INVESTIGATION OF WATER PARAMETERS AND FISH STATUS FROM PAUK INN AND PADONMILAY INN, CHAUNG U TOWNSHIP, SAGAING REGION

Khin Thandar Latt[1], Htay Khaing[2], Myint Kyaw[3]

Abstract

In the present study, a total of 10782931 individuals, 40 species belonging to 30 genera, 17 families and eight orders from Pauk Inn (site I) and 780133 individuals, 33 species under 26 genera, 16 families and eight orders from Padonmilay Inn (site II) were recorded during October 2018 to September 2019. The total production fish weight was recorded over 283581 kg/yr from Site I and over 15802 kg/ yr. from site II. The water sample was collected from both study sites for analyzing some water parameters during planting and harvesting period of *Melon* spp. and other crops were examined by the laboratory of water supply and sanitation department of Mandalay. Some parameters of water temperature, pH and total alkalinity from both sites were fall within the EPA limit and the rest of the water parameters were unsuitable limit for fish fauna in the study area. This study was aimed to focus the limnology and sustainable utilization of floodplain for fisheries development.

Keywords: Wetlands (Inn), Water parameters, Fish, EPA limit

Introduction

Wetlands are ecosystems or units of the landscape that are found on the interface between land and water. Wetlands are covered approximately 5% - 8% of the global land area. These are important part of the ecosystem and are among the most threatened of all environmental resources. Wetlands are one of the most productive ecosystems and play crucial role in hydrological cycle. Wetland ecosystems are associated with a diverse and complex array of direct and indirect use depending on the type of wetlands, soil water characteristics and associated biotic influences. Direct uses include water supply source and harvesting of wetland products such as fish and plants resources. Indirect benefits are derived from environmental functions such as floodwater retention, groundwater recharge/ discharge, climate mitigation and nutrient abatement (Abraham, 2015).

Fish are cool blooded aquatic vertebrates. They are keystone species which determine the distribution and abundance of other organism in the ecosystem they represent and good indicators of water quality and health of the ecosystem (Malakar and Boruah, 2017). Fish is sensitive to change in water chemistry due to different antropogenic activities from their catchment. Fish assemblages have widely been used as ecological indicators to assess and evaluate the level of degradation and health of water bodies at various spatial scales. However, the impact of the anthropogenic activities, habitat degradation, exotic species introduction, water diversions, pollution and global climate change are main causative agents for the aquatic species rapid decline (Basavaraja *et al*., 2014).

In Myanmar, fisheries can be classified into inland fisheries and marine fisheries. The inland fisheries are mainly flood fisheries made possible by the vast river system and heavy raindfall. There are also leasable fisheries, which cover a large area. Leasable fisheries operate in streams, lakes and ponds during the monsoon. A fishery is leased through a bidding process, and winning bidder is granted the right to harvest the fisheries resources in demarcated "Inns" from September to April. Revenue from the lease is collected by the Department of Fisheries listed throughout the country, of which about 3800 are being operate at present (Win Aung, 2019).

[1] Dr, Lecturer, Department of Zoology, Monywa University
[2] Dr, Lecturer, Department of Zoology, Monywa University
[3] Lecturer, Department of Zoology, Monywa University

In Chaung U Township, there are ten flooded plains (Inns). Among these, Pauk Inn is the largest and highest production of nutritious fish resources area and Padonmilay is the second largest Inn, which provides fish resources for local people. During the last decades, agricultural activities have been expanded in the wetland area of the Chaung U Township very rapidly which has affected the wetland ecosystem. According to Sabbir *et al*., 2010, water quality focuses on the various aspects of the physicochemical parameters of water that detect the status of pollution and suitability of a particular water body for various aquatic organisms as well as fisheries. Thus, the investigation of water parameters and status of fishes from two flooded plains in Chaung U Township is importance. So, the present study was carried with the following objectives:

- to investigate the water quality in water from Pauk Inn and Padonmilay Inn and
- to assess the fish status in the two study sites.

Materials and Methods

Study sites and study area

Chaung U Township is situated in Sagaing region within the Dry Zone of Central Myanmar, which has dry and hot climate. It is located at the southwestern part of Monywa Township. It lies between Latitudes 21° 57′ 0″ North and Longitudes 95° 16′ 0″ East. Two study sites were chosen in the present study.

Site I - Pauk Inn lied Eastern bank of Chindwin River, Chaung U Township, Sagaing Region and Central Myanmar. It is situated between Taw Chaung Gyi and Makyi Gwa Village. It lies between 21°48' 54.20" N-21°48'50" N and 95°11'34" E-95°13'11.55" E. It extends approximately 12.88 kilometers in length and covers an area of 180.63 hectares. The water body of Pauk Inn is drained from Chindwin River in June. The depth of water in this area is around 7 meters in the rainy season but the water level is very low in summer. Some crops were cultivated in southern part of the study area. There are many houses near the southern part area. *Melon* spp. was cultivated around the northern part of Inn. The water body of the northern part of the Pauk Inn is derived by Chindwin River via from southern part of the Pauk Inn.

Site II – Padonmilay Inn is situated between Makyi Gwa Village and Thone Pan Hla Village, Chaung U Township. It is located at a distance of approximately 5km from Chindwin River. The water body of the Padonmilay Inn is drained by Chindwin River via from Pauk Inn. The water level in the study area is around 6 meters in the rainy season but very low in summer. It lies at Latitudes 21° 50' 12.71" N and Longitude 95° 12' 24.84" E. It measures 10.6 km from north to south and 4.83 km) from east to west and covers an area of 150.61 hacteras. *Melon* spp. was cultivated extensively along the both sides of the Padonmilay Inn.

Study period

The study period was conducted from October 2018 to September 2019.

Sample collection

The present study is an attempt to study of fish fauna from Pauk Inn and Padonmilay Inn, Chaung U Township. Samplings were done twice a month. Collections were made from both study sites caught by fishermen. The physical appearance of fish was noted down and the photo was also taken immediately after capturing the fish. Small specimens were preserved in 5% formalin for future examination. The medium-sized specimens were injected with 10% formalin on the side of abdomen for total fixation before they were preserved.

Identification and classification

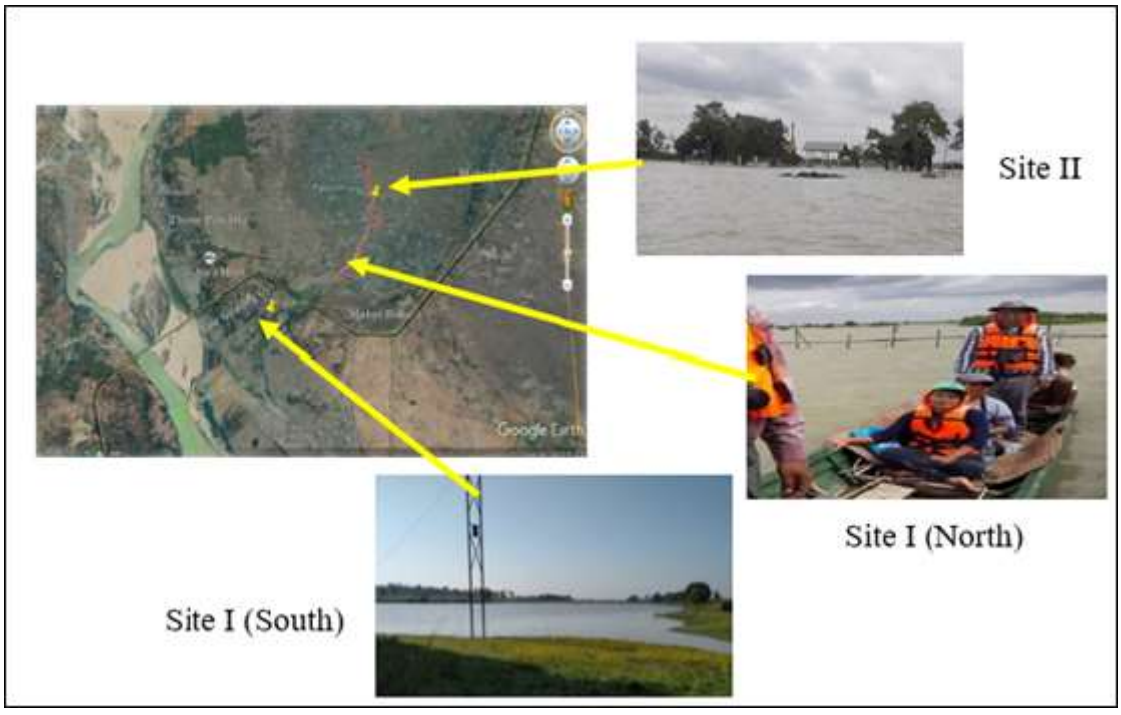
Genus and species were identified according to Lagler *et al*., (1977), Talwar Jhingram (1991), FishBase and 2013 Jayaram (2013). The identified specimens were arranged and presented according to the system of classification given by Jayaram (2013).

Collection of water sample and analysis

For water quality analysis, random samples of water were collected from the study site in the morning during planting period and harvesting period of *Melon* spp. around the study area. Planting period of *Melon* spp. started from December to March and harvesting period started from April to June. Water samples were collected from 50 cm depth in each location. Water samples were collected in clean plastic bottles. Bottles were rinsed with distilled water and then the water from the Inn (wetland) before sample collection. The water parameters such as water temperature, pH, nitrites, alkalinity, dissolved oxygen (DO), biochemical oxygen demand (BOD) was estimated in the laboratory of water supply and sanitation department, Mandalay Region.

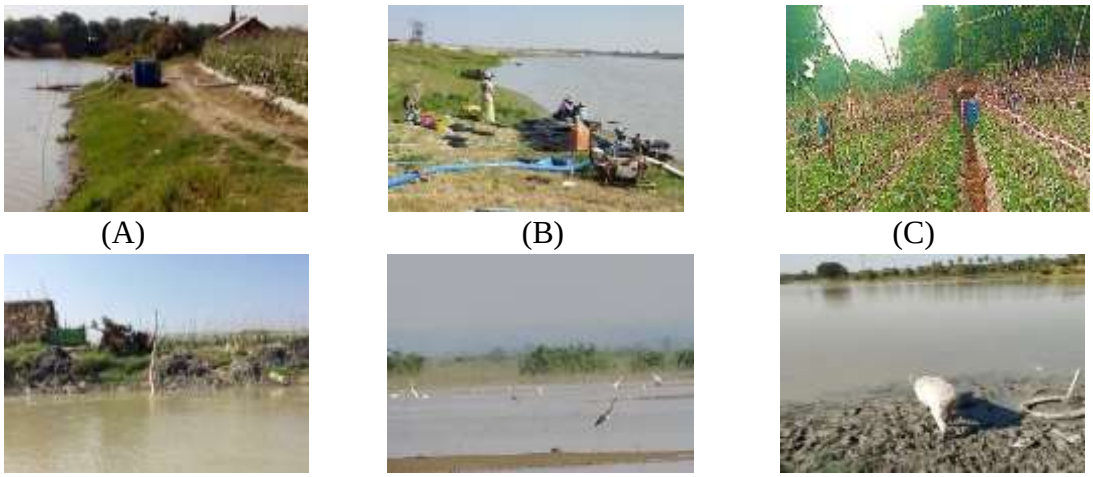
Collection of data

In the present study, fish catch statistics has been recorded at monthly interval by visiting the fish landing sites. The fishermen families residing in these areas have been interviewed. Interview from the leaseholder, the cultured fish species such as *Hypophthalmichthys molitrix*, *Ctenopharyngodon idellus*, *Cyprinus carpio*, *Barbonymus gonionotus*, *Gibelion catla*, *Labeo rohita* and *Colisa labiosus* were seeded only in Northern part of Pauk Inn in May. The productivity rates of fish from the study area were taken by fishery lessee and local fishmonger that were selling in the market.



(**Source:** Google earth 2018)

Plate 1 Location map of the study area with study sites



(A) (B) (C)

(D) (E) (F)

Plate 2 Environmental Impacts to study area (A)Farming near the study area (B) washing medium cups (C) Pesticides on farming (D) Plastic Mulch waste (E) Feeding ground for birds (F) Pasturing of Domesticated animals

(A) Fishing activities (B) Fish collecting (C) Fish selling

Plate 2 Fishing activities and fish selling

(A) *Channa striata* (B) *Puntius sarana* (C) *Glosogobius giuris*

Plate 4 Some skin infected fish species in the study area

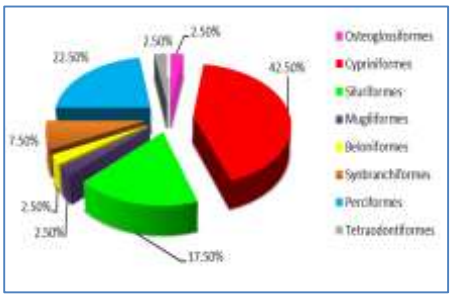


Figure 1 Percentage composition of fish species in different orders from Site I Pauk Inn

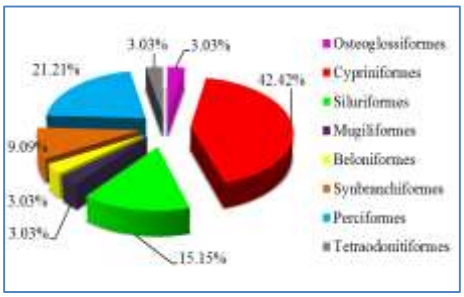


Figure 2 Percentage composition of fish species in different orders from Site II Padonmilay Inn

Result

Species composition of recorded fish species

A total of 40 fish species of fishes belonging to 30 genera, 17 families and eight orders were recorded from Site I Pauk Inn, Chaung U Township. Of these eight orders, the order Cypriniformes with (17 species, 42.5%), followed by Perciformes with (nine species, 22.50%), Siluriformes with (seven species, 17.5%), Synbranchiformes with (three species, 7.50%) whereas each of Osteoglossiformes, Mugiliformes, Beloniformes and Tetraodontiformes with (one species, 2.50%). In the study period, the maximum numbers of 37 species were recorded in February, while the highest number (1545180 individuals) was recorded in December. While the minimum numbers of three species and the lowest number of (1871 Individuals) was recorded in May. *Puntius sarana* was the highest total number of 5883946 individuals while *Johnius coitor* was the lowest number of four individuals (Table 1 and Fig.1).

A total of 33 fish species belonging to 26 genera, 16 families and eight orders were recorded from Site II Padonmilay Inn (Lake), Chaung U Township. Among the eight orders, order Cypriniformes with (14 species, 42.42%), followed by Perciformes with (seven species, 21.21%), Siluriformes with (five species, 15.15%), Synbranchiformes with (three species, 9.09%) whereas each of Osteoglossiformes, Mugiliformes, Beloniformes and Tetraodontiformes with (one species, 3.03%). During the study period, the maximum numbers of 32 species were recorded in February (2019) while the highest number of (445897) individuals were recorded in November. While the minimum numbers of three species and the lowest number of (24) individuals were recorded in May. *Puntius sarana* was the highest total number of 286108 individuals while *Labeo boga* and *Xenentodon cancila* were the lowest number of one individual (Table 1 and Fig.2).

Production of fishes during the study period

In the present study, total production of fishes was over (283581.39 kg/yr) from Pauk Inn. The highest catch weight was found in December (70483.2 kg/yr) while the lowest in May (38.4 kg/yr). There were 40 fish species were collected from the Site I. Total production of fishes was over (15802.56 kg/ yr) from Padonmilay Inn. According to the recorded data, the highest catch weight was found in November (7406.4 kg/yr) while the lowest in May (1.2 kg/yr). There were 33 fish species were collected from the Site II. All fishes were directly sold to traders, wholesalers and retailer. The majority of fish traders from the study area were retailers from local market and wholesalers from near Township such as Monywa and Chaung U. Often fishes were sold nearest villages in the study area due to local demand.

Physico-chemical parameters of water from two study sites

Physico-chemical parameters of water were observed in Pauk Inn and Padonmilay Inn (Lake) during planting period and harvesting period from the study area (Table 2).

Table 1 List of fish species recorded from Pauk Inn and Padonmilay Inn

No.	Order	Family	Scientific Name	S.I	S.II
1	Osteoglossiformes	Notopteridae	*Notopterus notopterus*	+	+
2	Cypriniformes	Cyprinidae	*Hypophthalmichthys molitrix*	+	-
3			*Esomus danricus*	+	+
4			*Amblypharyngodon atkinsonii*	+	+
5			*Ctenopharyngodon idellus*	+	+
6			*Puntius carnaticus*	+	+
7			*Puntius sarana*	+	+
8			*Puntius chola*	+	+
9			*Barbonymus gonionotus*	+	+
10			*Cyprinus carpio*	+	+
11			*Osteobrama belangeri*	+	+
12			*Osteobrama cunma*	+	-
13			*Cirrhinus mrigala*	+	+
14			*Catla catla*	+	+
15			*Labeo boga*	+	+
16			*Labeo calbasu*	+	+
17			*Labeo rohita*	+	+
18			*Labeo stoliczkae*	+	-
19	Siluriformes	Bagridae	*Sperata aor*	+	-
20			*Mystus cavasius*	+	+
21			*Mystus pulcher*	+	+
22		Siluridae	*Ompok bimaculatus*	+	-
23			*Wallago attu*	+	+
24		Clariidae	*Heteropneustes fossilis*	+	+
25		Loricariidae	*Pterygoplichthys pardalis*	+	+
26	Mugiliformes	Mugilidae	*Rhinomugil corsula*	+	+
27	Synbranchiformes	Mastacembelidae	*Macrognathus aral*	+	+
28			*Macrognathus zebrinus*	+	+
29			*Mastacembelus armatus*	+	+
30	Perciformes	Ambassidae	*Parambassis ranga*	+	+
31		Cichlidae	*Oreochromis mossambicus*	+	+
32		Sciaenidae	*Johnius coitor*	+	-
33		Gobiidae	*Glossogobius giuris*	+	+
34		Anabantidae	*Anabas testudineus*	+	+
35	Beloniformes	Belonidae	*Xenentodon cancila*	+	+
36		Channidae	*Channa striatus*	+	+
37			*Channa punctatus*	+	+
38		Belontidae	*Colisa fasciatus*	+	+
39			*Colisa labiosus*	+	-
40	Tetraodontiformes	Tetraodontidae	*Tetradon cutcutia*	+	+

Table 2 Comprison of water parameters of water recorded from Pauk Inn and Padonmilay Inn with EPA standard

Water parameters	Pauk Inn (South)		Pauk Inn (North)		Padonmilay Inn		EPA standard
	P (I)	P (II)	P (I)	P (II)	P (I)	P (II)	
Temperature (HC)	24	35	24	35	24	35	25
pH	7.5	7.6	7.5	7.6	7.4	8.2	6.0-9.0
DO (mg/L)	3.58	1.42	2	1.5	1.45	0.97	≥7
BOD(mg/L)	35	32	28	25	25	30	≤5
TDS (mg/L)	549	697	493	599	192	660	500
Total Alkalinity (mg/L)	280	308	240	300	392	1170	50-300
Nitrite (mg/L)	0.1	0	0.25	0	0.1	1.2	≤0.03
Salinity (%)	0.5	0.7	0.5	0.6	0.4	0	0.05-0.5
TSS (mg/L)	283	384	266	382	1354	750	≤25

EPA = Environmental Protection Agency
P(I) = Planting period (Dec. to Feb.),
P(II) = Harvesting period (March to May)

Discussion

In the present study, a total of 40 fish species belonging to 30 genera, 17 families and eight orders were recorded from Pauk Inn and 33 fish species, 26 genera, 16 families and eight orders were recorded from Padonmilay Inn. Among the eight orders of fish species, the order Cyrpiniformes represented as the highest species composition of both study sites (42.5 %, 17 species) from Pauk Inn and (42.42%, 14 species) from Padonmilay Inn. According to the result, it was concluded that the fish species in the order Cypriniformes was a dominant. The result from the present study was agreed with Kay Zin Thet (2016), and Nwe Nwe Aye (2018), they also recorded from Pauk Inn, Chaung U Township. Their results stated that the order Cypriniformes was the largest species composition. It may be concluded that the tropical weather condition is preferred to order Cypriniformes and this order contains more fish species than the other orders.

Kay Zin Thet (2016) reported that a total of 44 species from Pauk Inn, Chaung U Township. Compare with the present study, 32 fish species were similar and 12 species such as *Gudusia variegata, Tenulosa tilo, Salmophasia sardinella, Aspidoparia mora, Osteobrama feae, Puntius chola, Botia histrionica, Lepidocephalus thermalis, Mystus bleckeri, Hemibagrus menoda, Eutropiichthys vacha* and *E. burmanicus* were not found in the present study. It may be assumed that weather condition was drought in this year and the entrance of water from the river was very low. So, these fish species may not be entered in the study area from river or it may possible that there may be gradual scarcely presence of natural fishes in this Inn.

Compared with the two study sites, the recorded 33 fish species from Padonmilay Inn were also recorded from the Pauk Inn. However, seven fish species such as *Hypophthalmichthys molitrix, Osteobrama cunma, Labeo stoliczkae, Sperata aor, Ompok bimaculatus, Johnius coitor* and *Colisa labiosus* were found only in Pauk Inn. Except *H. molitrix,* the rest six species were natural fish. This may be assumed that these natural fishes entered from Chindwin River to the adjacent site of the Pauk Inn.

Lasne *et al*., 2007 stated that environmental variables could be mainly determined by the slope, temperature and depth of the water body. This statement agreed with the present finding. During the course of study, the highest water temperature of both study sites were 35 HC and the

lowest was 24 HC. According to the EPA (2001), the standard limit of water temperature is 25 HC. The water temperature from both study sites during the planting period were fall within the limit and those for harvesting period were higher than the standard limit. The catching fish weight was gradually higher than in the months of October to January. This may be due to the presence of favorably large water body and suitable water temperature for fishes. The fish catching weight of both study sites were gradually decline and the lowest fish caught weight was recorded in the month of May. Since the water levels from both study sites were very low in May.

The highest TDS content (1170 mg/L) was recorded during the harvesting period and the lowest (392 mg/L) during the planting period from Padonmilay Inn. The TDS content from Pauk Inn was more or less acceptable for fish. The standard limit of TDS in water is 500 mg/L (EPA, 2001). In addition all of the TSS contents from two study sites were much higher than the standard limit of ≤ 25mg/L (EPA, 2001). The contents of TDS and TSS value from Padonmilay Inn were very higher than the standard limit. This may be due to deposit of waste materials such as plastic mulch and other materials from the farmlands of *Melon* spp. and other crops around the study area and this lead to unfavorable water for fish species.

In the present study, DO contents of both study sites were much lower than the desired limit of ≥7 mg/L (EPA, 2001). Moreover, the content of BOD limit from two study sites during the planting and harvesting period were much higher than the standard EPA, 2001 limit of ≤ 5mg/L. The water qualities of two study sites were degraded and it was unsuitable for fisheries and aquatic organisms. This might be due to the concentration of waste pollutants and much of seeded fish to the study area. American Publish Health Association, 1992 stated that BOD indicates a potential for reducing DO content in water and this result could be stress for fish and even death. However, no fish was observed or seen under these conditions in both study sites.

Water is the home of fish and its quality is one of the most overlook aspects of fish culture until its affect fish production. Comparison with EPA, 2001 standard limit for fish, almost all of the recorded pH value and salinity from two study sites were suitable for fish fauna. Except the content of alkalinity during the harvesting period of Padonmilay Inn, the rest content were fall within the standard limit 50-300 mg/L (EPA, 2001). However, some parameters of DO, BOD, TDS and nitrites were unsuitable range for fish fauna.

In the present study, the high concentration of nitrites (0.25 mg/L) from northern part of the Pauk Inn and (0.1 mg/L) was recorded from the southern part of Pauk Inn and Padonmilay Inn during the planting period. There is no nitrite content was observed in two study sites during the harvesting period of cultivated plants. The standard EPA limits was (≤0.03 mg/L) and the values of nitrite content in harvesting period were lower than the standard limit. This may be due to the utilization of fertilizer from the farmland, the materials that contain organic matters and other excreta around the study area. These two extreme results revealed that the water parameters of two study sites were not impoverished with nitrite containing substances as well as not satisfactory level for fish production.

Hussian, 2018 stated that wetlands and waterbirds are inseparable elements and waterbirds are an important of most of the wetland ecosystem in the food web of wetland nutrient cycle. Htay Khaing *et al*., 2018 stated that 35 waterbird species from Pauk Inn. Thus, Pauk Inn supported breeding, feeding and spawning ground for most waterbird species. Crossing in water of grazing animals and pasture for domesticated animals can also affected water quality both positively and negatively. Thus, these factors may cause major surface water quality problem for fish associated with pathogens by other animals.

Noga (2000) stated that skin ulcer on fish are one of the most well recognized indicators of polluted or otherwise stress aquatic environments. Some fishes from the study area such as *Chana*

striata, *Puntius* spp., *Glosogobius giuris* and *Osteobrama belangeri* suffered skin infection on the fish body. It is observed that the Pauk Inn is encroached by environmental impacts such as agricultural land, overfishing, construction of house around the study area, pastures of domesticated animals, deposit of waste materials and visiting wild animals. Encroachment of wetland will also be harmful in near future. If the encroachment will be continue there will be disappeared of wetland. It will create imbalance in the nature.

Conclusion

From the overall discussion, it can be concluded that water parameters of both study sites were poor for aquatic environment as well as for fish production. There were several human made impacts exist that may affect the water quality in future. For these reasons the study recommended to converse the water quality of both study sites and their environment by regular monitoring of water quality with standard limit, keep record about fish species and their status, building awareness among the local people to conserve the study areas with local participation.

Acknowledgements

We would like to thank Dr Khin Soe Win, Professor and Head, Department of Zoology, Monywa University for her encouragement and providing facilities in the Department. We would like to thank Dr Thet Thet Lwin, Professor, Department of Zoology, Monywa University for her valuable suggestions. We are also thanks to the staffs from laboratory of water supply and sanitation department, Mandalay city development council for their technique assistance. We wish thank to all local fishermen from study sites for their helps and supports throughout the field work.

References

Abraham, S., (2015). The relevance of wetland conservation in Kerala. *International Journal of fauna and biological studies*; 2(3): 01-05Curr

Basavaraja, D., Narayana, J., Kiran, B. R. and Puttaiah, E.T., (2014). Fish diversity and abundance in relation to water quality of Anjanapura reservoir, Karnataka, India. *Int.J.Curr. Microbial, App.Sci:* 3(3): 747-757

EPA, (2001). *Parameters of Water Quality: Interpretation and Standards*. Environmental Protection Agency. Published by EPA Ireland. pp 1-132.

FishBase, (2013). List of freshwater for Myanmar. Available from http://fishbase.org.(Assessed 27 August 2014).

Htay Khaing, Myint Kyaw and Thin Thin Khaing, (2018). Species diversity and threat of waterbirds at Pauk wetland, Chaung U Township, Sagaing Region. *Monywa University Research Journal*; Vol:9(1).

Hussien, M.E.E., (2018). Seasonal abundance and diversity of waterbirds in some wetlands of Sinnar State, Sudan. *Poult fish wild Science*: 6(2).

Jayaram, K.C., (2013). *The freshwater fishes of the Indian Region*. (Revised second edition). Narendra Publishing House, New Delhi. 616 pp.

Kay Zin Thet, (2016). Species diversity and relative abundance of fish fauna from Pauk *In* (Lake), Chaung U Township, Sagaing Region. *PhD Dissertation*, Department of Zoology, University of Mandalay.

Lagler *et al*., K.F., Barach, J.E., Miller, R.R., (1977). *Ichthyology*. The study of fishes. Toppon printing Co.ltd. Tokyo. 454 pp.

Lasne, E., Bergerot, B., Lek, S. and Laffaille, P., (2007). Fish zonation and indicator species for the evaluation of the ecological status of rivers: example of the Loire basin (France). *River Res Appl.*, 23: 877-890

Malakar, M. and Boruah, S., (2017). Diversity and Present Status of Fish Species in Three Floodplain Wetlands of Central Assam, India. *IOSR Journal of Environmental Science, Toxicology and Food Technology*; 11(1): 54-59.

Nwe Nwe Aye, (2018). Investigation on freshwater fish species in Pauk *In* (floodplain), Chaung U Township, *MRes Thesis*, Department of Zoology, Monywa University.

Noga, E.J., (2000). Skin ulcers in fish: Pfiesteria and other etiologies. *Toxicol pathol*; 28(6): 807- 823

Sabbir, W., Masud, M.A.A., Islam, S.S., Rahman, M.R., Islam, M.R. and Rahi, M.L., (2010). Some aspects of water quality parameters of the Mouri River, Khulna: An attempt to estimate pollution status. *Bangladesh research publication journal*; 4(1): 95-102.

Talwar, P.K., Jhingran A.G., (1991). *Inland Fishes of India and Adjacent Countries.* Vol I, II Oxford and IBH Publishing Co. Pvt. Ltd, New Dahli, 1158 pp. Techinical Paper. No. 343. The World Bank, Washinton D.C.

U Win Aung. Review of national fisheries in Myanmar. Available from http://www.iotc.org.files (Assessed 2 December 2019).