SOCIO-ECONOMIC STUDY

IN

GULF OF MOTTAMA

By –

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1. Introduction

Myanmar has terrestrial and aquatic ecosystems and marine waters cover a total area of approximately 486,000 km^2, 8.1 million hectares of inland fresh water bodies and a large number of estuaries, rivers, creeks, streams, natural ponds, lakes and puddles. The major fishing areas occur in the down streams tributaries of the Ayeyawaddy, the Thanlwin and the Sittaung rivers. A long coastline and the swamp along the coast of Myanmar serve as spawning, nursery and feeding grounds for aquatic life (Anonymous, 2009). Myanmar possesses a considerable diversity of coastal habitat, including coral reefs, mangroves, sandy beaches and mudflats. During the monsoon season flooded plain are breeding and nursery grounds for fresh water fishes. Fisheries have major role in social and economic development because Myanmar people are largely and mainly depend on rice and fish consumers. Fishes and fish products are the major source of animal protein. These can be utilized as food in many forms such as fresh, dried, salted, sauce and paste for the whole country. Fishery sector provide the food security as well as employment opportunity to a large number of fisheries communities and rural dwellers.

The Mon State is located between L 15º 10' N and 17º 30' N and L 96º 46' and 98º 15' E with a unique ecosystem. The Gulf of Mottama is located at the mouth of Sittaung and the Thanlwin river along with two small rivers, the Gyine and Attran. This coastal area is characterized by the fluctuation of seawater flood and fresh water discharge.

The Gulf of Mottama, covering an area of 42,500 hectares is Myanmar's fourth Wetland of International Importance. The site (Ramsar Site No. 2299) is situated at the mouth of the Sittaung River. The Site supports a large number of species including marine fish invertebrates and up to 150,000 migratory waterbirds in the winter season. The Gulf of Mottama also support the livelihood of thousands of people by providing fish for local and regional consumption.

The designation of the site as a Wetland of International Importance was made possible through consultations between government and local communities, and they are working towards the implementation of a management plan.

The Gulf of Mottama coastal area has a broad mud flats, sandy beaches flood plains, salt marshes and mangrove trees. Two prominent rivers, the Thanlwin and the Sittaung Rivers flow into the Gulf of Mottama. The study sites are situated on the mouth of Sittaung river. It is a very good area for fish spawning and nursery ground of commercial fish such as croakers, threadfin, mullet and seabass. The various types of fishing gears are used to exploit the large diversity of fish fauna found in the Gulf of Mottama waters. The fishing gears are classified into commercial such as trawl net, purse seines, drift net and gill net, and traditional

including hook and line, cast net, bag net, trammel gill net, traps and fence net. And the fishing vessels are used mainly on mediun sized boats.

Similar to other species groups in Myanmar, there is also a need for a comprehensive global threat assessment of fish species in order to identify global conservation priorities in Myanmar. The fish diversity of Myanmar's non-marine habitats is seriously threatened by destructive fishing practices, dam construction, pollution and invasive specious. A number of fish species may be threatened with global extinction particularly among the fauna of Myanmar which is extremely sensitive and supports national endemic. To date, however, no fish species confirmed of occur in non- marine habitats in Myanmar have been assessed as globally threatened.

(Source; www.EndengeredspeciesMyanmar.org)

2. Objective

The present study contributed fisheries and Socioeconomic Monitoring of the some villages in the Gulf of Mottama. This project was funded by Network Activities Group (NAG). The objective of the survey are as follow:

- To study the fish and fishery status
- To reveal occurrence fish species and their distribution
- To observe fishing gears and fishing vessels
- To provide fisheries information to the Gulf of Mottama RAMSAR site.
- To provide the livelihood and socioeconomic of fishermen from some fishing villages
- To fulfill the informative requirements for the users in relation to fishery sector.

3. Survey Team and Area

Survey Team

The survey team was participated in survey trip to investigate and observe in the study villages.

Dr. Tint Swe	Professor (Retd), Marine Science Department	Chief
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Survey Area

The survey area is situated on the east coast of the Gulf of Mottama in Mon State. It is designated as a Ramsar Site. A total of 10 survey area was located in three townships, Thaton, Bilin and Kyaikhto. The villages Aungkanthar, Gyophyugone and Hatchery Station are in Thaton Township, Zokekali, Ywadanshe, Taunggyi and Koetalsu are in Bilin Township and Sutpanu, Boyargyi and Kyaukseik are in Kyaikhto Township. (Fig. 1)

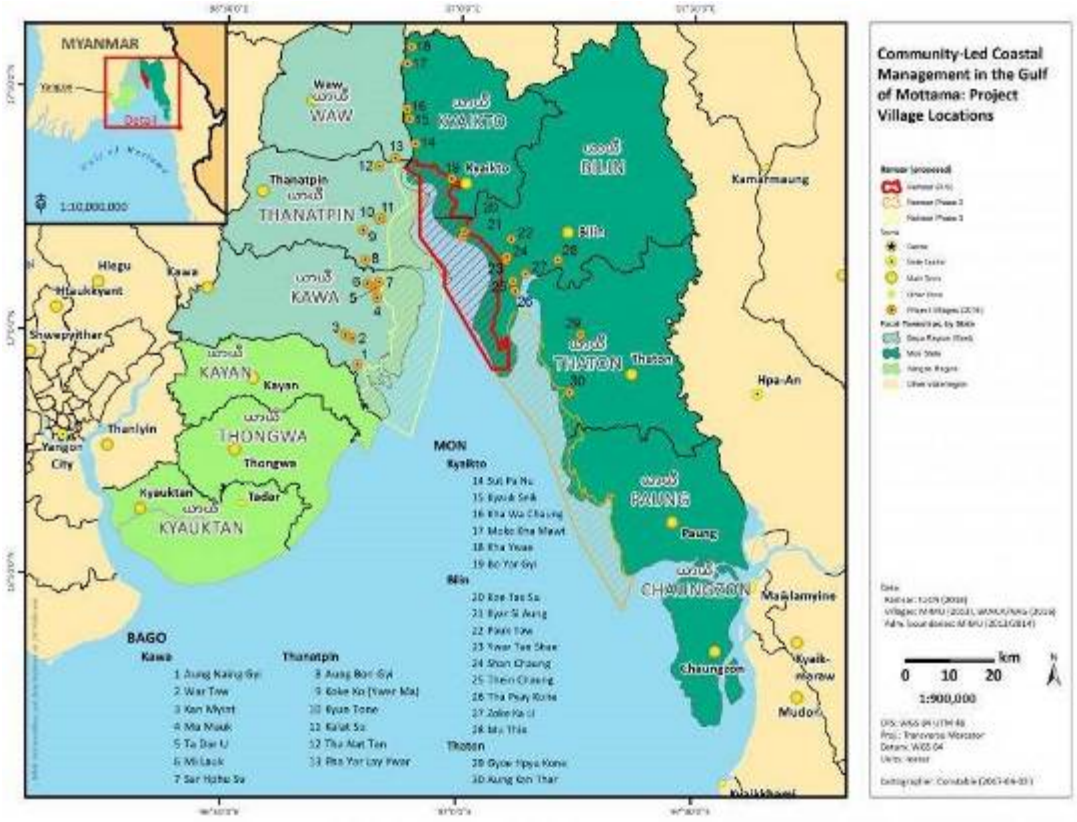


Figure 1. Map showing the survey villages of the Gulf of Mottama in Mon State

4. Itinerary

The total four trips were made to the east coast of the Gulf of Mottama during study period April 2017 to September 2017. The survey team went to the three townships Thaton, Bilin and Kyaikhto in 10 study sites (9 villages and 1 hatchery). The express bus, boat, motor cycle and tri-wheel cycle taxi which is locally known as "Sampalaw" are the main transportation vehicle to go around the area.

Table 1(A). The first trip to the study site of the Gulf of Mottama (5.5.2017-9.5.2017)

Date	From	To	Vehicle	Activities
5.5.2017	Mawlamyine	Thaton	Express	Go to DoF and collect some information. Night stayed.
6.5.2017	Thaton	Aungkanthar village	Boat	Collect fish samples and take photos, Fisherman consultation held at Aungkanthar village regarding resource use and livelihood assessment. Do transect walk and visual inspection of the community profiles come back and stay at Thaton
7.5.2017	Thaton	Kyaikhto	Express	Go to fish buyers (Mawlamyine Holding Company) and inform the fishery states and status. Night stayed
8.5.2017	Kyaikthto	Sutpanu village	Taxi	Go to Sutpanu village Conducted public consultation on fishery resources and livelihood assessment. Make the transect walk and visual inspection of communities profile. Come back Kyaikhto and night stayed.
9.5.2017	Kyaikthto Kyaikthto	Lauding site Mawlamyine	Taxi Express	Observe landing fishes and take photos. Return to Mawlamyine

Table 1(B). The second trip to the study sites of the Gulf of Mottama (12-17 Aug, 2017)

Date	From	To	Vehicle	Activities
12.8.2017	Mawlamyine	Bilin	Express	Collect village profiles at Rural Development Department (RDD) and night stay in Bilin.
13.8.2017	Bilin	Zoke kali village	Taxi	Go to coastal fishing area, take

				fishery photos and collect information include fishing gears and vessels. Some Livelihood and socioeconomics data are collected Return back Bilin.
14.8.2017	Bilin	Kyaikhto	Express	Collect some information at RDD Kyaikhto office Go to Fish Buyer Site (Nga dai), interview and take sample photos, night stop.
15.8.2017	Kyaikhto	Sutpanu village	Taxi	Interview with fisher and head of village GAD. collect information and visit to coastal fish landing site. Return back Kyaikhto.
16.8.2017	Kyaikhto	Thaton	Express	Go to DoF (District and Township) and collect fishery information. Go to fish market and take fish photos. Night stop.
17.8.2017	Thaton	Fish hatchery station Mawlamyine	Taxi Express	Visit to fish hatchery station, which is only one station in Mon State. Observe and inter view there. Return back Mawlamyine.

Table 1(C). The third trip to the study site of the Gulf of Mottama (26-31 Aug, 2017)

Date	From	To	Vehicle	Activities
26.8.2017	Mawlamyine Kyaikhto	Kyaikhto Boyargyi	Express Taxi	Transit and go to Boyargyi village. Meet head of village GAD, collect fishery information and village profile. Return to Kyaikhto and night stop.
27.8.2017	Kyaikhto	Boyargyi village	Taxi	Fisherman consultation in Boyargyi village regarding resources use/harvest and livelihood assessment. After that, do transit walk and visual inspection of the community profiles. Come back Kyaikhto night stop.
28.8.2017	Kyaikhto	Bilin	Express	Go to Township Rural Development Department (RDD) and copy the data of

				Ywadanshe and Taunggyi villages collect fish sample in fish market. Night stop.
29.8.2017	Bilin	Ywatanshe village	Taxi Boat	Collect fishery information, village profiles and livelihood data from village head. Very closed to Shanchaung village. Return back Bilin.
30.8.2017	Bilin	Thaton	Express	Go to RDD office and copy the village profile data for Aungkanthar and Gyophyugone villages. Contact DoF to meet fishers, some information is collected.
31.8.2017	Thaton	Fish hatchery station Mawlamyine	Taxi Express	Hatchery station observation Return to Mawlamyine.

Table 1(D). The fourth trip to the study site of the Gulf of Mottama (16-21 Sept, 2017)

Date	From	To	Vehicle	Activities
16.9.2017	Mawlamyine	Kyaikhto	Express	Go to fish buyer Mawlamyine holding Co. Ltd. informed fishery night stayed
17.9.2017	Kyaikhto	Kyaukseik	Taxi	Fisherman consultation in Kyaukseik village regarding resources and livelihood. Do walk and visual inspection of the community profile and coastal landing site. Come back Kyaikhto nigh stop
18.9.2017	Kyaikhto	Bilin Koetalsu	Express Taxi	Go to Bilin Township. Then trip to Koetalsu village and make interview with fisherman. Do walk and visual inspection of community profile and coastal bank. Comeback Bilin nigh stop.

19.9.2017	Bilin	Thaton	Express	Go to DoF of Thaton and collect some fishery data. Night stayed.
20.9.2017	Thaton	Gyophyugone	Taxi	Fisherman consultation in Gyophyugone village. Side walk and visual inspection of the community profile and coastal lauding site including dams. Night stayed.
21.9.2017	Thaton	Mawlamyine	Express	Return back Mawlamyine Transit from Hatchery station

5. Materials and Methods

The study group went to the selected towns and villages. Sample collections were carried out at the landing sites, fish markets and fish collectors (fish buyer) including walk-sellers in the villages. The team visit to the selected sites, villages and fish market using a motorized local boat and motorbike “sampalaw”. The team traveled in the study area to collect fish sample and recorded then the position of target selection area. Utilized fishing gears and catch were also recorded.

In the survey, the team was practiced in data collection, interview, market observation and visual inspection were conducted in study villages. Fishermen, village authorities and villagers at each selected village were interviewed for fish and fishery information and other livelihood data.

The team made the random transit-walk in the village, traveled to Department of Fishery, Basic Education Schools, Administrative Office, Rural Development Department, visited to River bank, beach coast, fish landing site dam and water flow current, coastal flood plain areas and mangrove swamps.

Data collections by using the SOC MON methodology were carried out in the study villages. The Key Information (KI) and House Hold (HH) indicators were chosen and decision-making, Data collection were using three complementary research methods namely, Household Interview (HHI), Key Information Interview (KII) and Focused Group Discussions (FGD).

The identification of fish was mainly based on FAO identification sheets and catalogue for fishery purposes and http://fishbase.org. And also concern document of reports

and Thesis papers of Marine Science Department, Mawlamyine University were recorded in desk study.

6. Results

6.1 Fisheries Status

6.1.1 Fish species

In the present study, a total of 60 fish species was recorded in area. They were 51 species of fish, 1 species of shrimp, 6 species of crabs and 2 species of eels Table 2 and Table 3.

In the present study, the recorded fishes were also mentioned common name, local name and IUCN Red list in Table 2 and 3.

6.1.2 The distribution and occurrence of fishes

The distribution and occurrence of fishes in the study villages were mentioned in Table 4. The most occurrence fish species is 34 numbers in Supanu village, followed by Aungkanthar and Boyargyi, 33 and 32 numbers, respectively. The least number of occurrence fish was found in Koetalsu and Taunggyi villages about 19 and 20 respectively. (Fig. 2)

Table 2. Systematic list of fish in study areas

Class	Order	Family	Scientific Name	Common Name	Local Name	IUCN Status
Actinopterygii	Anguilliformes	Muraenesocidac	*Congresox talabon* (Cuvier,1829)	Pike fish	Nga Shwe	NT
	Beloniformes	Belonidae	*Strongylura strongylura* (van - Hasselt, 1823)	Long tone, needle fish	Nga phaung yoe	NE
	Clupeiformes	Engraulididae	*Thryssa mystax* (Bloch & Schneider, 1801)	Anchovy	Nga byar	LC
			Setipinna taty (Valenciennes, 1848)	Anchovy	Nga byar	NE
			Coilia dussumieri (Valenciennes, 1848)	Gold spotted grenadier anchovy	Nga kyanywet	NE
	Cypriniformes	Clupeidae	*Tenualosa ilisha* (Hamilton, 1822)	Hilsa shad	Nga thalauk	NE
			Tenulosa toli (Valenciennes, 1847)	Toli shad	Nga thalauk york pha	NE
		Cyprinidae	*Osteobrama belangeri* (Valenciennes,1844)	Manipur osteobrama	Nga Phan ma	NT
			Osteobrama alfredianus (Valenciennes, 1844)	Osteobrama	Nga phanma	NT
			Puntius chola (Hamilton, 1822)	Swamp barb	Nga Khone ma	LC
			Cirrhinus mrigala (Hamilton, 1822)	River carp	Nga gyin phyu	LC

			Catla catla (Hamilton, 1822)	Carp	Nga thine	NT
			Chela fasciata (Silas,1958)	Carp	Ngada mauk	NT
			Labeo rohita (Hamilton, 1822)	Roholabeo	Nga myit chin	LC
	Tetraodontiforms	Tetraodontidae	*Logocephalus lunaris* (Bloch, 1801)	Puffer	Nga pu tin	LC
			Xenopterus naritus (Richardson, 1848)	Puffer	Nga pu tin	NE
	Mugiliformes	Mugilidae	*Mugil cephalus* Linnaeus, 1758	Mullet	Ka bi lu	LC
			Rhinomugil corsula (Hamilton, 1822)	Mullet fresh water	Ka bi lu	LC
	Polynemiformes	Polynemidae	*Eleutheronema tetradactylum* (Shaw,1804)	Thread fin four finger	Nga tha yaw	NE
			Polynemus indicus Shaw, 1804	Indian thread fin	Ka Ku yan	NE
			Polynemus paradiseus (Linnaeus, 1758	Paradise thread fin	Nga hmway	NE
	Perciformes	Sciaenidae	*Otolithoides biauritus* (Cantor, 1849)	Croaker	Nga Poke thin	NE
			Otolithoides pama(Hamilton, 1822)	Pama creaker	Nga Poke thin	NE
			Johnius coiter (Hamilton, 1822)	Croaker	Nga byat	NE
			Chrysochir aureus (Richardson, 1846)	Croaker	Thin war	NE
		Harpadontidae	*Harpadon nehereus* (Hamilton, 1822)	Bombay duck	Nga hnut	NE
		Lobotidae	*Lobotes surinamensis* (Bloch, 1790)	Triple tail	Nga byae ma	NE
		Latidae	*Lates uwisara* (Pethiyagoda and Gill, 2012)	Sea bass (*L. calcarifer*)	Ka ka tit	LC
Actinopterygii	Perciformes	Gobiidae	*Glossogobius giuris* (Hamilton, 1822)	Tank goby	Ka tha boe	LC
		Scatophogidae	*Scatophagus argus* (Linnaeus, 1766)	Scad	Nga bee	LC
		Theraponidae	*Therapon jarbua* (Forsskal 1775)	Therapon	Nga gone kyar	LC
		Sillginidae	*Sillaginopsis panijus* (Hamilton, 1822)	Whiting	Nga palwe	DD
		Trichiuridae	*Trichiurus lepturus* Linnaeus, 1758	Ribbon fish	Nga ta kon	NT
		Channidae	*Channa striata* (Bloch, 1793	Banded snake head	Nga yant	LC
		Cichlidae	*Oreochromis niloticus* Gunther, 1889)	Tilapia	Tilapia	NT

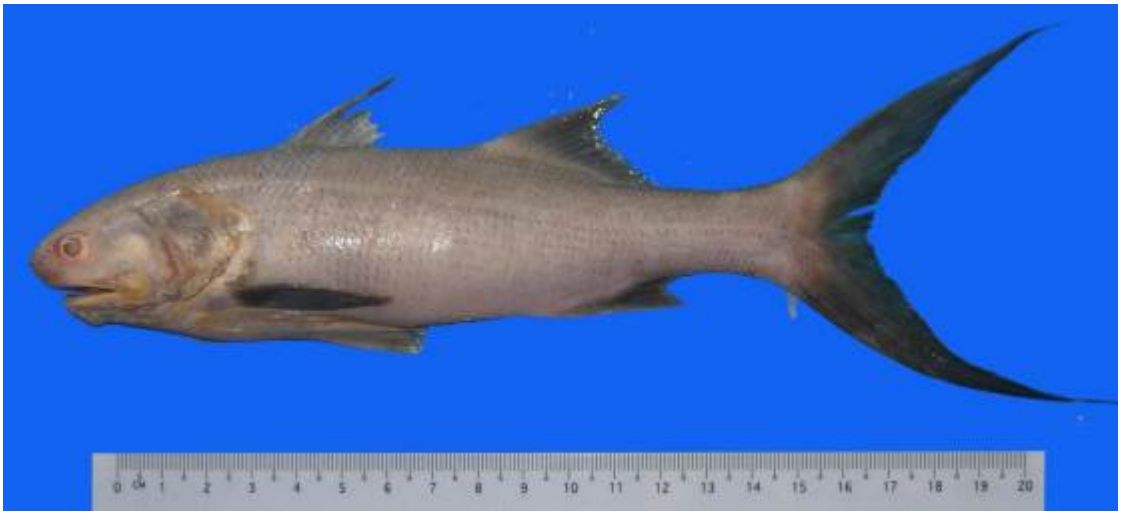
	Pleuronectiformes	Cynoglossidae	*Cynoglossus bilineatus* (Lacepede, 1802)	Flat fish tangue sole	Nga Khway shar	NE
	Scorpaeniformes	Platycephalidae	*Platycephalus indicus* (Linnaeus, 1758)	Flat head	Nga sinnin	DD
	Siluriformes	Ariidae	*Arius thalassinus* (Ruppell,1837) *Arius maculatus* (Thunbreg, 1792) *Osteogeniosus militarias* (Linnaeus, 1758)	Giant cat fish Sea cat fish Soldier cat fish	Nge yaung Shwe nga yaung Nga yaung	NE LC NT
		Siluridae	*Wallago attu* Bloch & Schneider, 1801 *Ompok bimaculatus* (Bloch 1794)	Sheat fish Butter cat fish	Nga bat Nga nu than	NT NT
		Claridae	*Clarias batrachus* (Linnaeus, 1758)	Fresh water cat fish	Nga khu	NE
		Pangasiidae	*Pangasius pangasius* (Hamilton,1822)	Butter cat fish	Nga dan	LC
		Bagridae	*Mystus vittatus* (Bloch 1794)	Dwarf cat fish	Nga Zin yine	LC
			Aorichtys seenghala (Sykes, 1839)	Dwart cat fish	Nga Zin yine	LC
	Osteoglossiformes	Notopteridae	*Notopterus notopterus* (Pallas,1769)	Feather back	Nga phal	LC
	Scombraidei	Anabantidae	*Anabas testudineus* (Bloch, 1792)	Climbing perch	Nge byae ma	DD
	Siluriformes	Plotosidae	*Plotosus canius* Hamilton, 1822	Sea cat fish	Pinlal ngakhu	NE
	Synbranchiformes	Synbranchidae	*Dasyatis bricatus* (Zuiew, 1973)	Rice swamp eel	Nga shint	LC
		Anguillidae	*Anguilla bengalensis* (J.E. Gray, 1831)	Mud eel	Nga shint	LC
Elasmobranchi	Carcharhiniforms	Carcharhinidae	*Scoliodon laticaudus* Muller & Henle, 1838	Spade nose shark	Nga man	NT
	Rajaformes	Dasyatiday	*Dasyatis bricatus* (Bloch Schneider 1808)	Ray	Nga Laik kyauk	NE

Table 3. Classified list of crabs and prawn in Ywadanshe village, Bilin Township

	Phylum	Class	Order	Family	Scientific name	Myanmar name
1	Arthropoda	Cruscatean	Decapoda	Portunidae	*Seylla Olivacea* Herbest, 1796	Mud crab Pinlal Kanan
2				Grapsidae	*Sesarma intermedian* (de Hann, 1935)	Phone kanan

3					*Metaplax elegans* (H Milve Edward, 1837)	Chayshay kanan
4				Ocypoda	*Gelesimus annulipes* Latreille, 1817	Fiddle crab Phonegyi kanan
5					*G. dussumieri* Milne Edward	Monk kanan
6					*Uca tetragonau* Crane, 1975	Fiddle crab Dekyin kanan
7				Palaemonidae	*Macrobranchia rosenbergii* (de Man 1879)	Puzonhtoke Gyi

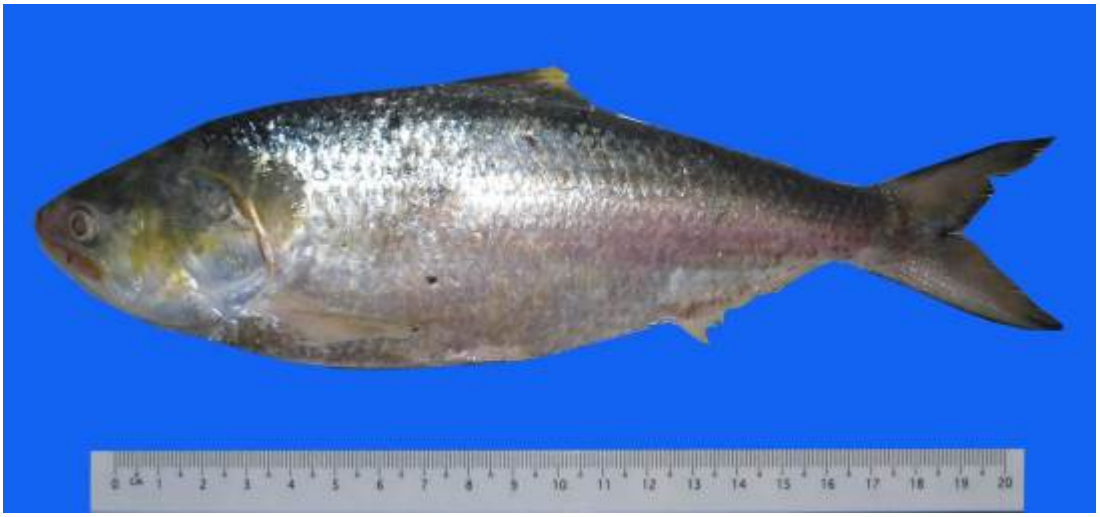
Lates calcarifer



Polynemus indicus

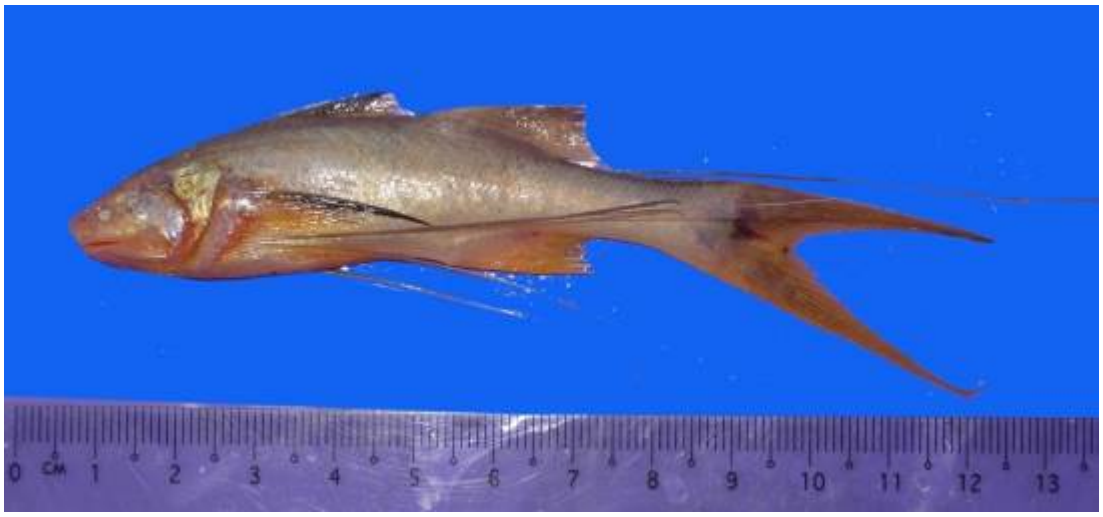
Mugil cephalus

Plate 1. Some commercial fishes of study area



Tenualosa ilisha

Chrysochir aureus



Polynemus paradiseus

Plate 2. Some commercial fishes of study area

Otolithoides pama

Macrobranchium rosenbergii

Plate 3. Some commercial fishes of study area

Tenualosa toil

Scylla olivacea

Scatophagus argus

Plate 4. Some commercial fishes of study area

Table 4. Distribution and occurrence of fishes in study villages

Sr. No.	Scientific Name	Sutpanu	Boyargyi	Kyaukseik	Zokekali	Ywadanshe	Taunggyi	Koetalsu	Aungkanthar	Gyophyugone	Occurrence Species
1	*Congresox talabon*	-	-	+	+	+	-	-	-	+	4
2	*Strongylura strongylura*	+	-	-	-	+	-	-	-	-	2
3	*Thryssa mystax*	+	+	+	-	+	+	+	+	-	7
4	*Setipinna taty*	+	+	+	-	+	+	+	-	+	7
5	*Coilia dussumieri*	+	+	+	-	+	+	+	-	-	6
6	*Tenualosa ilisha*	+	+	+	+	+	-	+	+	+	8
7	*Tenulosa toli*	+	+	+	-	-	-	-	+	+	5
8	*Osteobrama belangeri*	+	-	-	+	-	+	-	-	+	4
9	*O. alfredianus*	+	-	-	-	+	-	+	+	-	4
10	*Puntius chola*	+	-	-	-	-	+	-	-	-	2
11	*Cirrhinus mrigala*	+	+	-	-	-	-	-	+	+	4
12	*Catla catla*	+	+	+	+	+	-	-	+	+	7
13	*Chela fasciata*	-	+	+	-	-	+	-	+	-	4
14	*Labeo calbasu*	-	-	-	-	-	-	+	-	-	1
15	*Logocephalus lunaris*	-	+	-	-	-	+	-	-	+	3
16	*Xenopterus maritus*	+	+	-	-	-	-	-	+	-	3
17	*Mugil cephalus Linnaeus*	+	+	+	+	+	+	+	+	+	9
18	*Rhinomugil corsula*	+	+	+	-	+	-	-	+	-	5
19	*Otolithoides biauritus*	+	+	-	+	-	-	-	+	-	4
20	*Otolithoides pama*	+	+	+	+	+	+	+	+	+	9
21	*Johnius coiter*	-	+	-	+	+	-	+	-	+	5
22	*Chrysochir aureus*	+	-	+	-	+	+	-	+	-	5
23	*Eleutheronema tetradactylum*	+	+	-	+	-	-	+	+	-	5
24	*Polynemus indicus*	+	+	+	+	+	+	+	+	+	9
25	*Polynemus paradiseus*	+	+	+	+	+	+	+	+	+	9
26	*Harpadon nehereus*	+	+	-	+	+	-	-	+	-	5
27	*Lobotes surinamensis*	+	-	-	+	-	-	-	+	-	3
28	*Lates uwisara*	+	+	+	+	+	+	+	+	+	9
29	*Glossogobius giuris*	+	-	+	+	+	-	-	+	-	5
30	*Scatophagus argus*	-	+	-	-	+	-	-	-	-	2
31	*Therapon jarbua*	-	+	-	+	-	-	-	+	-	3
32	*Sillaginopsis panijus*	+	-	+	+	+	+	+	-	+	7
33	*Trichiurus lepturus*	-	+	-	+	+	-	-	+	+	5
34	*Channa striata*	+	-	+	+	-	+	-	+	+	6

35	*Cynoglossus bilineatus*	-	+	-	-	+	-	-	+	+	4
36	*Platycephalus indicus*	+	+	+	-	-	-	+	-	+	5
37	*Arius thalassinus*	+	-	+	+	-	-	-	+	-	4
38	*Arius maculatus*	+	-	-	-	+	-	-	-	+	3
39	*Osteogeniosus militarias*	-	-	-	+	-	-	+	-	+	3
40	*Wallago attu*	+	-	+	+	+	-	-	+	-	5
41	*Ompok bimaculatus*	-	+	-	+	-	+	-	-	+	4
42	*Clarias batrachus*	+	-	-	+	-	-	+	+	-	4
43	*Pangasius pangasius*	-	+	-	+	+	+	-	+	-	5
44	*Mystus vittatus*	+	+	+	+	+	+	+	+	+	9
45	*Aorichtys seenghala*	-	+	-	-	+	-	+	-	-	3
46	*Oreochromis niloticus*	+	+	-	-	-	+	-	-	+	4
47	*Notopterus notopterus*	-	-	+	+	+	-	-	+	-	4
48	*Anabas testudiueus*	-	-	+	-	+	-	-	+	-	3
49	*Plotosus canius*	+	-	+	-	-	-	-	+	-	3
50	*Dasyatis bricatus* (Zuiew, 1973)	-	-	-	-	+	-	-	-	-	1
51	*Anguilla bengalensis* (J.E. Gray, 1831)	-	-	-	-	+	-	-	-	-	1
52	*Scoliodon laticaudus*	-	+	-	-	-	-	-	+	-	2
53	*Dasyatis bricatus*	-	+	-	-	-	+	-	-	+	3
	Total	34	32	25	27	31	20	19	33	25	246

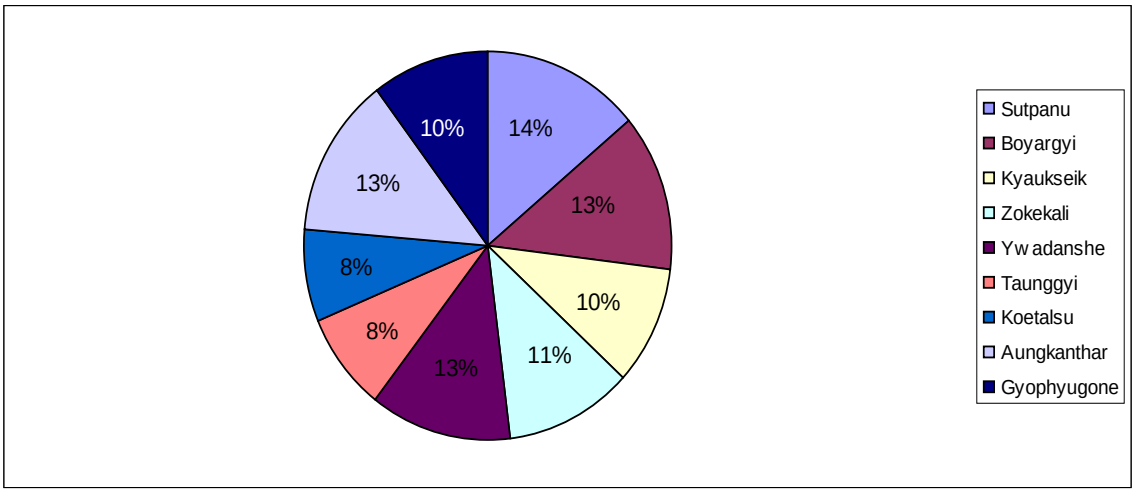


Fig. 2. Percentage of species occurences in different villages

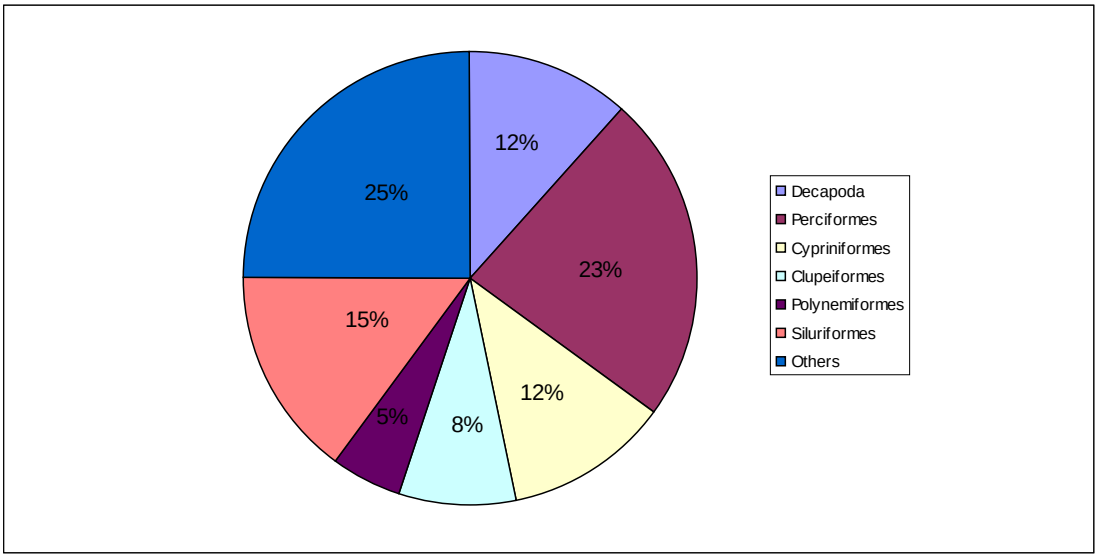


Fig. 3. Group-wise (Order) occurrence of species in the study area

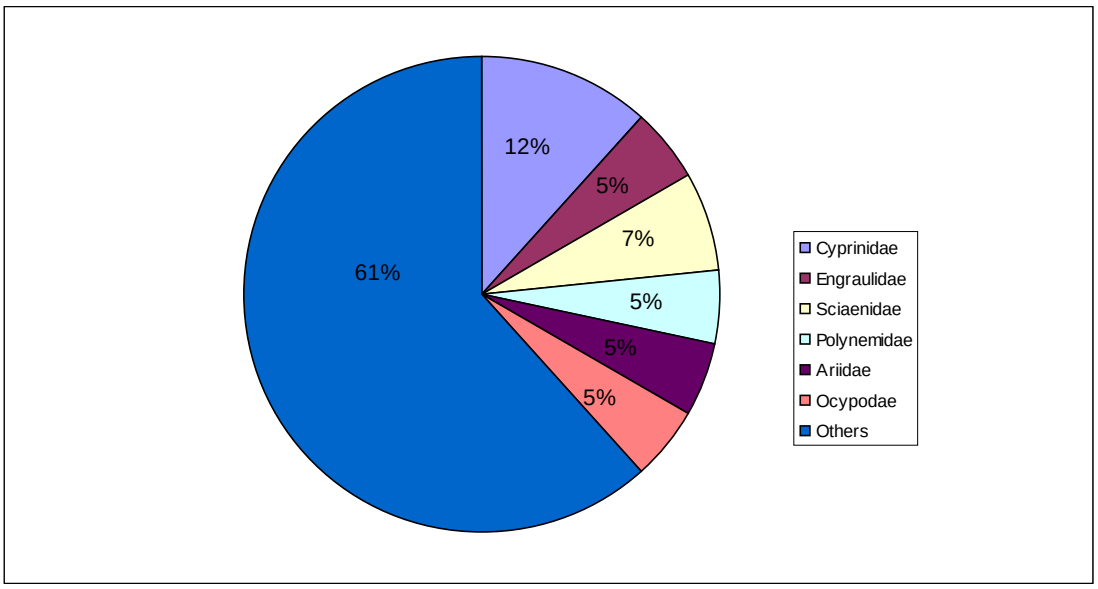


Fig. 4. Family-wise occurrence of species in the study area

Figure 3 and Figure 4 showed the species occurrence of Group-wise (Order-wise) and Family-wise abundance.

6.1.3 Fish production

The Table 5 showed the information of baby fish production of Aquaculture and Induced breeding in Thaton Township. Figure 5, 6 mentioned the production of different baby fish (Juvenile and fingerlings) in Aquaculture and Induced breeding site, Thaton Township, Mon State.

The Table 6 mentioned the village profile of study village in the Gulf of Mottama. Boyargyi village was the most population and Koetalsu village was the least populations during the study periods.

Table 5. Production of different baby fish in Thaton hatchery Site during (1.4.2017 to 30.9.2017)

Sr. No.	Species	Local Name	2017-2018 Estimate	Production			Actual Production %
				Total	Sold	Free disperse	
1	*Labeo rohita*	Nga myit chin	1,510,000	454,430	201,430	253,000	30.09
2	*Cyprinus carpio*	Shwe war nga gyin	370,000	495,125	495,125	130,125	133.81
3	*Puntius gonionotus*	Nga khone ma	250,000	393,000	393,000	143,000	157.20
4	*Oreochromis niloticus*	Tilapia	370,000	485,000	485,000	200,000	131.08
5	*Pangasius sutchi*	Nga dan	10,000	50,000	50,000	-	500.00
6	*Piriactus branchypomum*	Fresh water nga moke	10,000	50,000	50,000	-	500.00
7	*Catla catla*	Nga thine gyaung pwa	-	50,000	50,000	-	Extra
		Total	2,520,000	1,977,555	1,251,430	726,125	

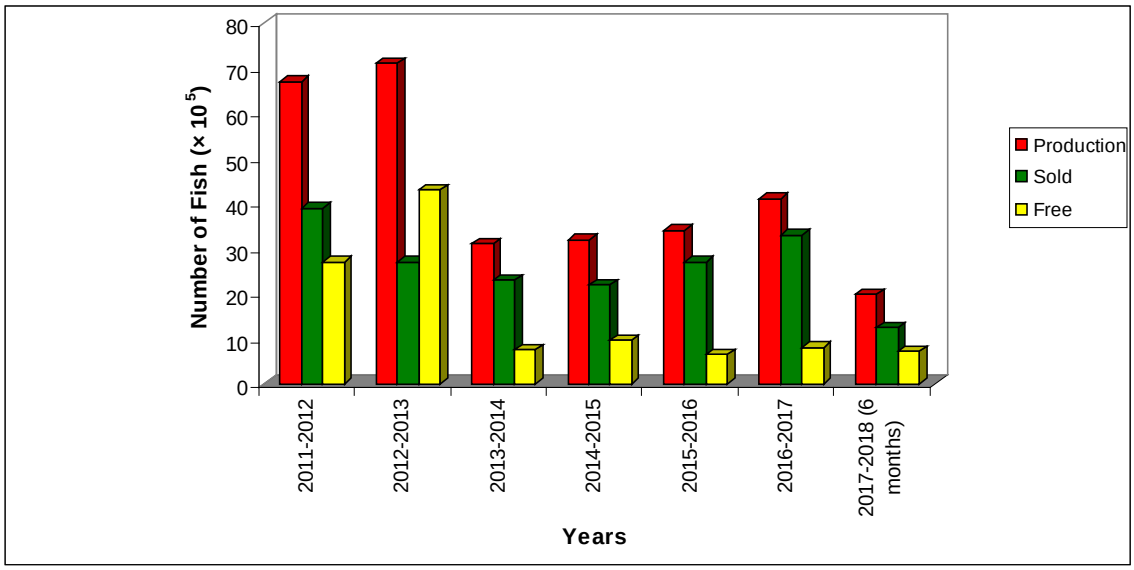


Fig. 5. Annual-wise production of baby fish

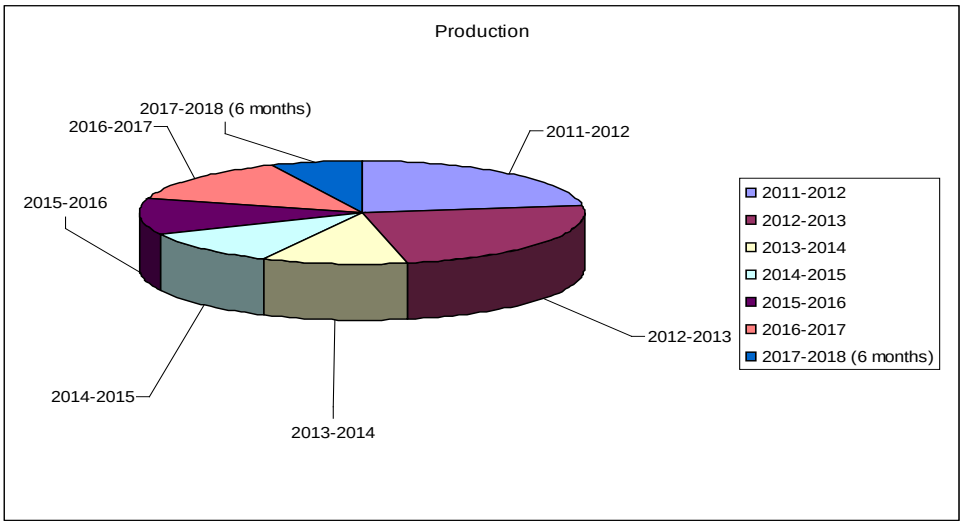


Fig. 6. Pie chart show the percentage number of baby fish in the hatchery site

Plate 5. The survey team in the hatchery station

Table 6. Village profile of study villages in the Gulf of Mottama

Sr No.	Village Name	Latitude (N)	Longitude (E)	No. of House	House Holds	Under 18		Over 18		Total Population
						Male	Female	Male	Female	
	Thaton Township	16º52'04"	97º22'30"	37234	39296	50936	50883	60410	67285	229514
1	Aungkanthar	16º52'25"	97º14'15"	174	174	341	313	356	275	1285
2	Gyophyugone	16º58'55"	97º17'00"	268	287	515	579	379	358	1831
3	Hatchery Station	16º49'20"	97º22'01"	4 Blds	-	-	-	3	2	
	Bilin Township	17º12'20"	97º16'10"	35319	37734	34804	34495	56190	62398	187887
4	Zoke kali	17º07'20"	97º12'17"	268	340	277	285	376	382	1320
5	Taunggyi	17º18'00"	97º06'30"	502	545	431	437	952	940	2760
6	Ywadanshe	17º12'55"	97º08'19"	230	245	259	235	371	360	1225
7	Koetalsu	17º13'00"	97º00'00"	66	74	80	68	85	90	323
	Kyaikhto Township	17º30'50"	97º02'30"	31162	32894	29101	28936	48111	52813	158961
8	Sutpanu	17º32'08"	96º56'00"	290	314	380	443	394	433	1650
9	Boyargyi	17º39'04"	96º59'50"	717	724	626	575	1215	1240	3656
10	Kyauk seik	17º44'00"	96º55'30"	160	166	197	165	233	254	849

6.1.4 Fishing boats

Table 7 recorded the different kinds of fishing vessels that are used in the study villages of the Gulf of Mottama. The boats are mainly divided into two kinds, medium size and small size. All are made of wood and motorized. The fisherman repaired their boats annually in April.

Table 8 was mentioned the variety of fishing gears used in study area. The fishing are medium and artisanal fishery. All are stationary gears except beach seine net. Table 9 was recorded the abundance of commercial fish in seasonally. The spawning time was estimated for some commercial fishes.

Sr. No.	Boat (m)			Kinds of Boats	Price for New boat	Engine Power	Engine Price	Crew members	Attached Net Set	Remarks
	Length	Width	Depth							
1	10.0 to 11.0 m	1.3 to 1.8m	1.1 to 1.9m	Hard woods (Ion wood, Thingan, Madama and Teak)	1,500,000 to 2,000,000	18 - 20 H.P.	130,000 200,000	3-5 men, include 1 skipper	60 - 80 Sets (1 set= 30 m) Drift gill net and Trammel net	Medium sized Boat.
2	7.0 to 8.0 m	0.8 to 1.1 m	0.76 to 1.0 m	Hard woods	450,000 600,000	6.5-8.0 H.P.	200,000	2-3	17 - 20 sets (1 set = 90 m	Small sized Boat Purse seine 4 fishers

Table 7. Different kinds of boats used in study area

Plate 6. Medium and small fishing boats in study area

6.1.5 Fishing gears

Table 8. Variety of fishing gears used in study areas

Sr. No.	Fishing Gear	Local Name	Mesh size	Net		Target fish	Use Location
				Length	Height		
1	Fence net	Thanzakar pike	8 - 25 mm	120 - 250 m	2 - 3 m	miscellaneous fishes	Kyaikhto Township
2	Trammel net	Thonehtut pike	23- 25 cm 30 mm	35 m - 100 m	1.5 m	Threadfin (Mango fish)	3 Townships
3	Trammel net	Thonehtut pike	25- 30 cm 5 - 7.5 cm	1000 - 3000 m	3- 5 m	Croaker	3 Townships
4	Drift gill net	Hmaw Pike	7- 10 cm	1000 - 3000 m	5 - 7.5 m	Croaker, Herring Thread fin	3 Townships
5	Stow net (small)	Nga zinyine kyar pazark pike	19 - 38 mm	20 m	2- 3 m	Dwarf and small fishes	Aungkanthar village, Thaton Tsp
6	Beach Seine	Thaung swe pike	25 - 30 mm	100 - 200 m	2 - 3 m	Mullet	Ywadanshe village, Bilin Township
7	Cast net	Let pyit kon	24 - 32 mm	3 - 4.5 m	10 - 17 m	Prawn and miscellaneous	Mostly in all villages in 3 Townships
8	Eel troap	Nga shint hnyone	-	40-60 cm	8-14 cm	eels	Bilin Township Bamboo made
9	Push net	Yintoon	10-14 mm	3-4 m	2-2.5 m	small fishes	Bilin

Plate 7. Fishing gear Fence Net

The Drift gill

The Cast net

The Trammel net

The Trammel net

The Set bagnet

The Eel traps

Plate 8. The variety of fishing gears

The fence net (Pike Bawun / Thanzakar pike)

- The length of net……..120 to 250 m
- The depth of net ……...4 to 5 m
- The mesh size of net……..8 to 25 mm
- The cost of net……180,000 kyat/set
- The target fish…….Miscellaneous fishes

The net fence (pike bawum) is a long wall net that is mounted along river banks using bamboo poles. It is temporary fence to enclose an area along the bank of tidal creek or river at high tide. The net is set low tide. Fishermen fix bamboo poles along the bank at about 5 m intervals. They used 40 to 50 bamboo poles at a time. The lower part of the net is dug into the mud.

- At high tide, the upper parts of the net are raised and tied to the bamboo poles. At that time the net enclosed the area and fishes are trapped inside the fence and are caught by hand at low tide.
- The material of the main body net is knot less nylon (Rachel) net 210 D/9 with a mesh size of 8 mm. The selvage of the bottom and upper parts of the net is PE 380 D/6 with mesh size about 32 mm
- The fishing season is from January to December and target catch is miscellaneous fish such as mango fish, croaker, dwarf, shrimps and others.

The trammel net (Nga ponna/ Paradise thread fin pike)

- The length of float live…….35 m/ piece
- The depth of net……..1.5 m
- The inner mesh size…….30 m
- The outer mesh size…….230 to 260 mm
- The cost of net piece……12,500 kyat
- The target catch……Paradise threadfin/ Mango Fish

The Nga ponna pike is a trammel net and the wetting materials is normally nylon multifilament. The design and construction of the net is same as for Nga tha lauk pike (trammel net). The twice size of the inner net is 210 D/2., where as that of the outer net is 210 D/ 6 to 210 D/9.

The mode of operation is similar to drift gill net as it is carried out either day or might twice. The fishermen used eight to ten pieces nets at a time. The nets are primarily used from April to June. The target catch are mango fish and croaker.

The trammel net (Nga tha lauk pike)

- The length of float line ……20 to 25 m/ piece

- The depth of net……...2 to 7.5 m
- The inner mesh size……..35 to 100 mm
- The outer mesh size…….125 to 570 mm
- The cost of net pieces……15,000 kyat
- The target catch…….. Hilsa spp.

The trammel net consists of three layers. The two outer layers have the same twine, mesh size and number of vertical and horizontal meshes. The inner layer has a small mesh size, finner twice and is more slack (lower hanging ratio) than the outer layers. When the fish outer the first layer the pass through eventually hitting the inner layer where they become entangled thus preventing any enhance of escape. They continue, however, into the third layer where they are impounded. The material used for the trammel net is usually nylon monofilament. Some trammel nets make use of nylon monofilament for the inner layer and nylon multifilament for the outer layers. The twine size of the inner layer is 210 D/2 to 210 D/12 where as that of the outer net is 210 D/4 to 210 D/12.

The setting operation of the trammel net is similar to that gill net, carried out either day or night time. The fishermen use a long net made eight to ten pieces net each time, each piece being 20 to 25 m long. The net is set across the tide and allowed to drift for a couple of hours before howling. The Nge tha lauk pike are primarily used from September to January. The target catch is hilsa (herring fish).

Drift gill net (Hmyaw pike)

This net likes as Trammel net without outer two layers. Construction and operation are used same as Trammel net.

The Dwarf catfish stow net (Nga zinyine kyar pazark)

- The length of net …….. 10 – 20 m
- The mouth of net Horizontal…..5 – 10 m
- The cost of net……..100,000
- The target catch…….Dwarf

The net is made of polyethylene twice of 380 d/6 to 380 d/ 15. Mesh size is 75 mm at the net mouth and down to 6 mm at the cod end. To keep the net mouth open, two vertical bamboo poles are used as support at the side. At the two wings ends, big bamboo poles are bamboo poles are tied to anchors or pole driven into the bottom of the river. Stow nets are operated year- round during day or at might, usually from high tide to the lowest tide, but less frequently during the monsoon period. The target catch is miscellaneous fish.

The beach seine net (Thaung swe pike)

- The length of the float live……100 to 120 m

- The depth of net ……4 to 5 m
- The mesh size of net …….20 mm
- The cost of net……..1,140,000 kyat
- The fish caught ……Miscellaneous fish

The beach seine net consists of two long using to which a bunt or a bag is attached. The using are rectangular tapered pieces of netting hung to a weighed foot rope and kept in vertical position by a float live. Since the depth of the beach seine has to be level with the depth of the water, sieves operating on steep slopes have tapered wings, where as those operated in shallow waters have straight wings.

The most seines, the mesh size decreases gradually from using tip to bunt. The mesh size is 20 mm at the bunt section. In some areas, 50 to 60 mud balls of about 0.8 kg each are used as sinker at the foot rope.

Beach seines are set from the beach from the starting point in a semi-circle pattern to another point on the beach, with the distance between those points roughly half to one- third of the diameter of the semi-circle. To increase the area swept by the beach seine, long ropes are attached to the wing tips. The beach seine is hauled in by teams of fishermen from both ends, at equal speed. First the ropes are hauled in, them the wings, and finally the bunt or bag, approaching each other as the radius of the encircled area decreases.

The fishing seasons are throughout the year except during the spring tide period and target catch is miscellaneous fishes.

The portable cast net (Let pyit kon)

- The length of net…… 3 – 4.5 m
- The mouth of net (circumference)…10 – 15 m
- The mesh size…….24 to 32 mm
- The cost of net …… 40,000 kyat
- The target catch……Prawn and miscellaneous fish

The portable cost net (Let pyit kon) has a conical shape. At the mouth of net there are small bags where the fish are caught. The top of the net has a rope (about 5 mm diameter) so that costing and hauling can be done nor easily.

The net is made of nylon multifilament of 210 D/3 to 4, with the wash size 24 to 32 mm, The number of meshes at the mouth of the net varies between 850 to 1400. Sinkers made of lead are attached to the bottom edge. Every 15 to 20 cm the lead line is tie to the webbing 10 to 13 meshes above the edge to form small pockets at the bottom of the net where the fishes are trapped

The portable cost net is operated by one fisherman, at time using a small boat. This gear is operated throughout the year and the target catch is small fish and shrimps.

The eel trap (Nga shint hmyone)

- The height of trap…….40 – 60 cm
- The diameter of trap……8 to 14 cm
- The cost of trap ……...1,000 Kyat
- The target catch…… Freshwater swamp-eel

The eel trap is a vertically positioned bottle shaped trap with an entrance come on the side, near the base. The circular entry come is 5.5 to 6.0 cm in diameter and is made of very thin, 80 mm long, bamboo spikes that are narrowed down to 20 mm at the end of the entrance

The small bait basket is hung inside the trap. The eel trap is a very popular fishing gear for small- scale fisher. It is operated in the flood plains and rich fields during the raining season. The trap is tied to a wooden pole with the bottom studying on the ground and the upper part of the trap above the water surface. A paste of fish and snails, which has a very strong smell, is used as bait. The target catch is freshwater swamp eel.

The push net (Yin toon)

- The length of the net……3 to 4 m
- The mouth of net…….2 to 2.5 m
- The mesh size of net……10 to 14 mm
- The cost of net……..10,000 kyat
- The fish caught…….small miscellaneous fishes

The structure of push net (Yin toon) consist of a net and a scissor shaped 2.5 to 3 m long bamboo frame. The net is made of 10 to 15 mm. Some fishermen use knotless nylon netting for the main net body with the same mesh size.

The mouth of the net is linked to the scissors shaped bamboo tips to keep it open. The shoes at the end of poles are made of wood. The fishing is carried out at daytime in shallow waters. The gear is used near the shore and in muddy areas. The net is attached to the poles and the fishers made in the water, pushing the net forward from time to time the net is raised above the surface and the fishes collect the small fish and shrimp. The net are often operated by women and children.

This fishing operation can be carried out during the monsoon. The target catch is small fish and shrimp.

6.1.6 Abundance and spawning season

Table 9. Abundance and spawning time of commercial fish species and groups in different months

Sr. No.	Group / Species	Jan	Feb	Mar	Apr (No Fish)	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Spawing Season**
1	*Otolithoides pama*	R	R	R	-	A	A	A	A	C	C	R	R	Oct, Nov,

														Dec
2	*Polynemus indicus*	R	R	R	-	R	R	C	A	A	C	C	R	Oct, Nov, Dec
3	*Tenualosa ilisha*	R	R	-	-	R	-	-	-	R	R	C	C	Sept-Nov, Apr-May Peak Nov
4	*Tenualosa toli*	R	R	-	-	-	-	-	C	R	R	C	C	Agu-Dec, Mar-Apr Peak Oct
5	*Lates calcarifer*	C	R	R	-	R	R	R	C	A	A	A	C	Apr-Jul
6	*Polynemus paradiseus*	R	R	R	-	A	A	A	C	C	C	R	R	Oct-Jan
7	*Osteobrama spp*	C	R	R	-	R	R	R	C	C	A	A	A	Oct-Dec
8	*Rhinomugit corsula*	C	C	R	-	A	A	A	A	C	C	R	R	Jan-Mar
9	Talapia	C	C	C	-	C	C	C	R	R	R	R	R	
10	Anchovies	R	C	C	-	C	C	R	R	C	C	C	R	
11	Freshwafer cat fishes	R	R	C	-	C	A	A	A	C	C	R	R	
12	Carp groups	R	R	R	-	A	A	A	C	C	C	C	R	
13	Snake head	R	C	A	-	A	C	C	A	C	A	R	R	
14	Dwarf groups	R	C	C	-	C	A	A	C	C	R	R	R	
15	*Chrysochir aureus*	R	R	R	-	C	C	A	A	C	C	C	R	Sept-Jan

A = Abundance C = Common R = Rare

Plate 9. The fish walk-seller in the village

Plate 10. Juvenile fish and shrimp of the study area

6.1.7 Discussions

The Gulf of the Mottama has very rich fishery resources and the most suitable place for breeding and nursery area of aquatic forma. The Gulf is also declared in June 2017 as a Myanmar's Fourth Wetland of International Importance (The Ramsar Sitae no. 2299).

During the study survey, there are no Critical Endangered (CE) species in this area. In the IUCN Red List fish species *Garra flavat* (Cyprinidae) and *Yunnanilus brevis* (Balitoridae) was Vulnerable (VU) status (http://iucn.org). The records were expressed in Table 2 and 3.

The species occurrence and distribution were more or less found in different villages. Sutpanu village has 34 species and is the most abundance village in the study areas. Koetalsu village has 19 species and is the least abundance village in the study area Table 4 and Figure 2.

For the group-wise and family-wise species occurrence were examined in Figure 3 and Figure 4. The most abundant of species occurrence was Perciformes 14 species followed by Cypriniformese and Clupeiformes, 7 and 5 species respectively. And the most abundant species occurred in family Cyprinidae 7 species and followed by Sciaenidae 3 species.

There are 7 kinds of breeders were used to spawn in this financial year. They are *Labea rohita, Cyprinus carpio, Puntius gonionotus, Oreochromis niloticus, Pangasius sutchi, Piriactus branchypomum* and *Catla catla.*

The production of baby fish were recorded annually from 2011-2012 to 2017-2018 financial year. The most numbers of production baby fish was reached 7 millions in 2012-2013 financial year for the 6 months of present financial year, (April-Sept) the young fish production was nearly 2 million numbers.

During the study periods, the 9 villages and 1 hatchery station were surveyed and recorded. The Boyargyi village, Kyaikhto Township has the most dense population among the villages 3656 numbers and Koetalsu village, Bilin Township has the least dense population among the villages 323 in Table 6.

Most of the fishermen owned the fishing boats but a little have no boat to operate fishing. The measurement of boat and other status are described in Table 7. The fishing gears are mentioned detail in Table 8. Fence net was only use in Kyaikhto Township.

In the present study *Otolithoides pama* and *Polynemus indicus* were nearly the same seasonal maturation and spawning time. These two species spawning time is October to December with distinct peak in December. The herring species *Tenualosa ilisha* and *T. toli* marked two times per year for spawning. September to November and April to May was spawning time for Ilisha shad with November was the peak season. August to December and March to April was spawning time for toli shad with October was the peak season. The other

commercial fishes are generally spawn in March to June premonsoon and early monsoon season.

The length weight relation of some commercial fishes are as follow:

Otolithoides pama	-	W	=	$0.0036L^{3.2138}$	(Thazin Htet)
Polynemus indicus	-	W	=	$0.0029L^{3.3941}$	(Thazin Htet)
Tenualosa ilisha	-	W	=	$0.0577L^{2.4223}$	(Khine Myat Htwe)
Tenualosa toli	-	W	=	$0.12388L^{2.904}$	(Khine Myat Htwe)
Polynemus paradiseus	-	W	=	$0.018L^{2.836}$	(Mya Mya Thet)
Chrysochir aureus	-	W	=	$0.3314L^{2.0298}$	(Ohn Mar Min)

The Anadromous fishes such as Mullet and herring are spent most of their lives in the Ocean and swim up large rivers to spawn. The fishermen catch the adults from the marine or estuaries environment as well as juveniles during their migration from the rivers to the sea. A sharp decline catch was noticed by local fishermen in present time. Now environmental becomes degradation and confront following challenges. Loss of fish species, flooding increased run-off, river bank erosion, soil degradation, increased sedimentation, change in water levels, irregular flow, changes in delta formation and increase salinity.

6.1.8 Conclusion

The survey trips were carried out from April to September 2017. Among the project time, our survey team was made 4 trips to study villages. During the survey trip visits were made to towns and villages and study on the fishery and socio-economic was conducted. Interviews were conducted and information and data were collected. The socioeconomics of the local people was also studied through interviews. Information and data were gathered from 10 designated stations of 3 Townships. Public meetings were held and interviews were conducted focusing on fishermen and fishing activities. In these meetings, people from all walk of life and organizations and societies were invited and information and data collected and recorded.

The followings are the comments based on the findings during the study trip.

- As banana tissue culture and corn cultivation are undertaken only for export both should be stopped
- Avoid overexploitation, irresponsible and unsustainable exploitation of fishery resources
- Stop using all kinds of destructive fishing gears prohibited by the Department of Fishery.
- Avoid the fishing of spawner, fry, fingerling and juvenile during the spawning season

- As population increases the demand for fish increases. On the other-hand the principle of sustainable fishery should be adhered to.
- Gold and Marble mining in this region lead to sedimentation and shallowing of river water, alteration of river course, turbidity, and the detrimental effect of mercury. All these have negative impacts on breeders and migratory fish and this eventually leads to decline in living resources. Mining activities should be limited and effectively controlled
- Tributaries and flood plains are spawning and nursery grounds for fish. Such areas should be prevented from chemicals influx and sediment that leads to turbidity resulting in the decline in fishery resources.
- Protection of reserved forests and sanctuary should be carried out more effectively.
- Fish culture should be commence for the development of fishery and fishery resources.
- Education, training and capacity building should be provided for the locals in order to
- improve their skill and knowledge in fish culture.
- The government should provide plots of land to the locals for fish culture
- The government should also provide financial assistance as far as possible
- Regarding fish cultivation priority should be given to the selection of native species rather than exotic species (or species from elsewhere)
- Encourage the locals to raise chickens, ducks and pigs on a manageable basis (ta-naing-ta-paing basis)
- Apply effective law enforcement regarding laws and regulations issued by the department of fishery.(DOF)
- Regular and in time monitoring, inspection and supervision of fishery activities should be undertaken by personals of the Dept. of Fishery.
- Educate and train the locals in fishery products processing technology; not to be content only with harvesting fishery resources.
- Avoid and prevent pollution of streams, rivers and lakes or any water body.
- Encourage them; educate and train them for application of scientific and modern technology in agriculture.
- Use natural fertilizers rather than chemical fertilizers for increasing the yield of crops.
- If chemical fertilizers have to be used follow the regulation and guideline concerning the uses of chemical fertilizers
- For suppression of pests and insects chemicals pesticides can be applied; but not to be applied more than necessary (not to overuse).

Suggestions

- Laws and regulations regarding fishery, mining, resources exploitation etc.. should be enforced and should be effective.
- Employment opportunities should be created or jobs should be provided or vocational / training for livelihood should be implemented.
- The government as well as NGOs and INGOs should fulfil the local basic needs.
- The governmental departments should have more cooperation with the locals
- The use of destructive fishing gears; net with fine mesh are to be banned.
- Migratory fish and spawning fish can no longer enter their spawning grounds due to mining activities that lead to erosion, sedimentation, alteration of water course and high turbidity.
- Due to deforestation soil structure can no longer be maintained and this leads to severe erosion, siltation, turbidity and pollution resulting in the decline of fishery resources.

6.2 Socioeconomics (Livelihood)

The study villages lie close to the mouth of the Sittaung River and are facing the waters of Gulf of Mottama. The present survey mainly emphasized on the socioeconomic value of river-related communities; including their fishing, fishing-related and other income generating activities. And also summarized overall Livelihood strategies as well as their dependency on aquatic resources based on the household surveys conducted by our team with key issues and challenges in sustaining the livelihoods of the communities. The main purpose of this study is to know the necessary baseline information needed for establishing conservation of fishery resources used by communities. Fig (7,8)

Objective

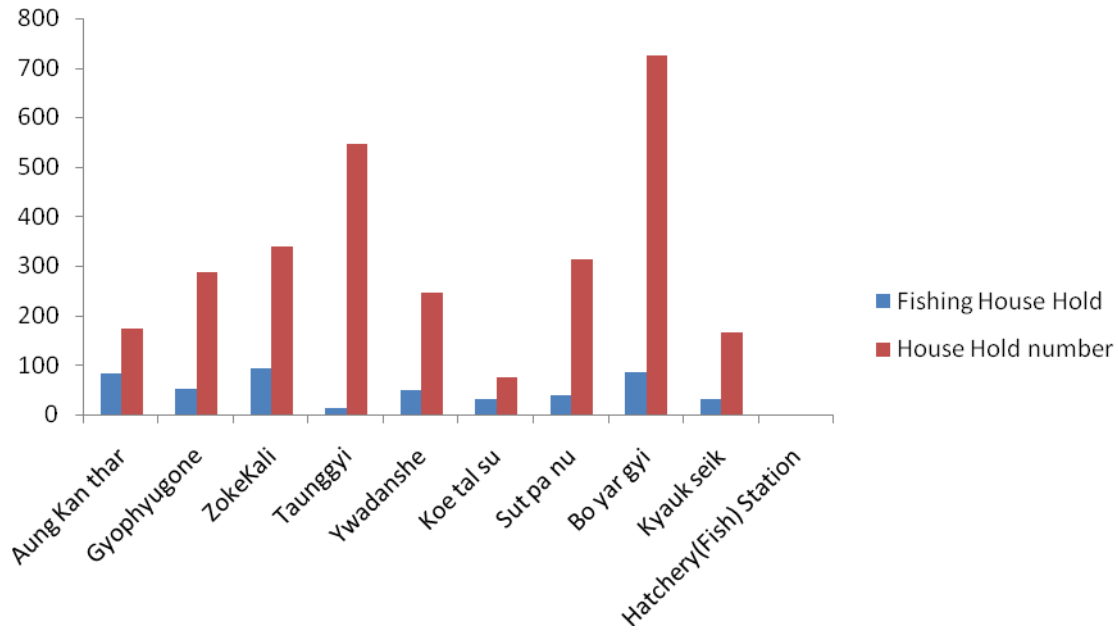
- Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.
- The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.
- The ecosystem approach should involve all relevant sectors of society and scientific disciplines.
- The special habitats of GoM are sustainably and equitably manage on the basis of clear scientific information and through integrated local, regional and national institutions/management bodies.
- Benefits of sustainable fishery management in the Gulf of Mottama area are shared through effective value chains and equitable market access.

- Vulnerable coastal communities have increased income through livelihood diversification and improved access to non-fishery resources.

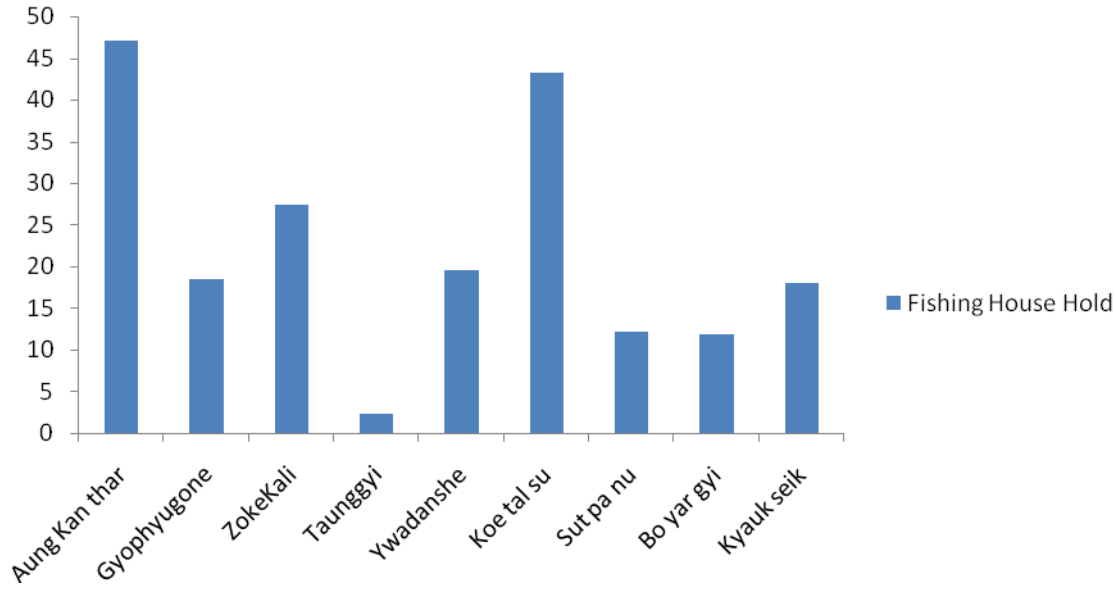
www.ebd.inf/ecosystem/principles.shtml

6.2.1 Profiles of study areas.

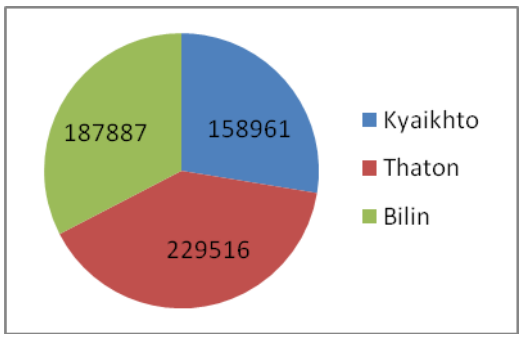
The Fig (9) showed the ratios of the different age classes of gender in 3 townships Thaton, Bilin and Kyaikhto. And also each village was mentioned in Table 6. The most households have 4.7 size index in Thaton, 4.4 index in both Bilin and Kyaikhto. Concerning age group lived in th study areas, it was recorded to be higher in middle age group, such as (15-64 yrs) 60.7% in Thaton.

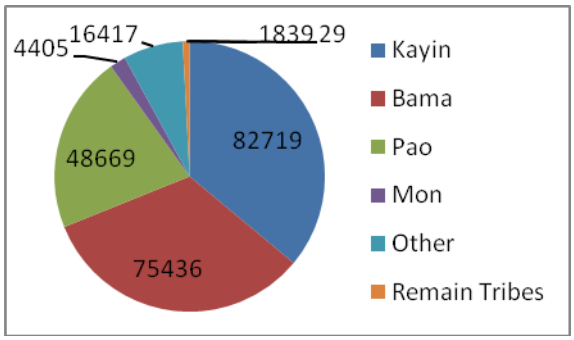


Fig(7) Village wise total house-hold and fishing house-hold number

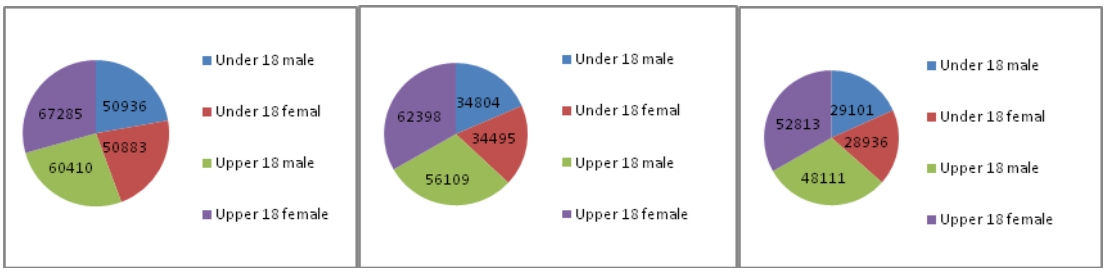


Fig(8) Percentage ratio of house hold and fishermen from different villages.





Town-wise population Variety of Tribes in Thaton Townshop



Thaton Township Bilin Township Kyaikhto Township

Fig (9) Population and different Tribe of study area.

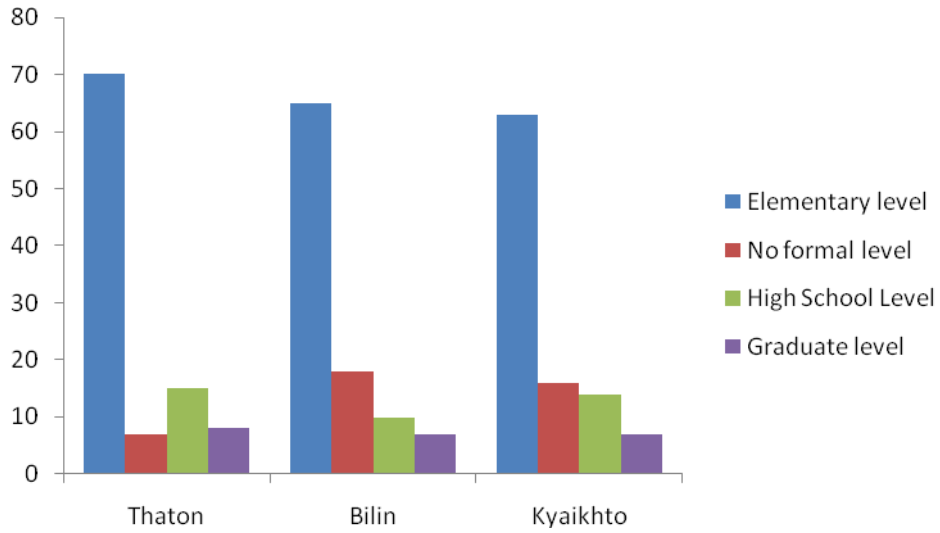


Fig (10) Educational attainment in study area

The assessment revealed in Tab 6 and Fig (9) that women were little higher proportion (51.49%) than men population (48.51%) at Thaton Township. The ratios were women (51.57%) and men (48.43%) at Bilin Township and women (51.43%) and men (48.57%) at Kyaikhto Township. Buddhist is the most dominant religion and followed by Christian and a very few are Muslim and Hindu.

6.2.2 Education status and Health

In the study areas, the level of educational attainment of the respondents showed slight variation from each others. The literacy rates are 85.8%, 86% and 93% in Thaton, Bilin and Kyaikhto Townships respectively. In Thaton the most of the people (70%) have elementary level, (7%) have no formal education, (15%) as high school level and (8%) as college graduate. In bilin the most of the people (65%) have elementary level, (18%) have no formal, (10%) as high school level and (7%) as college graduate. In Kyaikhto the most of the people (63%) have elementary, (16%) have no formal (14%) Fig(10) as high school and (7%) as graduate Fig(10) The all villages have primary or post primary schools and only Boyargyi has sub-middle school. From the result, the more number of people with no formal education were found in Bilin and the elementary level were found in nearly equal numbers.

Table (10) The status of fishing, education, health some employment of studied villages

Sr No.	Village name	Fishing House	Education			Dispensary	Home Shop	Monastry
			Level	Teacher	Student			

		Hold	School					
1	Aungkanthar	82	Primary	-	-		5	1
2	Gyophyugone	53	Post Primary	8	403	1	10	1
3	Zoke kali	93	Post Primary	11	355		17	1
4	Taunggyi	13	Primary	6	450		21	1
5	Ywadanshe	48	Primary	2	106		9	1
6	Koe tal su	32	Primary	5	68		4	1
7	Sut pa nu	38	Post Primary	15	568		14	3 Hindu 3
8	Bo yar gyi	86	Sub-middle	13	630	1	12	5
			Primary	5	120			
9	Kyauk seik	30	Primary	6	47		6	1

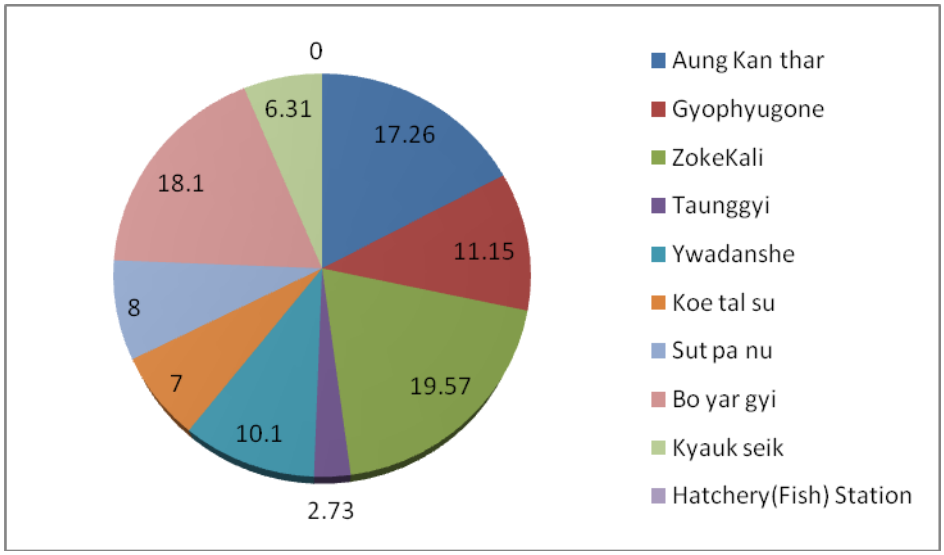


Fig (11) Percentage of fishing households in different villages.

The college graduate and beyond college level were more fewer in all study areas. Between gender, the female education status in numbers is more than the male numbers, but more males are educated than females.

The village libraries are established in the most villages in study areas. But only Gyophyugone library is operating running condition.

There are no dispensary in study villages except Gophyugone, Thaton township and Beyargyi Kyaikhto Township. One assistance Health, 1 Nurse and 3 midwives are appointment in Gyophyugone. Two nurse and 1 midwife are appointment in Boyargyi. The mostly villages have village – maternity – welfare-centre.

6.2.3 Primary Occupation status

Fishery and Agriculture have long been central to communities living in and around the Gulf of Mottama coastal areas. From observation results, Fig(7) and Fig(8) the village fishing household were assessed. Zohekali (Bilin Township), Boyargyi (Kyaikhto Township) and Aung kanthar (Thatnon Township) have the msot fishing households 93, 86 and 82 respectively. The percentage ratios of household and fisher were 47.12% and 43.24% in AungKanthar (Thaton Township) and Kotalsu (Bilin Township) respectively. Tab(10)Fig(11)

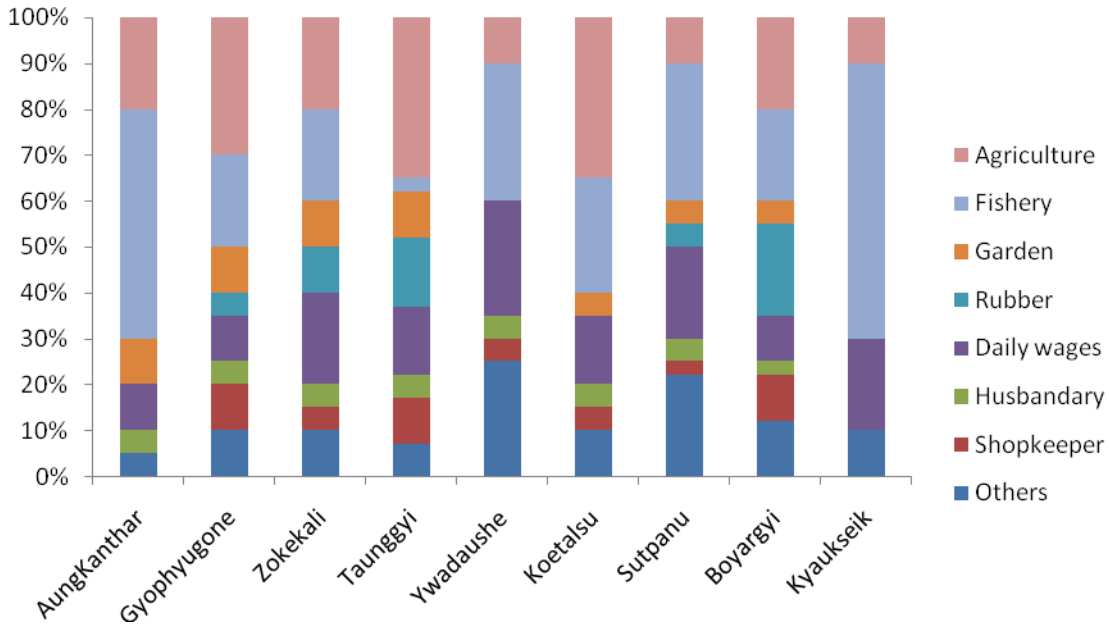


Fig (12) % of Occupation status in different villages.

The Fig(12) assessed the occupation status in different villages. Aungkanthar, Ywadaushe and Kyaik Seik villages were the most fishing occupation among the study periods. Agriculture were made in plain villages and Gardening were made in mountain hills. Above 3 occupations are the main employee in study areas.

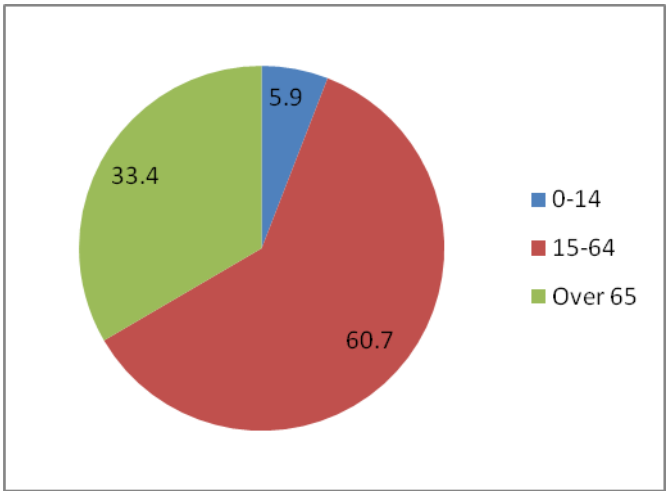


Fig (13) The percentage of age group in study areas.

Based on the survey of study areas, all fisher households fished all year round except April. In April the fisher prepared and mended their fishing gears and boats. Fishermen use various types of fishing gears depending on the fishing operation and targeted species and fishing season (Table. 8). Trammel nets and drift gill nets are mainly used in family fishing as they are considered a relatively low-cost and artisanal gear, suitable for catching many fish species in different ground. These coastal areas support a rich fishery in varied intensities, consisting of croaker, threadfin, sea bass, mullet, anchovy, cat fish, Herring, butter fish and crabs and crustacean (Marine, estuarine and fresh water fishes). Catches are evacuated to local markets and fish collectors in fresh, commercial are in ice preserved.

These marine resources are used for a variety of fish products which are processing by various methods including traditional and advanced modern techniques. Utilization of catches in fishing villages in this study areas are really the same. An average of 86 percent of total catches is sold fresh, 8 percent is sold as dried fish, 4 percent is processed, while the remaining 2 percent is far home consumption. There are various ways of utilization in fishery resources such as fresh, fresh with ice, freezing products, dried and smoke-fish, fish pasted (fresh water) and sauces. There is no canning and fish meal industry in the study areas. Sun drying products are produced mainly for Bombay duck, anchovy and shrimp with 50%, 30% and 50% respectively of total products. Cold freeze for export, the fish groups such as thread fim, croaker, ribbon fish, and other large fish are utilized.

Distribution of fishery products targeted for local, domestic and export to foreign countries. Fresh fish were sold mainly in local markets although the dried products were distributed to local and domestic. Cold freeze products from fish buyer (such as Mawlamyine

Holding Co. Ltd) were extensively sent to Yangon as well as export China, Thailand and Malaysia.

Depending on the fish groups, landing price and market price noticeably differed. Market price was three or two fold higher than the landing place Table(11).

Table (11). Price of a varieties of fishery products (Ks/Viss)

Sr.No	Fish Group	Price at Landing centre	Market Price	Remarks
1.	Bomby duck	500	1000-1500	
2.	Anchovy	400	1000-1200	
3.	Shrimps (medium)	1000	3000	
4.	Croaker		10000	Depend on size
5.	Thread fin	3000	10000	Depend on size
6.	Large commercial fishes	Varies	up to 20000	Depend on size
7.	Trash	100	...	

6.2.4 Coastal and Marine Activities

The coastal activities in villages are comprised of fishing and non-fishing activities. Fishing activities are capture fisheries in nature while non-fishing activities identified are "Mya Sein Yaung" "Fishery Association" and "Village Development Committee". Fishermen use various devices and methods to catch fish and crabs. Most of the catch sold within and out side the village while smaller portions are left for household consumption. Some of the households make small-scale vegetables and Beetle nut and leaves. Some of the households make animal husbandry Chicken, ducks, pigs and cattle.

6.2.5 Attitude towards indirect use values, option values and **Bequest values of resources**

"Indirect use values" are derived from ecological functions and services provided by aquatic resources systems in terms of, for example, use of flooded forests as natural fish nurseries and spawning and foraging grounds, maintenance of water quality, flow and storage, flood control and storm protection, nutrient retention and microclimate stabilization. "Option value" is

value of preserving the option to use the resources in the future, for example, in putting aside protected areas. "Bequest value" associated with the desire to set aside resources for future generation.

Generally, local people recognize and value the direct economic benefits derived from the resources in their environment. However, SocMon team looks at the community's appreciation of their coastal and other resources beyound the direct economic benefits and from an ecosystem perspective. Hence, five liker-type item statements were asked pertaining to their attitudes towards indirect use values, option values and bequest values of coastal resources in study villages of Gulf of Mottama Romsar Site (Tab.12)

Table 12. Attitudes towards indirect use values, option values and bequest values of resources in

Sr No	Item Statement	Response Options			
		D (Score 2)	NAD (Score 3)	A (Score 4)	SA (Score 5)
1.	Wet lands are to be protected so that we will have fish to catch	-	15	12	10
2.	Coastal regions are only important for fishing and cultivation	-	14	32	3
3.	I want future generation to enjoy the coastal habitats	-	9	27	8
4.	Fishing should be restricted in certain areas to allow fish and aquatic animal to grow	4	6	16	2
5.	We should restrict development in some coastal areas for future generations to have natural environments	-	13	19	5
	Total	4 2.05 %	57 29.23 %	106 54.35 %	28 14.35 %

D = Disagree, NAD = Neither agree nor disagree, A = Agree, SA = Strong agree

Agreement (54.35%) indicate positive attitude is given a score of 4, neither agree more disagree(29.23% is given a score of 3, (14.35%) is given strongly agreement, a score of 5 and only (2.05%) is given the lowest score of 2, a response of disagreement. The highest ratings were given to item 3 I want future generation to enjoy the coastal habitats and item 5 restricting development in some coastal areas so that future generations will be able to have natural environments. The result indicates that people attitudes are generally very positive with respect to the indirect non-market contribution of mangroves and habitat to fishery and option and bequest values of resources.

6.2.6 Climate hazard

Most household in study areas are faced with climate impacts such as storm, storm surges, beach erosion, salt-water inundation, flood, climate related land or mud slide. Ywadauske (Bilin Township) and Kyaukseik (kyaikhto Township) villages are more affected by beach erosion and flooded. The dams such as Zikekaye, Mayankone, Seikkyun are built in Thaton township to protect salt-water inundation and the paddy field are presented from sea water flooded.

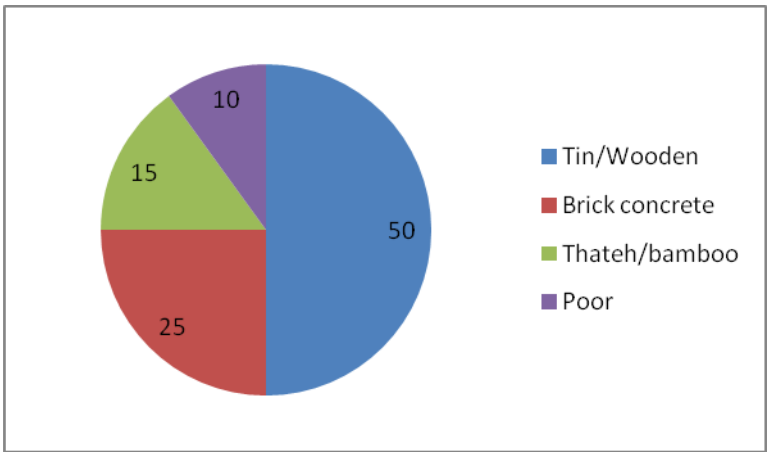
6.2.7 Perceived threats to resources

River-related communities are usually the direct users of the resources, they are presumed to be knowledgeable not only on the condition of their resources but also on their associated threats. From the interviewing results, mangrove trees and upland forests are in poor conditions because they still consider cutting them for housing materials as fuel, either as firewood or charcoal or commercial use as a major threat and natural phenomenon (cyclone, big waves). There are also threats to other resources. Since the beach is near residential settlements, a major threat cited is pollution garbage dumping, mining, indicating that waste management is still an issue in the community and natural phenomena such as sea level rise, cyclones, and big waves. Other cdited threats are river bed changing or reforming, sand and pebble quarrying, both for commercial and household uses, and soil erosion from the uplands and residential area expansion. Key threats to rivers/creeks include water pollution, dumping of garbage, soil erosion/upland sedimentation, and natural phenomenon (e.g cyclones). Meanwhile, threats to ground water include natural phenomenon, deforestation/ cutting of trees in watershed, pollution/dumping of garbage, water contamination due to sewage, expansion of residential settlements, tourist and resort related development, overexploitation for household use and salt-water intrusion.

6.2.8 Material style of life

We the SocMon Team, do not attempt to measure the household income because in rural villages whereby income is not officially declared. Instead, the variable "material style of life" is used as a substitute. Hence, as a proxy variable, this is used as a rough measure of

economic status of the households. Material style of life was quantified as an aggregate ordinal value derived from scoring the type of the household's residential structure with respect to roof and structural walls. In most of study villages, 50% of the households have middle material life of style as reflected in their use of materials such as tin/wooden. Nearly 25% of the households have houses that are predominantly made of brick/ concrete and 15% use thatch/bamboo and the remain 10% are poor conditions, Fig(14). From the field collected data it was noted that they have fair income and just enough to cover important household expenses.



Fig(14). Percentage of material style of life in study areas.

6.2.9 Conclusion

Fishing is an important activity for the majority of households in the study villages of the Gulf of Mottama. Nowadays, aquatic resource dependent communities of those coastal areas face several challenges in sustaining their livelihoods. From ecological and environmental perspectives, they are vulnerable to short and long-term climatic variations effects. Such changes can also be induced by human activities, such as deforestation, use of pesticides in agriculture and land development, dam construction, and mining, etc. Other kinds of activities with adverse impacts on fisheries catches and thus income to communities, are use of illegal and destructive fishing gears and over fishing. As commonly found around the world, population growth, social and economic conflicts due to declining resources, increasing fishing pressure, changes in ownership and access (to resources and markets) are some of the issue face in sustaining livelihood of people living in and around the coastal areas in the mouth of the Sittaung River. So, clear study, survey and discussion should be needed to their livelihood concerns, such as secured access to resources and basic rights to food security, jobs, education and health care for about sustainable management of fisheries and aquatic ecosystems of Gulf of Mottama fishing villages.

Comment and Suggestions

- Most of the locals are backward and have very Limited knowledge, skill and general knowledge. In this regards all round improvement is necessary.
- The standard of higher education, health and skill should be raised.
- Communication of the area should be developed, more road should be built, existing road should be upgraded.
- Gold mining and other mining in this region led to sedimentation and shallowing of river water alteration of river course, turbidity and the detrimental effect of mercury. All these have negative impacts on breeders and migratory fish and this eventually leads to decline in living resources.
- Mining activities should be limited and effectively controlled.
- Logging and cutting of trees should be limited as trees and forest stabilize climate.
- The production of fuel wood and charcoal also lead to deforestation, this should be also limited and controlled.
- Reforestation, replantation and creation of plantation for fuel wood should be undertaken at all villages.
- Rare and endangered wildlife (including migratory birds) should be protected and conserved, foraging grounds should be also preserved.
- Educate the locals to realize the value of the Sittaung River and basin, its tributaries and flood plain as good natural habitats and also valuable sources for living resources, eg. fish, wildlife... so to maintain the ecosystem and the healthy river is of great importance for the locals. Educate them until environmental conservation idea is ingrained in their mind sets.
- In order to have adequate government service personals for the region the locals should be prioritized for employment in government services.

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