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Occurrence of fish species with relation to some physico-chemical water parameters of Chindwin River, Monywa Township, Sagaing region

Abstract

The present study was carried out to assess the occurrence of fish species with the relation to some physico-chemical water parameters in Chindwin River between Sonekyin and Waegyi segments, Sagaing Region from January 2018 to August 2018. The present study revealed that a total of 45 species representing 17 families under seven orders were observed. The most dominant order was found to be Siluriformes consisting 43% of the total fish population in Sonekyin segment. Puntius sophore was dominated in Waegyi segment while Parambasis ranga dominated in Sonekyin segment. The dissolved oxygen and pH were found as major influential factors for fish species distribution. The endemic species, Mystus leucophasis, M. rufescens and Chaga burmensis were observed. Near-threatened species, Tenualosa ilisha, Osteobrama belangeri, Ompok bimaculatus, Wallago attu and Bagarius bagarius were also recorded in Chindwin River. The decline of river water quality might be due to impacts of human activities.

Keywords: physico-chemical parameters, chindwin river, endemic, near-threatened, human activities

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Introduction

As a part of the river ecosystem, fish not only plays a significant role in maintaining a healthy aquatic environment but also a part of the food chain.[1] Growing human population and industrialization have led to the pollution of most aquatic ecosystems and consequent deterioration in environmental water quality. Fishes have been widely documented as useful indicators of environmental water quality because of their differential sensitivity to pollution.[2] But, many fish species have become highly endangered, particularly in rivers. The impact of anthropogenic activities, habitat degradation, pollution and the use of illegal methods of fishing are the main causes of the decline if aquatic species.[3] It is important to know the occurrence of fish species and distribution in order to develop management and conservation program.[4] The health of water bodies could be assessed by physical and chemical parameters of water and biological monitoring.[5] Important parameters influencing the aquatic environment are pH, temperature, dissolved oxygen, and heavy metal contaminants. These parameters are the limiting factors for the survival of aquatic organisms.[6] Water quality parameters play key role in fish's microhabitat predilection and may be used as index of biological productivity in freshwater ecosystem.[7] Fish have been widely documented as indicators of water quality because of their sensitivity to pollution.[8] Many fish species are endangered due to the degradation of their habitat and river water quality.[1] Moreover, illegal fishing such as electric shock and adding poison have been intensified without considering the size and species of fish. Many rivers and streams were once fresh and pristine, but have now become polluted by sullage, effluents, xenobiotic and silt loads.[9] The Chindwin River is vital for the lives and livelihoods of people in Myanmar. But the river is facing serious environmental problems such as pollution, riverbank erosion and sedimentation. An urgent concern is the impact of upstream mining activities and discharge of untreated chemical and heavy metal wastes into the river and waterways. In Monywa environs, north and south Yama creeks join the Chindwin River at its western side. It is a significant habitat for food sources as a variety of fish species are abundant. But, potential impact on water quality and sedimentation of Chindwin River cause due to gold mining such as river bed dredging, riverbank mining in Uru River. Chindwin River is contaminated with a significantly high level of heavy metals such as iron, copper and arsenic has increased in the Chindwin river due to waste disposal from gold mining operations.[10] Moreover, Lepadaung copper mine is a large surface mine near Chindwin River in Monywa. Therefore, this research is to determine the status of occurrence of fish species in Chindwin River between Sonkyin and Waegyi segments with some physico-chemical water parameters.

Materials and methods

Study area. The present study area was allocated along the Chindwin River between two segments near Sonekyin village and Waegyi village (Figure 1).

Study period

The present study was conducted from January 2018 to September 2018.

Study methods

Some physico-chemical parameters of water of the study area were also recorded by using a thermometer for temperature, a pH meter for pH of water and a test kits (LaMotte model 5860) for dissolved oxygen. The samples of fish species were collected twice per month from the local fishermen using trammel, drift net, set gill net, beach seine net at study area. The morphology and measurements of specimens were carried out in fresh forms. Then, collected fishes were preserved in 10% formalin for future study. The photographic records were also carried out on the fresh specimens.

Identification of specimen

The specimens were identified.[11–13] Local names of fishes were recorded according to local fishermen. Valid names and IUCN Redlist status were checked by Fishbase (2018).

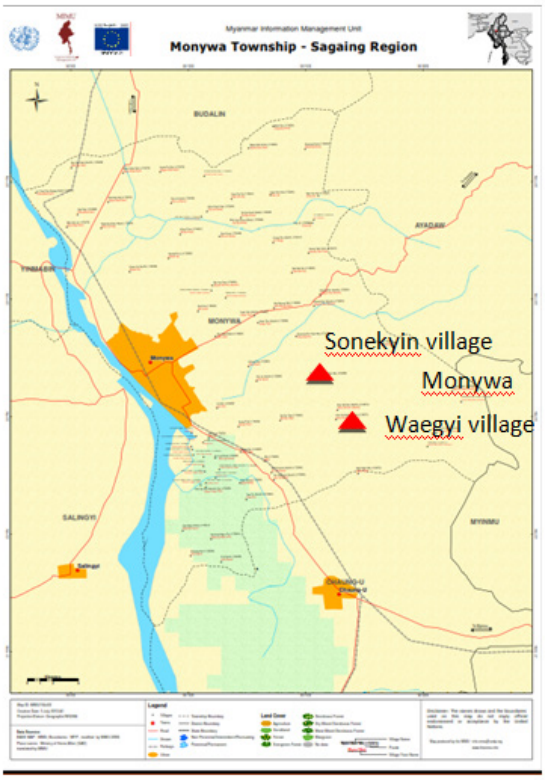

Figure 1 Location map of the study area (Source: MIMU, 2012).

Results and discussion

A total of 2392 individuals, representing 45 species from 17 families were collected in Sonekyin and Waegyi segments of Chindwin River. The highest number of fishes were observed at Waegyi segment (1270 individuals) followed by Sonekyin segment (1122 individuals). Moreover, Waegyi segment has the highest number of species with 39 species whereas the lowest number of species was recorded at Sonekyin segment with 37 species in Chindwin River (Table 1 & Table 2). Order Siluriformes represented the highest species composition (43%) in Sonekyin segment but the species composition of Siluriformes (37%) in Waegyi segment was observed. During the present study, silurid species in Sonekyin segment were recorded in more abundance than that in Waegyi segment. Parambasis ranga was highest number of individuals (135 individuals) in Sonekyin segment. Ishikawa et al.,[14] reported that rising water temperature is likely more important for active spawning of P. ranga. Puntius sophore was recorded highest number of individuals (163 individuals) in Waegyi segment. Das et al.,[15] stated that P. sophore is a surface dweller and feeds on small insects, algae and planktons. Bashar[16] reported that it is larvivorous and herbivorous species. This species might be more adapted for food sources and environmental conditions. Some physico-chemical parameters water temperature, pH, and DO were taken from two segments in Chindwin River (Table 3). The mean temperature values of Sonekyin segment was (27ºC) that is higher than Waegyi segment (25ºC) in Chindwin River (Figure 2 & Figure 3).

The mean temperature values of Sonekyin segment was (27ºC) that is higher than that of Waegyi segment (25ºC). In the present study, the temperature of two segments in Chindwin River falls within the normal range as prescribed by WHO for fishes. Hauer et al.,[17] revealed that the limit temperature for aquatic life is 32.5ºC. Campbell et al.,[18] pointed out that a pH range of 6.5 to 8.2 is optimal for most organisms. The pH of Sonekyin segment (7.1) was lower than that of Waegyi segment (7.8). The dissolved oxygen (DO) concentration range from 5.5 to 6.8 mg/l. Bhatnager et al.,[19] mentioned that DO level greater than 5mg/l is essential to support fish production. The pH values were also fell within WHO standard limit. EPA[20] recommended that DO percentage of freshwater (equal and above 7mg/l) is suitable range. Bhatnager et al.,[19] also mentioned that dissolved oxygen level greater than 5mg/l is essential to support good fish production. In the present study, percentage of DO concentration in Sonekyin segment (5.9mg/l) was lower than that in Waegyi segment (6.8mg/l). Onuoha et al.,[21] pointed out that low level of DO concentration was due to human activity such as organic fertilizers are used in farmlands that are around the river and they wash off into the river and biodegrade. Farmers in Sonekyin village cultivated watermelon plants between December to May. Hence, DO range in Sonekyin segment is near the lower limit of WHO standard (Figure 4).

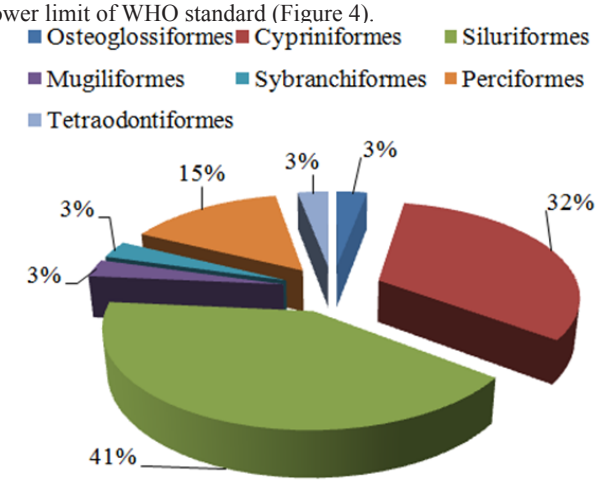

Figure 2 Relative percentage of species composition in different orders in Sonekyin segment in Chindwin river.

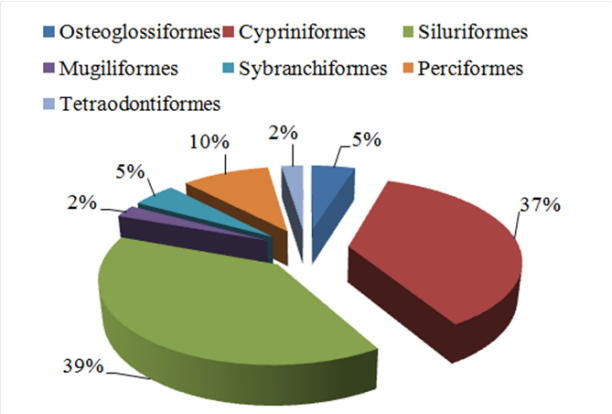

Figure 3 Relative percentage of species composition in different orders in Waegyi segment in Chindwin river.

Figure 4 shows the relationship of water physico-chemical parameters (water temperature, dissolved oxygen (DO) and pH) with number of fish collected in Sonekyin and Waegyi segments in Chindwin river. High number of fish species was collected at high concentration of DO. The low DO concentration in Sonekyin segment might be due to high organic enrichment contributed by human activity (Figure 5).

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Table 1 Fish specimens collected from SG and WG segments in Chindwin river and their IUCN status

Scientific name	Location		IUCN status
	(SK)	(WG)	
Notopterus notopterus	+	+	LC
Tenualosa ilisha	-	+	NT
Gudusia variegata	-	+	LC
Cabdio morar	+	-	LC
Raiamas guttatus	+	+	LC
Osteobrama belangeri	+	+	NT
Osteobrama cotio	+	+	LC
Osteobrama feae	-	+	LC
Puntius sarana	+	+	LC
Puntius sophore	+	+	LC
Cirrhinus mrigala	+	+	LC
Gibelion catla	+	+	LC
Labeo boga	+	+	LC
Labeo calbasu	+	+	LC
Labeo microphthalmus	+	-	LC
Barbonymus gonionotus	-	+	LC
Botia histriónica	+	+	LC
Lepidocephalus berdmorei	+	-	LC
Acantopsis dialuzona	+	+	LC
Rita rita	+	+	LC
Sperata aor	+	+	LC
Mystus cavasius	+	+	LC

Table 2 Fish specimens collected from SG and WG segments in Chindwin river and their IUCN status

Scientific name	Location		IUCN status
	(SK)	(WG)	
Mystus leucophasis	+	+	LC/ Endemic
Mystus pulcher	+	+	LC
Mystus rufescens	-	+	LC/ Endemic
Ompok pabo	+	+	LC
Ompok bimaculatus	+	+	NT
Wallago attu	+	+	NT
Clupisoma garua	+	+	LC
Eutropiichthys vacha	+	+	LC
Pangasius pangasius	+	+	LC
Gagata gagata	-	+	LC
Gagata cenia	+	-	LC
Bagarius bagarius	+	+	NT
Arius acutirostris	-	+	LC
Chaca burmensis	+	+	LC/ Endemic
Rhinomugil corsula	+	+	LC
Mastacembelus armatus	+	+	LC
Mastacembelus unicolor	-	+	LC
Parambasis ranga	+	+	LC
Johnius coitor	+	+	LC
Oreochromis sp.	+	-	LC
Channa striata	+	-	LC
Glossogobius giuris	+	+	LC
Leiodon cutcutia	+	+	LC
Total no. of species	37	39	
Total no. of individual	1122	1270	

SK, sonekyin segment; WG, waegyi segment; + = present, - = absent; LC, least concern; NT, near-threatened

Table 3 Some mean physico-chemical parameters in Sonekyin and Waegyi segments

Segments in Chindwin river	Temperature (°C) (mean)	pH (mean)	Dissolved oxygen (DO) mg/l (mean)
Sonekyin	27	7.1	5.5
Waegyi	25	7.8	6.8
WHO standard limit	25–32	6.5–8.5	5-8

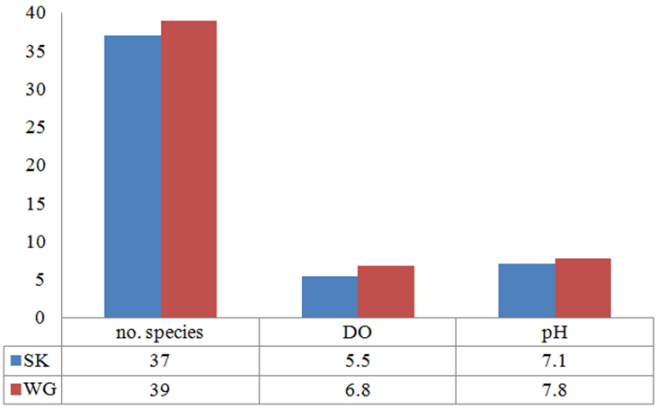

Figure 4 Relationship between water parameters with fish abundance in Sonekyin (SK) and Waegyi (WG) segments in Chindwin river.

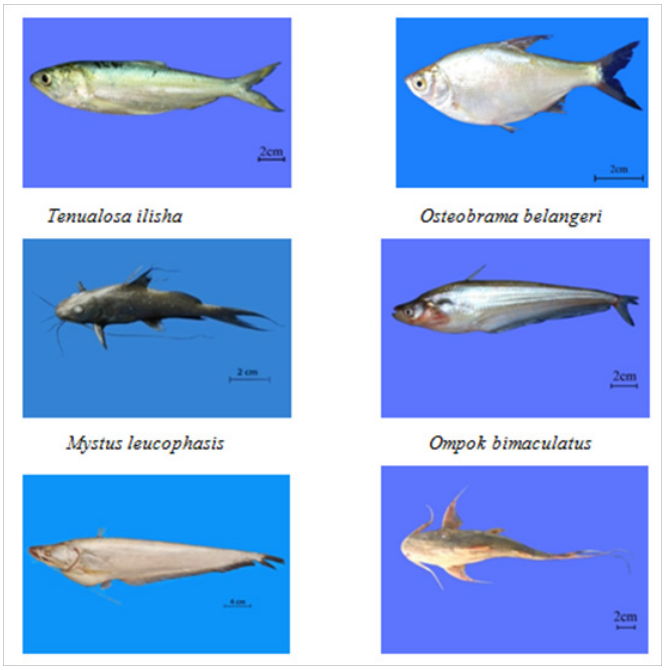

Figure 5 Plate 1 near-threatened fish species and endemic species from two segments in Chindwin river, Monywa township.

According the IUCN Redlist, five species were in the category of Near-threatened species; Tenuolosa ilisha, Osteobrama belangeri, Ompok bimaculatus, Wallago attu and Bagarius bagarius in Waegyi segment and Sonekyin segment. Three endemic species namely Mystus leucophasis, M rufescens and Chaca burmensis were observed in two segments, Chindwin River whereas two introduced species; Barbonymus gonionotus in Waegyi segment, Oreochromis sp. in Sonekyin segment were recorded. Kottelat et al.,[22] considered that environmental degradation brings about, and enumerated

pollution, increased sedimentation, flow alteration, water diversion and introduced species as the main causes for decreased fish faunal diversity in Asian countries. Wezel et al.,[23] observed that the dreadful conditions of natural habitats, excess exploitation using prohibited fishing gears, use of toxins are liable for loss of fish diversity. During the present study, electric shock and the production of river gravel and sand were also observed in Sonekyin segment. These findings might be loss of breeding and spawning habitats of aquatic organisms. Hauer et al.,[17] concluded that the ranges of water quality parameters were between favourable ranges for inhabiting the threatened fish species of which water temperature and dissolved oxygen was found as major influential factors for threatened species. Khin Ohnmar Htwe et al.,[24] stated that water quality of Chindwin River has declined due to mining and deforestation, river bank erosion and unpredictability in water availability due to climate change. The fluctuation of fish specimens during the study period were related to the various physico-chemical parameters of water and also affected on anthropogenic activities.[25]

Conclusion

This study has shown that the relationship between physico-chemical parameters and number of species and individuals in Sonekyin and Waegyi segment of Chindwin River. High species and individual of specimens were observed at Waegyi segment with good water quality. The loss of breeding and spawning habitats of aquatic organisms might be caused by using illegal methods. River water quality might be influence by human activities. Hence, it is suggested more enforcements are needed in order to maintain the sustainability of fishes that thrive in the Chindwin River and also to maintain the environment friendly to the inhabitants.

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Conflicts of interest

The author declares there is no conflicts of interest.

References

1. Chow VKK, Said MIM, Mohamed M, et al. Species composition and abundance of freshwater fishes in selected rives of Johor, Malaysia. *Journal of Research in Chemical, Metallurgical and Civil Engg.* 2016;3(2):214–218.
2. Naigaga I, Kaiser H, Muller WJ, et al. Fish as bioindicators in aquatic environmental pollution assessment in Lake Victoria Wetlands, Uganda. *Physics and Chemistry of the Earth.* 2011;36(14–15):918–928.
3. Basavaraja D, Narayana J, Kiran BR, et al. Fish diversity and abundance in relation to water quality of anjanapura reservoir, Karnataka, India. *India Int J Curr Microbiol app Sci.* 2014;3(3):747–757.
4. Golestan Hashemi FS, Rafii MY, Ismail MR, et al. The genetic and molecular origin of natural variation for the fragrance trait in an elite Malaysian aromatic rice through quantitative trait loci mapping using SSR and gene-based markers. *Gene*. 2015;555(2):101–107.
5. Sweidon AH, Bendary El N, Hegazy OM, et al. Water pollution detection system based on fish gills as a biomarker. *Procedia Computer Science*. 2015;65:601–611.
6. Lawson EO. Physico-chemical parameters and heavy metal contents of water from the mangrove swamps of lagos lagoon, Nigeria. *Advances in Biological Research.* 2011;5(1):8–21.
7. Gogoi B, Kachari A, Das DN. Assessment of water quality in relation to fishery perspective in flood plain wetlands of Subansiri River Basin Assam, India. *Journal of Fisheries and Aquatic Science.* 2015;10(3):171–180.
8. Das SK, Chakrabarty D. The use of fish community structure as a measure of ecological degradation: a case study in two tropical rivers of India. *Biosystems.* 2007;90(1):188–196.
9. Moyle PB, Crain PK, Whitener K, et al. Alein fishes in natural streams: fish distribution, assemblage structure, and conservation in the Consumnes River, California USA. *Environmental Biology of fishes.* 2003;68(2):143–162.
10. Kay Thwe Hlaing. *Integration of environmental changes in the Chindwin river basin using remote sensing*. 2016.
11. Day F. *The fishes of Indian being a natural history of the fishes known to inhabit the sea and freshwater of Indian, Burma and Ceylon*. 1878.
12. Talwar PK, AG Jhingran. *Inland fishes of India and adjacent countries*. Oxford and TBH publishing Comoany. 1991.
13. Jayaram KC. *The freshwater fishes of India, Pakistan, Bangladesh, Myanmar and Sri lanka*, Zoological survey of India Calcutta. 2013.
14. Ishikawa T, Tachihara K. Reproductive biology, growth and age composition of non-native Indian glassy fish *Parambassis ranga* (Hamilton, 1822) in Haebaru Reservoir, Okinawa-jima Island Southern Japan. *J Appl Ichthyol.* 2012;28(2):231–237.
15. Das S, Nandi S, Majumder S, et al. New characterization of feeding habits of *Puntius sophore* (Hamilton, 1822) through morphometry. *Journal of Fisheries Sciences.* 2013;7(3):225–231.
16. Bashar MA. Spotfin swamp barb: Puntius sophore. Bangaladesh fisheries information share home. 2011.
17. Hauer FR, Hill WR. Temperature, light, and oxygen. In Hauer FR, Lamberti GA, Editors. Methods in stream ecology. Academic Press; San Diego. 1996.
18. Campbell G, Wildberger S. *The monitors handbook*. Chestertown, Maryland. 1992.
19. Bhatnagar A, Singh G. Culture fisheries in village ponds: A multilocation study in Haryana, India. *Agriculture and Biology Journal of North America*. 2010;1(5):961–968.
20. EPA. *Parameters of water quality, interpretation and standards*. Johnstown Castle Co. Wexford, Ireland. 2001.
21. Onuoha GUC, Ukagwu JI. Acute toxicity of gramoxone (Paraquat dichloride) to the freshwater catfish *Clarias gariepinus* (Burch) Post fingerlings. *Nigerian Journal of Fisheries.* 2007;4(2):105–113.
22. Kottelat M, Whitten T. Freshwater biodiversity in Asia with special reference to fish. *World Bank Technical Paper*. 1996.
23. Wezel A, Oertli B, Rosset V, et al. Biodiversity patterns of nutrient-rich fish ponds and implications for conservation, *Limnology.* 2014;15(3):213–223.
24. Khin Ohnmar Htwe, Piman T. Water quality monitoring in the Chindwin river basin; capacity building, state and challenge. 2017.
25. Jin Y, Liu S, Yuan Z, et al. Catfish genomic studies: progress and perspective. *Genomics in Aquaculture*. 2016;73–104.