



International Journal of Fisheries and Aquatic Studies

E-ISSN: 2347-5129

P-ISSN: 2394-0506

(ICV-Poland) Impact Value: 5.62

(GIF) Impact Factor: 0.549

IJFAS 2018; 6(5): 348-355

© 2018 IJFAS

www.fisheriesjournal.com

Received: 05-07-2018

Accepted: 10-08-2018

Thet Htwe Aung

Demonstrator, Department of
Marine Science, Mawlamyine
University, Myanmar

Flatfishes and their catch composition in Mon State, Myanmar

Thet Htwe Aung

Abstract

Based on the morphological evidences, a total of 9 genera, including 15 species of flatfishes (Order-Pleuronectiformes) were identified in the present study and the samples were monthly collected from Mawlamyine, Kyaikkhami, Setse, Zee-Phyu-Thaung, Belugyun island, Paung and Thaton from July to December 2017. As a result, *Heteromycteris oculus*, *Zebrais zebra*, *Brachirus orientalis*, and *Cynoglossus carpenteri* were the first records for the fishery resources of Myanmar. Moreover, by catch composition, flatfishes were one of the abundant species with 8% of total catches in Mon State. Among them, Cynoglossidae was the most abundant fish during the study period.

Keywords: flatfishes, catch composition, Mon State, Myanmar

Introduction

Pleuronectiformes were first named in 1758 by Linnaeus; *pleuro* meaning "on side" and *necto* meaning "swim". Flatfishes are easy to recognize since this is the only group of fishes that is not bilaterally symmetrical. The ventral side of the body is eyeless and white, while the dorsal is dark and has both eyes. They swim by the undulation of the body, and usually remain close to the bottom on the continental shelf. They are abundant and supportive recreational and commercial fisheries^[1].

Mon state is an administrative division of Myanmar. It is sandwiched between Kayin State in the east, the Andaman Sea in the west, Bago Region in the north and Tanintharyi Region in the south. The land area is 12, 155 km^[2].

In relation with the previous records for Myanmar about flatfishes, there are 7 species of flatfish recorded by Mya Than Tun^[2], 7 species of flatfish by Hla Win^[3], 3 species of flatfish by Su Su Hlaing^[4], 2 species of flatfish by Tint swe^[5], 1 species of flatfish by Thanda Tun^[6], 14 species of flatfish by Theingi Soe Myint^[7], 2 species of flatfish by Zin Zin Zaw^[8]. The objectives of the present study is to exploit and conserve the diversity of flatfishes along the Mon State studying their distinguished morphology among the species of flatfishes and to estimate their total catches in Mon state. As a result, this study also expects to become a basic informational providing data for further observing (in Academic) on Order Pleuronectiformes (flatfishes) along the Mon State.

Materials and Methods

From July to December 2017, the samples of flatfish species were randomly collected on monthly basis, at seven stations along the Mon State, including Mawlamyine, Kyaikkhami, Setse, Zee-Phyu-Thaung, Belugyun island, Paung and Thaton. For the observation of fishery status, artisanal fisheries were concentrated, and doing interviews with artisanal fishermen. Interviews contained questions on a day fishing activity, time and duration of the fishing trip, characteristics of fishing method, catch size, richness and composition, consumption and sole of fish, etc. The flatfishes are caught by bag-nets, gill nets, cast nets, drift nets and bottom trawl nets. Local name and producers' price of the studied species were informed by fishermen in study site. The fishes on the fishing boats, back from the sea, in the fishing villages of stations were examined to estimate the order-wise and family-wise abundance. The site location and topography were recorded. The samples were put in the bags and containers. The samples were brought back to the laboratory, rinsed and identified using the illustration Vol. I-handbooks produced by the F.A.O species identification

Correspondence

Thet Htwe Aung

Demonstrator, Department of
Marine Science, Mawlamyine
University, Myanmar

sheets for fishery purposes Vol. I-IV [13]. Fishbase [11] on the website of the Academic Sinica, Taiwan was used as a supplemental guide for identification purposes.

Results

Classification for species of flatfishes from Coastal Area of Mon State

Order	Family	Genus	Species	
Pleuronectiformes	Psettodidae	<i>Psettodes</i>	<i>p. erumei</i>	
	Paralichthyidae	<i>Pseudorhombus</i>	<i>P. dupliciocellatus</i>	
			<i>P. arsius</i>	
	Bothidae	<i>Engyprosopon</i>	<i>E. grandisquama</i>	
	Soleidae	<i>Heteromycteris</i>	<i>H. oculus</i>	
			<i>Euryglossa</i>	<i>E. orientalis</i>
			<i>Synapture</i>	<i>S. albomaculata</i>
			<i>Zebrias</i>	<i>Z. zebra</i>
	Cynoglossidae	<i>Cynoglossus</i>	<i>Z. synapturoides</i>	
			<i>C. lingua</i>	
			<i>C. arel</i>	
			<i>C. cynoglossus</i>	
		<i>Paraplagusi</i>	<i>C. macrolepidotus</i>	
			<i>C. carpenteri</i>	
<i>P. ablochii</i>				
<i>P. bilineata</i>				

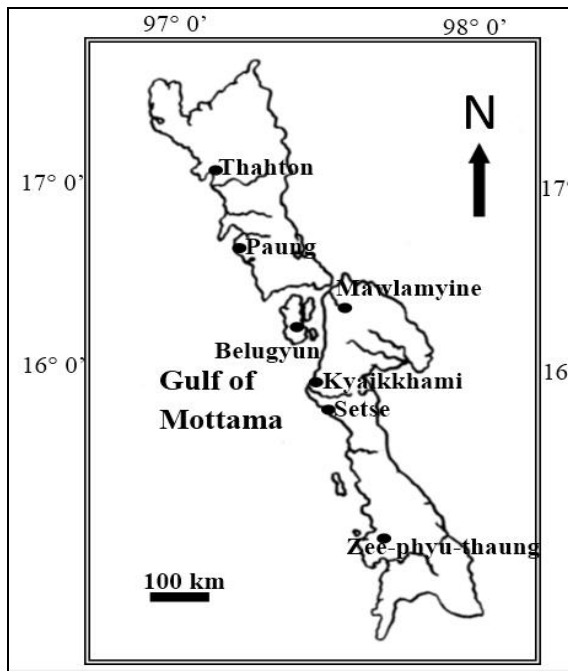


Fig 1: Map showing the specimens collection sites of the flatfishes (Order Pleuronectiformes) from Mon State.

Keys to the families of flatfishes which collected along the Mon state.

- 1a. Dorsal fin with spinous rays, its origin behind upper eye.....Psettodidae
- 1b. Dorsal fin without spinous rays, its origin beyond eye.....2
- 2a. Eyes on right side of body and contour shaped body.....Soleidae
- 2b. Eyes on left side of body and not contour shaped body.....3
- 3a. Flat and elongate body, margin of preoperculum not free and caudal fin joined to dorsal and anal fins.....Cynoglossidae
- 3b. Flat and not elongate, margin of preoperculum free and caudal fin not joined to dorsal and anal fins.....4
- 4a. Eyes sinistral, Mouth asymmetrical, pelvic fin base on

eyed side longer than on eyeless side and pelvic fin rays not branched.....Bothidae

4b. Eyes sinistral in most species, mouth symmetrical, pelvic fin base short and pelvic fin rays branched.....Paralichthyidae

Key to the species of family Paralichthyidae

1a. Grill rakers short, as broad as long, eyed side with 3, rarely 4, large paired spots, each pair surrounded by a ring of white spots.....*Pseudorhombus arsius*

1b. Gill rakers pointed, longer than broad, Canine teeth present, eyed side with a varying pattern of brown spots and blotches.....*Pseudorhombus dupliciocellatus*

Key to the species of family Soleidae.

1a. Caudal fin separate from dorsal and anal fin, Pectoral fins totally absent..... *Heteromycteris oculus*

1b. Caudal fin not separate from dorsal and anal fin, Pectoral fins present2

2a. Body very elongate, a bony process on snout.....*Synapture albomaculata*

2b. Body more or less oval, no bony process on snout.....3

3a. Not colour bands on the body..... *Euryglossa orientalis*

3b. Colour bands on the body.....4

4a Dorsal and anal fin completely joined to caudal.....*Zebrias zebra*

4b. Dorsal and anal fin joined to basal portion of caudal.....*Zebrias synapturoides*

Key to the species of family Cynoglossidae.

1a. Lips fringed.....*Paraplaguisa bilineata*

1b. Lips not fringed.....2

2a. Body flat, elongate, short and stout, large head.....*Cynoglossus cynoglossus*

2b. Body flat, elongate, long and not large head.....3

3a. Three lateral line *Cynoglossus carpenteri*

3b. Two lateral lines 4

4b. Body flat and very elongate, corner of mouth reaching well beyond lower eye, much nearer to gill opening than to tip of snout.....*Cynoglossus lingua*

4a. Body flat and elongate, corner of mouth reaching or almost reaching beyond lower eye, about midway between

gill opening and tip of snout.....5
 5a. Body asymmetrical, not reddish colour, Scales large, 7 to 9 rows between lateral lines on eyed side.....*Cynoglossus macrolepidotus*
 5b. Body symmetrical, Scales reddish colour, 7 rows between lateral lines on eyed side.....*Cynoglossus arel*.

1.1 Identification of field samples

Psettodes erumei Bloch & Schneider, 1801 (fig.2 A)

Diagnosis. - Dorsal spines (total): 9 - 11; Dorsal soft rays (total): 38-45; Anal spines: 1; Anal soft rays: 33 - 43. Body oval and flat. Mouth large with strong teeth; maxillary extends well beyond hind edge of lower eye; both eyes on left or right side; upper eye lying immediately below dorsal edge. Gill rakers not developed. Dorsal fin origins well posterior to eyes; anterior fin rays spinous; lateral line almost straight. Common length 50 cm. Colour usually brownish/ greyish, sometimes with 4 broad, dark cross-bars.

Pseudorhombus arsius Hamilton, 1822 (fig.2 B)

Diagnosis. - Dorsal soft rays (total): 71-84; Anal soft rays: 53-62; Body oval and flat, its depth 1.8 to 2 times in standard length. Both eyes on left side. Upper jaw ending below posterior edge of lower eye. Gill rakers pointed, longer than broad. Canine teeth present, 6 to 13 in lower jaw of blind side. Dorsal fin origins in front of upper eye; pelvic fin base of blind side almost equal in length to that of eyed side. Lateral line curved above pectoral fin, forming 2 branches on head, the upper ending between 8th to 12th dorsal fin rays. Colour eyed side with a varying pattern of brown spots and blotches, but always a longer blotch an anterior end of straight part of lateral line and a smaller blotch halfway to caudal fin base. Common length: 30 cm.

Pseudorhombus dupliciocellatus Regan, 1905 (fig.2 C)

Diagnosis. - Body oval and flat with a notch in upper profile of head. Both eyes on left side. Upper jaw extending below middle of lower eyes. Gill rakers short, as broad as long. 13 to 22 teeth in lower jaw of blind side. Pelvic fin base of blind side almost equal in length to that of eyed side. Lateral line curved above pectoral fin, forming 2 branches on head, the upper ending between 8th to 9th dorsal fin rays. Scales ctenoid (rough to touch) on eyed side. Colour eyed side brown, with 3, rarely 4, large paired spots, each pair surrounded by a ring of white spots. When 4, these pairs of spots form a square. Common length 25cm.

Antiprosopon grandisquamis Temminck & Schlegel, 1846 (fig.2 D)

Diagnosis. - Dorsal soft rays (total): 79-87; Anal soft rays: 59-65. Body oval and flat. Both eyes on left side. Upper jaw more than 2.5 times in length of head, ending just in front of lower eye. Gill rakers 5 to 7 on lower part of first gill arch. Pelvic fin base of blind side much shorter than that of eyed side. Lateral line curved above pectoral fin and absent from head; scales on eyed side feebly ctenoid (rough to touch); 36 to 48 scales in lateral line. Adult males have spaces on snout and near eyes, and a larger space between eyes than females. Colour eyed side brown; caudal fin with two large, dark spots. Dorsal anal and caudal fins usually with small brown spots. Common length: 10 cm.

Heteromycteris oculus Alcock, 1889 (fig.2 E)

Diagnosis. - Body oval and flat, caudal fin separate from dorsal and anal fin. Eyes on right side, separated by a scaly space, snout forming a distinct hook with dorsal rays extending to its tip. Pectoral fins totally absent. 80-95 lateral line scales. Scales on both side ctenoid (rough). Colour eyed side brown or reddish brown with distinct eye shaped spots and rings arranging five numbers on each side with opposite position. Common length 15 cm.

Synaptura albomaculata Kaup, 1858 (fig.3 A)

Diagnosis. - Body elongate, a bony process on snout. Eyes moderate size, the upper half in advance of the lower. Angle of mouth below the hind third of the eye. Lips on coloured side fringed. Two tubular nostrils on the coloured side. Pectoral fins very small on blind side. Scales ctenoid on coloured, cycloid on blind side. Lateral-line single on either side. Colours: body brown on the coloured side, with three to five rows of widely separated white dots. Fins slate-coloured edged with white. Common length: 30 cm.

Zebrias zebra Bloch, 1787 (fig.3 B)

Diagnosis. - Dorsal soft rays (total): 74-78; Anal soft rays: 65 - 68. Body oval and flat, opercular membrane joined to upper pectoral fin rays and a number of dark crossbars on body. Dorsal and anal fin completely joined to caudal. Eyes placed close together: the upper eye is scarcely, in advance of the lower. Pectoral fin on the coloured side rather longer than the one on the blind side, but both very short. Lateral line single on both side. Colour: twelve to thirteen vertical chestnut bands on a light ground colour, the anterior of which is on the snout, they are continued on to the vertical fins. Caudal dark with white marking, dorsal having a white edge. Common length: 16.0 cm.

Zebrias synapturoides Jenkins, 1910 (fig.3 C)

Diagnosis. - Body oval and flat, opercular membrane joined to upper pectoral fin rays and a number of dark crossbars on body. Eyes close together, the anterior third of the upper being in advance of the lower. Jaws of about equal length anteriorly. Fins pectorals attached to the gill-covers, the upper two rays on the right side longer than the others: left pectoral rudimentary. Colours: greyish-brown, with ten reddish-brown vertical bands, commencing on the dorsal and continued on to the anal fin, where they become nearly black: pectoral on the right side nearly black: caudal black, with some irregular white marking towards its edges. Common length: 10.0 cm.

Brachirus orientalis Bloch & Schneider, 1801 (fig.3 D)

Diagnosis. - Body oval and flat, both contours equally arched. Eyes on right side, separated by a scaly space; mouth small, curved, cleft reaching to below middle of lower eye. Dorsal and anal fins joined to caudal fin; pectoral fins well developed, that on blind side somewhat shorter than that on eyed side; pelvic fins moderately symmetrical, united basally. 75-85 lateral- line scales. Colour: grey or brown with cloudy indistinct patches on eyed side, with narrow bars crossing lateral line tinged yellow on blind side; pectoral fin on eyed side darker. Common length: 12.0 cm.

Paraplagusia bilineata Bloch, 1784 (fig.3 E)

Diagnosis. - Dorsal soft rays (total): 99-115; Anal soft rays: 72- 28. Mid-lateral line scales 75-109. Body flat and elongate, with dorsal and anal fins jointed to caudal fin. Eyes on left

side of body, with a scaly space between them. Snout rounded, rostral hook long and reaching beyond lower eye; corner of mouth not reaching beyond lower eye, nearer to gill opening than to tip of snout. Mouth fringed with tentacles. Two lateral lines on eyed side of body but none on blind side. Colour: Upper side tan, marbles with darker wavy lines enclosing pale patches: 2 lateral lines on eyed side, none on blind side. Common length: 25 cm.

***Cynoglossus cynoglossus* Hamilton, 1822 (fig.4 A)**

Diagnosis. - Dorsal soft rays (total): 95-102; Anal soft rays: 72 - 78. Body flat and elongate, with dorsal and anal fins joined to caudal fin. Eyes on left side of body, with a space between them. Snout rounded, rostral hook short, corner of mouth not reaching beyond lower eye, nearer to tip of snout than to gill opening. Lip not fringed. Two lateral lines on eyed side but none on blind side. Scales ctenoid (rough to touch) on both sides of body, 12 to 14 rows between lateral lines of eyed side. Common length: 12 cm. Colour: eyed side brown/ grey, with vague dark marbling.

***Cynoglossus carpenteri* Alcock, 1889 (fig.4 B)**

Diagnosis. - Body flat and elongate, with dorsal and anal fins joined to caudal fin. Eyes on left side of body with a small scaly space between them. Snout obtusely pointed, rostral hook short, corner of mouth reaching beyond lower eye, slightly nearer to gill opening than to tip of snout. Three lateral lines on eyed side, none on blind side. Scales ctenoid (rough to touch) on both side of body, 15 to 23 rows between upper and middle lateral lines on eyed side. Colour: eyed side brown with dark blotches on gill- cover, blind side white. Common length: 23 cm.

***Cynoglossus lingua* Hamilton, 1822 (fig.4 C)**

Diagnosis. - Dorsal soft rays (total): 126-138; Anal soft rays: 97 - 114. Body flat and very elongate, with dorsal and anal fins joined to caudal fin. Eyes on left side of body, with a

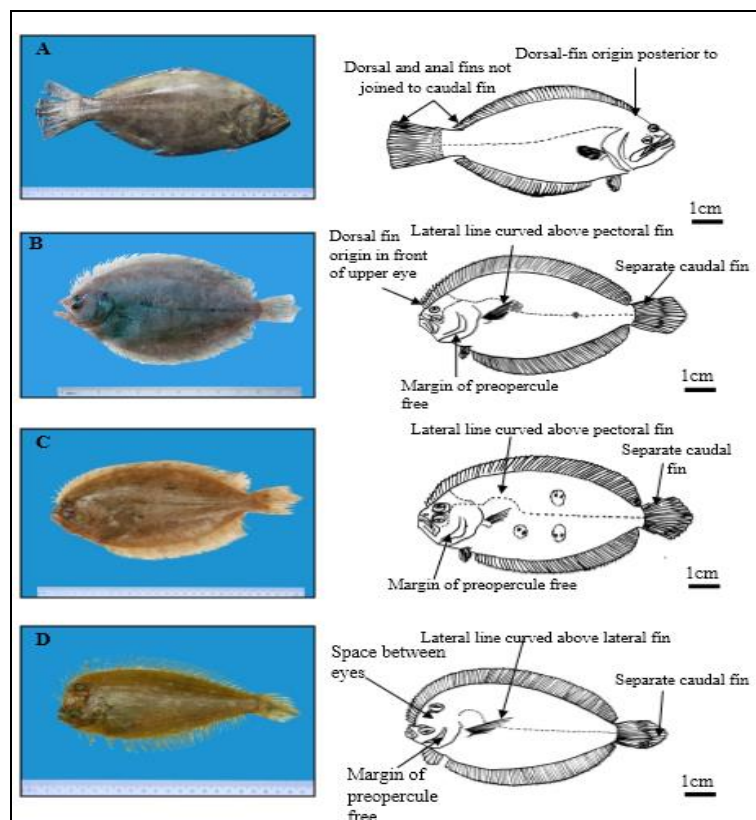
small space between them. Snout obtusely pointed, rostral hook short, corner of mouth reaching well beyond lower eye, much nearer to gill opening than to tip of snout. Lip not fringed. Caudal-fin rays 10. Two lateral lines on eyed side but none on blind side. Scales ctenoid (rough to touch) on eyed side but cycloid (smooth) on blind side, fairly large. Mid lateral-line scales 90 to 101 only 11 to 12 rows between lateral lines on eyed side. Common length: 25.0 cm. Colour: Eyed side red/ brown, sometimes with irregular brown/ black patches, with a large blotch on gill cover.

***Cynoglossus macrolepidotus* Bleeker, 1851 (fig.4 D)**

Diagnosis. - Body flat and elongate, with dorsal and anal fins joined to caudal fin. Eyes on left side of body, with a small scaly space between them. Snout obtusely printed, rostral hook short, corner of mouth reaching or almost reaching beyond lower eye, about midway between gill opening and tip of snout. Lip not fringed. Two lateral lines on eyed side but none on blind side. Scales catenoid (rough to touch) on eyed side but Cycloid (smooth) on blind side, large, 7 to 9 rows between lateral lines on eyed side. Colour: Eyed side uniform brown, with a dark patch on grill cover, blind side white.

***Cynoglossus arel* Bloch & Schneider, 1801 (fig.4 E)**

Diagnosis. - Dorsal soft rays (total): 116-130; Anal soft rays: 85 - 98. Body flat and elongate, with dorsal and anal fins joined to caudal fin. Eyes on left side of body, with a small scaly interorbital space. Snout obtusely pointed, rostral hook short, corner of mouth reaching posteriorly to or beyond lower of eye about midway between gill opening and tip of snout. Lip not fringed. Caudal-fin rays usually 10. Midlateral-line scales 56 to 70. Lateral lines on eyed side and no lateral line on blind side. Scales ctenoid on eyed side but cycloid on blind side, 7 rows between lateral lines on eyed side. Colour: Eyed side uniform brown, with a dark patch on gill cover, blind side white. Common length: 30.0 cm.



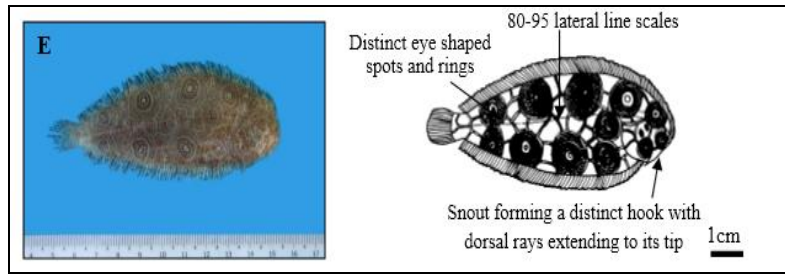


Fig 2: Morphological characters; (A) *Psettodes erumei*, (B) *Pseudorhombus arsius*, (C) *Pseudorhombus dupliciocellatus*, (D) *Engyprosopon grandisquama*, (E) *Heteromycteris oculus*.

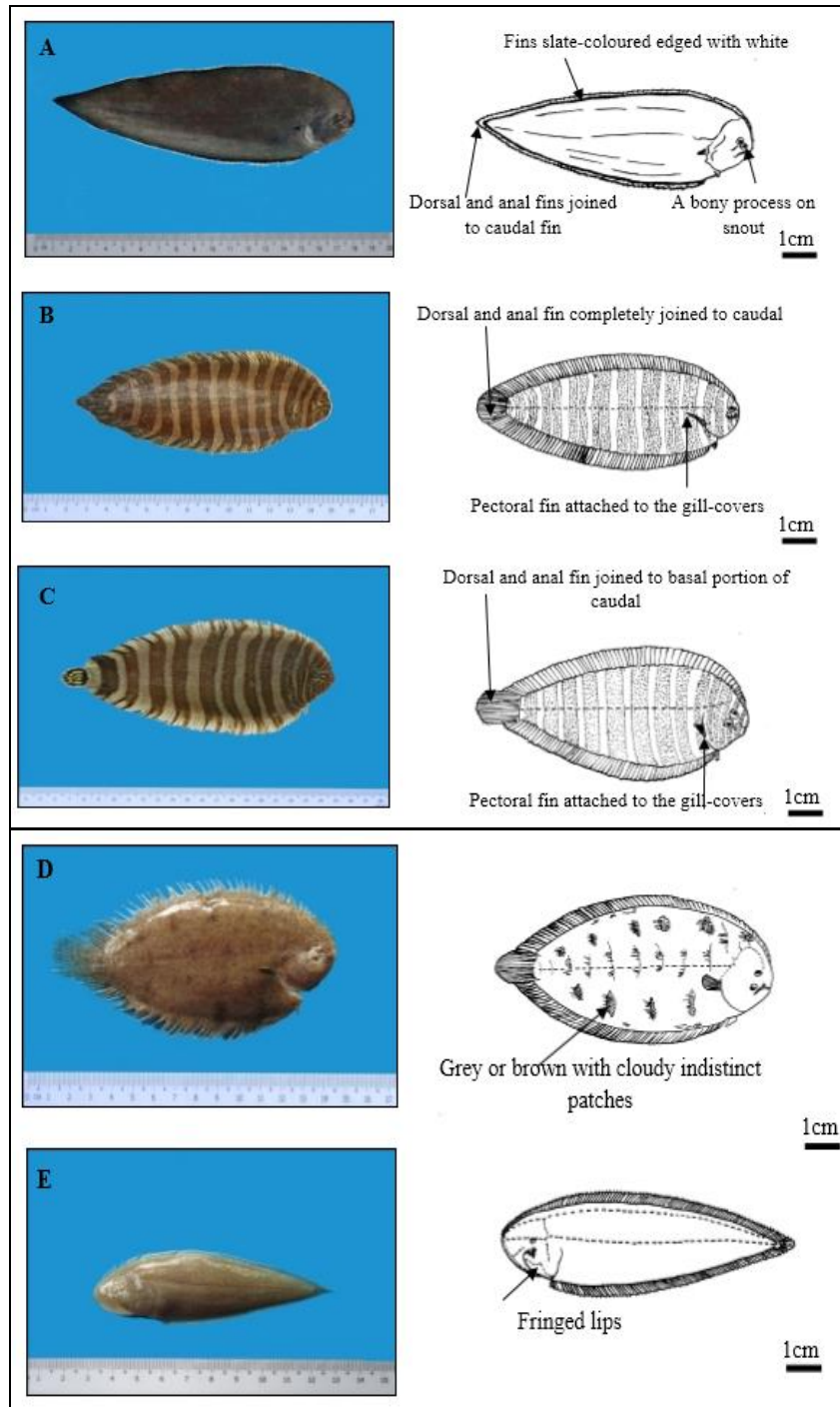


Fig 3: Morphological characters; (A) *Synaptura albomaculata*, (B) *Zebrias zebra*, (C) *Zebrias synapturoides*, (D) *Brachirus orientalis*, (E) *Paraplagusi bilineata*

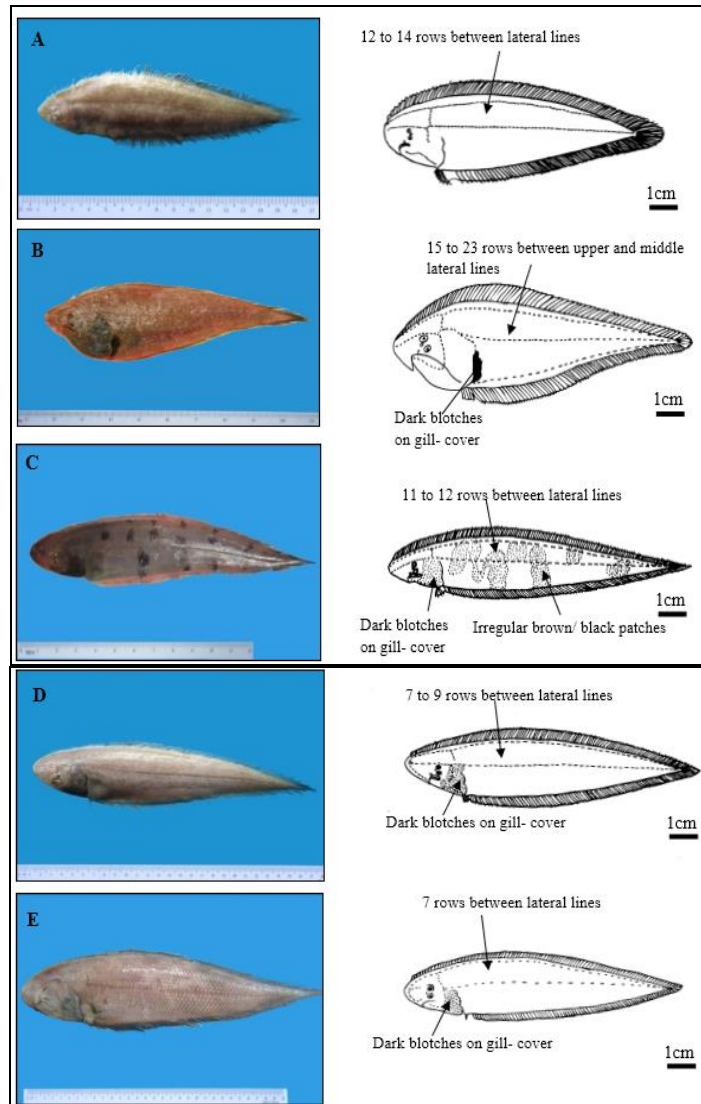


Fig 4: Morphological characters; (A) *Cynoglossus cynoglossus*, (B) *Cynoglossus carpenteri*, (C) *Cynoglossus lingua*, (D) *Cynoglossus macrolepidotus*, (E) *Cynoglossus arel*

The fish abundance in study area during July to December 2017.

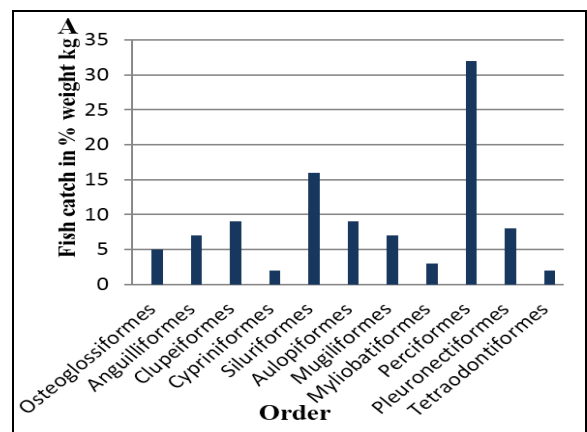
The fish abundance was conducted during July to December 2017 in the fishing villages of Mon State. The following results are mainly based on the fishes from about 9 fishing boats in Setse, Kyaikkhami, Zee-Phyu-Thaung, Kyauk- Tan, Nyung-pin-seik of Mon State

Table 1: Order wise fish (groups) abundance in study area during July to December 2017.

No.	Order (groups)	Fish catch in % weight kg
1.	Osteoglossiformes	5
2.	Anguilliformes	7
3.	Clupeiformes	9
4.	Cypriniformes	2
5.	Siluriformes	16
6.	Aulopiformes	9
7.	Mugiliformes	7
8.	Myliobatiformes	3
9.	Perciformes	32
10.	Pleuronectiformes	8
11.	Tetraodontiformes	2

Table 2: Family wise fish abundance in study area during July to December 2017.

No.	Family of Pleuronectiformes (8%)	Fish catch in % weight kg
1.	Psettodidae	10
2.	Paralichthyidae	10
3.	Bothidae	10
4.	Soleidae	20
5.	Cynoglossidae	50



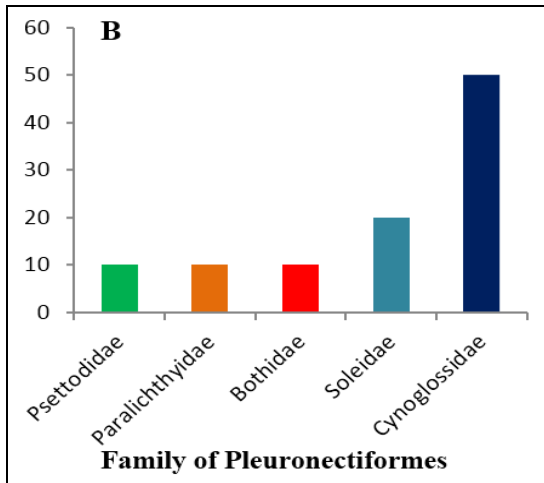


Fig 4: (A) Order wise fish (groups) abundance and (B) Family wise fish abundance in study area during July to December 2017.

Discussion

A total of 5 families, including 15 species of flatfishes were recorded in this study. The Psettodidae which included 1 genus and 1 species, the Paralichthyidae, which included 1 genus and 2 species, the Bothidae which included 1 genus and 1 species, the Soleidae which included 4 genera and 5 species, the Cynoglossidae which included 2 genera and 6 species were found along the Mon state in this study.

Compared with the morphological distinguishing characters of flatfishes, there is only one species with dorsal and anal spines. It is *Psettodes erumei*. Others are without spines. Besides the eyes of all species are only on the left side except for Order Soleidae. Psettodidae, Paralichthyidae and Bothidae are identified mainly using Gill racker and Soleidae and Cynoglossidae are identified mainly using their number of scales such as FAO identification sheet [13].

In Myanmar, the flatfishes had already been recorded by Mya Than Tun [2], Hla Win [3], Su Su Hlaing [4], Tint swe [5], Thanda Tun [6], Theingi Soe Myint [7], Zin Zin Zaw [8]. Moreover, some species had been described in Day [9] and it was described that *Cynoglossus cynoglossus* are very plentiful in Sittaung river of Myanmar. In fact, *C. cynoglossus* was identified as *C. Bengalensis* and *Brachirus orientalis* was identified as *Euryglossa orientalis*. However, *C. bengalensis* has gone as a synonym of *Cynoglossus cynoglossus*. Likewise *E. orientalis* had changed into *B. orientalis* according to fishbase 2018. Among the species, *Zebrias synapturoides* are also near same with *Aesopia cornuta* described by Hla Win³ but the present study was identified mainly using FAO identification sheet [13], fishbase [11], De Bruin [12], Day [9], Rainboth [10]. Therefore based on the previous studies, *Heteromycteris oculus*, *Zebrais zebra*, *Brachirus orientalis*, and *Cynoglossus carpenteri* could be designated as new records for the fishery resources Myanmar.

As regards the occurrence of flatfishes in Mon State, Psettodidae is found only in Zee-Phyu-Thaung, Bothidae is found only in Setse and Paralichthyidae is found in Zee-Phyu-Thaung and Setse. Cynoglossidae is found in every station abundantly but Soleidae is not found there and it is found in Mawlamyine, Paung and Thahton which are brackish and fresh water regions.

In the present study, flatfishes are caught mostly using bottom trawl nets by fishermen in all stations as the flatfishes are close to the bottom and swim by undulation of the body. Besides bag nets, gill nets, cast nets and drift nets are used for

catching flatfishes in some stations. Soleidae appears to be caught mostly by bag nets and cast nets and Psettodidae, Paralichthyidae and Bothidae appear to be caught mostly by bottom trawl nets in Mon State.

Table 1 and figure 4 (A) show the order wise fish (groups) abundance in study area during July to December 2017. The most percentages of catch in weight (kg) or abundance fishes of Mon state was Perciformes estimated about 32 % in total catches. Then, the Order Siluriformes, Clupeiformes, Aulopiformes Pleuronectiformes, Mugiliformes, Anguilliformes, Osteoglossiformes, Myliobatiformes, Tetraodontiformes, Cypriniformes are 5%, 7%, 9%, 2%, 16%, 9%, 7%, 3%, 32%, 8%, 2% in total catches respectively. By this catch, the Order Pleuronectiformes is one of the most abundance in Mon State. Table 2 and figure 4 (B) show the family wise fish abundance of order in study area during July to December 2017. In Pleuronectiformes, the family Cynoglossidae with 50% peaks sharply other than Psettodidae with 10%, Paralichthyidae with 10%, Bothidae with 10%, Soleidae with 20%. The Psettodidae, Paralichthyidae and Bothidae may not be plentiful because they are not found exclusively and they are hardly caught together with mixing other fishes in the present study.

Conclusions

It can be concluded in the present study that some flatfishes live in the marine habitats and some live in fresh water or brackish water because some were found in the marine areas and some were found in the areas adjacent to brackish water or fresh water. However they are mostly marine species and there is also some brackish and fresh water species. Currently there is just a meager study about the flatfishes in Myanmar. As a result, based on the present study, the stock assessment of flatfishes should be conducted for the fishery management because flatfishes are also included in the important and abundance fishes of Myanmar.

Acknowledgements

I am deeply grateful to my dearest parents, U Kyin Aung and Daw Myint Myint San for their kind moral and financial supports to reach the goal of this work.

References

- Lapierre KL. Taxonomic Revision of the Genera *Achiroides*, *Brachirus*, *Dexillus*, and *Paradicula* (Pleuronectiformes: Soleidae). MSc. Thesis. Ottawa-Carleton Institute of Biology, 2007, 197.
- Mya Than Tun. Marine Fishes of Myanmar (Pelagic and Demersal), Marine Fisheries Resources Survey Unit, Department of Fisheries, 2001, 1-276.
- Hla Win, Swe Twin, Myint Pe, Myint Maung. Commercial fishes of Myanmar. Myanmar Fishery Products Processors and Exporters Association, 2008, 1-248.
- Su Su Hlaing. Commercially Important Ichthyological Fauna of the Thalwin River Mouth and Adjacent Sea. Unpublished M.Res. Thesis. Department of Marine Science. Mawlamyine University, 2010.
- Tint Swe. Biology and Economic of Fishery Resources Caught by Stationary Bagnets Along The Coast Of Mon State. Unpublished Ph. D Dissertation. Department of Marine Science. Mawlamyine University, 2011.
- Thanda Tun. Some Fishery Resources and Socio-m Economics of Coco Island. Ministry of Education.

- Department of Higher Education (Lower Myanmar) Mawlamyine University. 2011; 3(1):140-147.
7. Theingi Soe Myint. Fish species from Kaladan River Segment, Sittway Township, Rakhine State. University Research Journal. 2012; 5(2):21-36.
 8. Zin Zin Zaw. A study in Fishery Of some commercial Fishes in Asin coastal areas, Ye Township, Mon state. Unpublished M. Res. Thesis. Department of Marine Science. Mawlamyine University, 2014.
 9. Day F, FLS, FZS. The fishes of India, being a natural history of fishes known to inhabit at the seas and freshwater of India, Burma and Ceylon. 187; 1:778. and Vol. II (Atlas) 1-195.
 10. Rainboth WJ. Fishes of the Cambodian Mekong. FAO Species Identification Field Guide for Fishery Purposes. FAO, Rome, 1996, 265.
 11. Froese R, Pauly D. (Eds). FishBase. World Wide Web electronic publication, 2014-2018 [http:// www.fishbase.org](http://www.fishbase.org), Cited.
 12. De Bruin GHP, Russell BC, Bogusch A. The marine fishery resources of Sri Lanka. F. A. O species identification field guide for fishery purpose. Food and Agriculture Organization of the United Nations, Rome. 1995; 1995:400.
 13. Carpenter KE, Niem VH. (Eds). FAO species identification guide for fishery purpose. The living marine resources of the Western Central Pacific. Food and Agriculture Organization of the United Nations. Rome. 2001, 3051-3089.