and other fresh water species. There were also about five venders selling dried fish from southern Mon and Rakine. There were also a few vendors selling fish paste. Because of the wide diversity and complexity of the marketing chains it was decided not to continue the surveys.

GoM fish marketing: The marketing chains are described in more detail in the Value Chain Reports (available from NAG). The most important value chain is fresh fish direct to Yangon or Mawlamyine. In almost all villages' fish are sold to a village fish collector who also supplies advances to the fishers. Collectors in northern Kyaikhto and Bago Region normally send their fish in Styrofoam boxes often with ice direct to fish brokers in Yangon, sometimes accompanying the fish. The boxes are often transported from the fishing villages by motorcycle to the main highway where they are sent via long distance bus to Yangon. In Thaton Township the fish are often transport by boat in ice chests to Thaton and then by road transport to Mawlamyine cold storages (three companies). Most vender's sell a few fish within the villages included both lower value fish and more expensive fish. Lower value fish (both lower quality and less desirable fish) are often sold to township markets. When croaker catches are peaking there are bough in the GoM by mobile collecting boats that buy fish directly from

the fishers at sea. One village complained that this lead to unfair price competition with village fish collectors and in this village, a fish vender was importing fish from Yangon to sell in the village.

A few villages dry lower value fish e.g. mullet, while small fish normally go into fish paste. The Value Chain Study suggested that because of the increased supply of ice, fewer fish are dried in the village than previously. This concentration on fresh fish in the GoM villages is much different from the value chain elsewhere in Mon State where from Paung south the majority of fish are dried and sold dried for human consumption or for animal feed.

Crab marketing is similar throughout the project villages. A village crab collector (buyer) will buy crabs form the local fishers and in some cases from a number of surrounding villages. In all case the crabs are transport to Yangon and sold to brokers there, and then the assumption is they are then exported to China. One collector indicated that small (undersized crabs) were sold to Myawaddy on the Thai border and we assume transported to Thailand.

Other Studies

Fisheries Inns (leases): In many areas of Myanmar large productive fishing areas, particularly in freshwater, are leased by auctioned for one to nine years. These are often purchased by businessmen who then sublease to local fishers. The end result is that small scale village fishers often do not have access to productive fishing areas adjacent to their villages. In Mon State there are very few Inns, although two project villages have indicated issues with Inns. In Bago Region Inns are much more common. We identified two villages with Inns in Kawa (Mu Du and Paing Kyone Villages): one managed by a village fishers group and another by a local businessman. We initiated a survey of these Inns including mapping the area. However, as these village where deemed not to be coastal villages but were in the potential boundary area for the Ramsar site, the study has been given low priority and not followed up.

Wild fish aquaculture in Bago Region: Small scale aquaculture in Myanmar has not previously been reported. During a village visit to Tadar Oo village, Kawa Township, Bago Region, project staff were invited to visit an aquaculture pond There we discovered a small scale indigenous aquaculture system using monsoon flooding of the rice fields to stock the pond with wild fish, when the water levels dropped the fish were trapped, and then fed, in addition at harvest about 20% of the fish were selected as brood stock to carry over in the dry period and spawn at the start of the next monsoons. As a result a detailed survey was carried out of eight villages, a follow up visit to three of these villages, and a survey of two ponds during harvest. This small scale aquaculture using wild species appears to be very widespread being practiced by 100's of farmers in these villages. A draft report is being finalized. A further study is planned for Thaton Township, Mon State where there appears to be a similar system in use. It is anticipated that this approach has considerable potential to be extended to other project farmers especially in Mon State.

Research meeting 2016: The Fisheries Advisor assisted in organising a research meeting 21-22 November in Mawlamyine. The meeting summarised research to date, for all three outputs, identify gaps, and developed an integrated work plan for 2017. The Advisor also prepared power pts that where presented by NAG colleagues. An agenda, the draft 2017 work plan and all Power Pt presentations are available from NAG.

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