

Seasonal Occurrence of Freshwater Fish Species in Hlawga Wildlife Park, Yangon Region

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Abstract

Hlawga Wildlife Park in the Mingaladon Township was chosen as the study area to conduct this work during the study period from June 2011 to May 2012. A total of 43 freshwater fish species, 26 genera, 17 families belonging to seven orders were recorded in the study area. Monthly collected fish samples from 10 dams in the Hlawga Park and collected fish samples from each dam in the Hlawga Park have been identified systematically and supported by scaled photographs. The number of fish samples in each selected study site associated with the environmental condition seasonally was recorded. Introduced exotic and natural fish species were also recorded in the collected samples. The distribution of recorded fish species are comparatively discussed in the study area.

Key words: Hlawga Wildlife Park, Freshwater fish, environmental condition

Introduction

Myanmar is enriched with many rivers, natural lakes and streams, serving as natural habitats for the freshwater fish species. Fish are valuable sources of high-grade protein and other organic products. They occupy a significant position in the socio-economic fabric of Myanmar by providing the population with not only nutritious food but also income and employment opportunities. The size and variety of local habitat types affect the diversity of fish. In addition to natural controls on the range and composition of fish communities, it is important to recognize that human activities, including deforestation, construction of dams, introduction of non-native species and pollution influenced the distribution of fish in many regions of the world throughout the course of recent history (FAO, 1973).

Physical and chemical characteristics of the environment regulate the composition and diversity of fish species that inhabit freshwater habitat. Light penetration and water temperature determine physical conditions that fish encounter. Local species assemblages and species distribution on their habitat largely reflect the preference of fish for different physical and chemical conditions (Thoney, et al., 2004).

Inadequate monitoring of sport and commercial fishing are threats to the aquatic biodiversity. This sequence of events can also negatively affect in aquatic resources. Despite these threats and the ecological importance of region, conservation efforts and biological investigation in the region of environmental threats are baseline exploratory research (Wager and Jackson, 2004).

Hlawga Park is a close distance from Yangon Proper in a densely crowded area and requires intensive management of animals kept under relatively closely confined conditions. Small lakes are common and may be permanent or ephemeral, depending on local precipitation. The largest lake (Kan-tha-ya) in Hlawga Park surrounded by four picnic sites with a surface area around 33 acres is located near the western boundary of the park. During the monsoon period, water from kan-tha-ya Lake in turning drains south and eastwards into Hlawga Lake via small canal. The contiguous vegetation in Hlawga Park is composed of trees and shrubs (Wikipedia Foundation, 2012).

Hlawga Parks chosen as the study site consists of many microhabitats for the fish species. Therefore, the present work was conducted with the following objectives;

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- to record the seasonal occurrence of fish species in the designated study sites, and
- to determine the species composition and distribution related to the environmental conditions in the study area.

The findings of this work after meeting the above objectives mentioned above were discussed approaching the conservation aspect.

Materials and Methods

Study area and study period

The studied fish samples were collected from 10 dams in Hlawga Wildlife Park. It is located 35 km (22 miles) from Yangon Proper. The park area covers 6.24 square kilometers. It was established in 1982 and opened to public in 1989 (Plate I and Figure 1). The study period lasted from June, 2011 to May, 2012.

Experimental design

Fish samples were collected in each dams in the Hlawga Wildlife Park which association with the environmental conditions (Plate II). The abundance of fish species in relation to the varying seasons was analysed based on monthly collected fish samples.

Collection of fish samples

Fish samples were caught randomly at each designated studied site by utilizing fishing gears; cast net and conical set net. In shallow waters, the fish samples were mainly caught by hand. Fishing rods with hooks were also used to capture the fish.

Identification of the fish species

External morphology of the collected fish was recorded soon after the catch supported by scaled photographs. Five specimens for each species were examined for identification which is followed after Talwar and Jhingran (1991). The specimens were then preserved in five to ten percent depending on the size of the specimens. One or two drops of glycerine were added to the formalin to keep the specimen soft. All preserved specimens were kept in labeled plastic bottles for later detailed study.

Data recording

Monthly temperature and humidity of the surrounding area in each dam were recorded with a thermohydrometer. Water temperature was recorded every month with the standardized laboratory thermometer. The data of monthly rainfall during the study period was obtained from the Mingaladon Station at the Department of Meteorology and Hydrology.

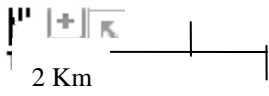
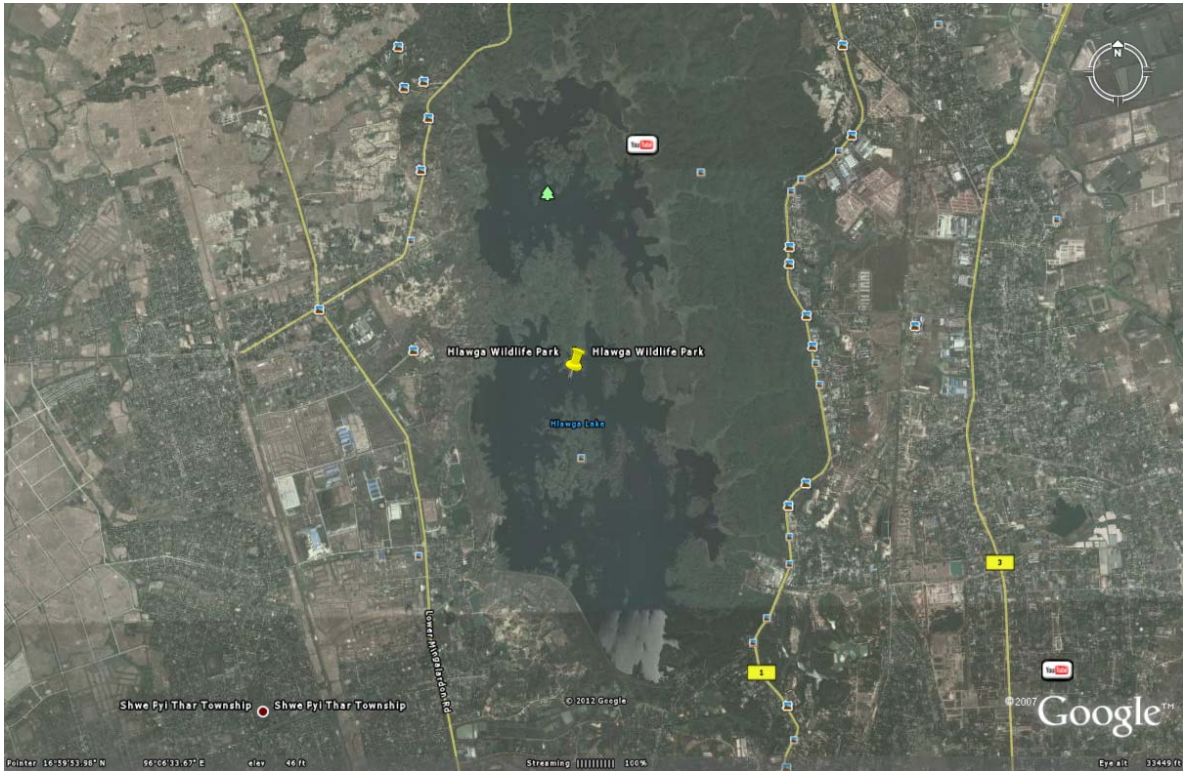
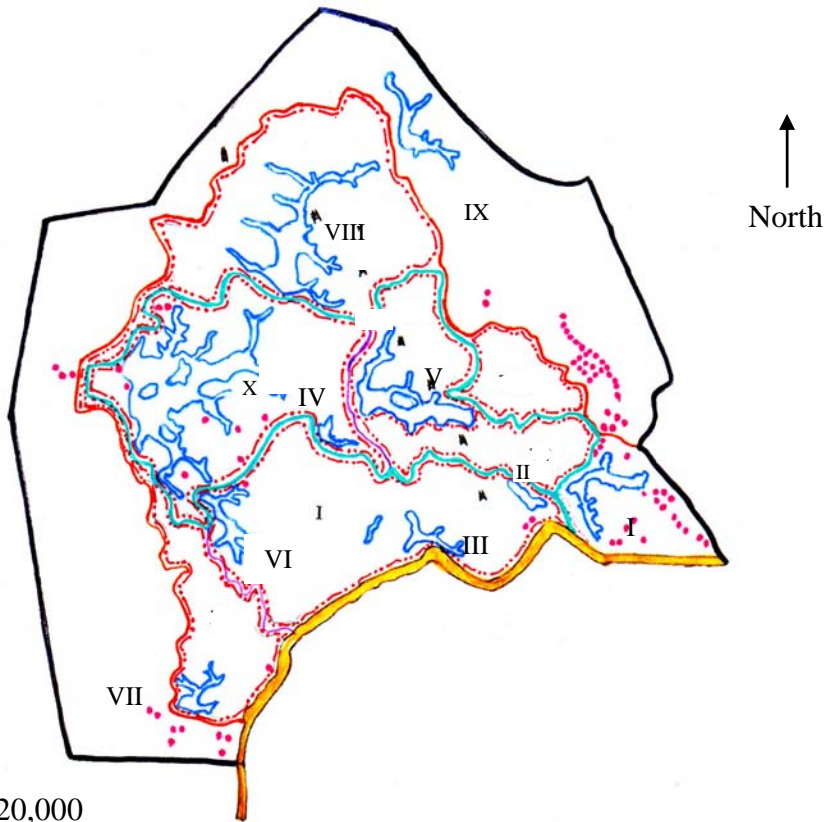


Plate I Map of study area (Source: Google Earth)



Scale - 1: 20,000

Figure (1) Map of Hlawga Wildlife Park (Source: Department of Forestry)



A. Entrance of Hlawga Wildlife Park



B. Dam I



C. Dam II



D. Dam III



E. Dam IV



F. Dam V



G. Dam VI



H. Dam VII



I. Dam VIII



J. Dam IX



K. Dam X

Plate (II) Dams in the Hlawga Wildlife Park

Results

Systematic position of the studied species of fish (According to Talwar & Jhingran, 1991)

Phylum	-	Chordata
Class	-	Osteichthyes
Order	-	Osteoglossiformes
Family	-	Notopteridae
Genus	-	<i>Notopterus</i> Lacepede, 1800
Species	-	<i>N. chitala</i> (Hamilton & Buchanan, 1822)
Species	-	<i>N. notopterus</i> (Pallas, 1769)
Order	-	Clupeiformes
Family	-	Pristigasteridae
Genus	-	<i>Ilisha</i> Richardson, 1846
Species	-	<i>I. filigera</i> (Valenciennes, 1847)
Order	-	Cypriniformes
Family	-	Cyprinidae
Genus	-	<i>Labeo</i> Cuvier, 1817
Species	-	<i>L. calbasu</i> (Hamilton & Buchanan, 1822)
Genus	-	<i>Osteobrama</i> Heckel, 1842
Species	-	<i>O. vigorsii</i> (Sykes, 1841)
Genus	-	<i>Puntius</i> Hamilton & Buchanan, 1822
Species	-	<i>P. amphibius</i> (Valenciennes, 1842)
Species	-	<i>P. bimaculatus</i> (Bleeker, 1844)
Species	-	<i>P. chola</i> (Hamilton & Buchanan, 1822)
Species	-	<i>P. denisonii</i> (Day, 1865)
Species	-	<i>P. dorsalis</i> (Jerdon, 1849)
Species	-	<i>P. guganio</i> (Hamilton & Buchanan, 1822)
Species	-	<i>P. sophore</i> (Hamilton & Buchanan, 1822)
Species	-	<i>P. ticto</i> (Hamilton & Buchanan, 1822)
Species	-	<i>P. titteya</i> (Deraniyagala, 1929)
Species	-	<i>P. vittatus</i> (Day, 1865)
Genus	-	<i>Chela</i> Hamilton & Buchanan, 1822
Species	-	<i>C. fasciata</i> Silas, 1958
Genus	-	<i>Amblypharyngodon</i> Bleeker, 1860
Species	-	<i>A. microlepis</i> (Bleeker, 1839)
Genus	-	<i>Branchydanio</i> Weber & de Beaufort, 1916
Species	-	<i>B. choprai</i> (Hora, 1928)
Species	-	<i>B. sondhii</i> (Hora & Mukerji, 1934)
Genus	-	<i>Rasbora</i> Bleeker, 1860
Species	-	<i>R. rasbora</i> (Hamilton & Buchanan, 1822)
Family	-	Cobitidae
Genus	-	<i>Lepidocephalus</i> Bleeker, 1859
Species	-	<i>L. annadalei</i> (Chaudhuri, 1912)
Order	-	Silluriformes
Family	-	Bagridae
Genus	-	<i>Mystus</i> Scopoli, 1777
Species	-	<i>M. montanus</i> (Jerdon, 1849)
Family	-	Siluridae
Genus	-	<i>Ompok</i> Lacepede, 1803
Species	-	<i>O. malabaricus</i> (Valenciennes, 1839)
Species	-	<i>O. macrophythalmus</i> (Day, 1878)

Species	-	<i>O. pabo</i> (Hamilton & Buchanan, 1822)
Family	-	Schilberidae
Genus	-	<i>Pseudeutropius</i> Bleeker, 1862
Species	-	<i>P. atherroides</i> (Bloch, 1794)
Family	-	Claridae
Genus	-	<i>Clarias</i> Scopoli, 1777
Species	-	<i>C. batrachus</i> (Linnaeus, 1758)
Family	-	Heteropneustidae
Genus	-	<i>Heteropneustes</i> Muller, 1840
Species	-	<i>H. fossilis</i> (Bloch, 1794)
Order	-	Cyprinodontiformes
Family	-	Belonidae
Genus	-	<i>Strongylura</i> Van Hasselt, 1823
Species	-	<i>S. strongylura</i> (Van Hasselt, 1823)
Order	-	Symbranchiformes
Family	-	Symbranchidae
Genus	-	<i>Monopterus</i> Lacepede, 1800
Species	-	<i>M. indicus</i> (Silas & Dawson, 1961)
Order	-	Perciformes
Family	-	Ambassidae
Genus	-	<i>Chanda</i> Hamilton & Buchanan, 1822
Species	-	<i>C.nama</i> (Hamilton & Buchanan, 1822)
Genus	-	Ambassis Cuvier, 1828
Species	-	<i>A. ranga</i> (Hamilton & Buchanan, 1822)
Genus	-	<i>Pseudambassis</i> Bleeker, 1874
Species	-	<i>P. notatus</i> (Blyth, 1861)
Family	-	Nandidae
Genus	-	<i>Badis</i> Bleeker, 1853
Species	-	<i>B. badis</i> (Hamilton & Buchanan, 1822)
Family	-	Anabantidae
Genus	-	<i>Anabas</i> Cuvier and Cloquet, 1816
Species	-	<i>A. testudineus</i> (Bloch, 1795)
Family	-	Belontiidae
Genus	-	<i>Colisa</i> Cuvier, 1831
Species	-	<i>C. fasciatus</i> (Schneider, 1801)
Family	-	Channidae
Genus	-	<i>Channa</i> Scopoli, 1777
Species	-	<i>C. gachua</i> (Hamilton, 1822)
Species	-	<i>C. melasoma</i> (Bleeker, 1851)
Species	-	<i>C. orientalis</i> (Bloch, 1793)
Species	-	<i>C. panaw</i> Musikasinthorn, 1998
Species	-	<i>C. striatus</i> (Bloch, 1793)
Family	-	<i>Mastacembelidae</i>
Genus	-	<i>Macrognathus</i> Lacepede, 1800
Species	-	<i>M. zebrinus</i> (Blyth, 1895)
Genus	-	<i>Mastacembelus</i> Scopoli, 1777
Species	-	<i>M. armatus</i> (Lacepeda, 1800)

Recorded species composition of fish

In present study, fish species belong to seven orders; Osteoglossiformes, Clupeiformes, Cypriniformes, Siluriformes, Cyprinodontiformes, Synbranchiformes and Perciformes. A total of 43 species of 26 genera from 17 families were recorded (Table-1). The percentage of studied fish species of each order was presented by pie graph (Figure-2).

Table (1) Species composition of fishes in the study area

No.	Order	Family	Genus	Species
1.	Osteoglossiformes	1	1	2
2.	Clupeiformes	1	1	1
3.	Cypriniformes	2	8	24
4.	Siluriformes	5	5	7
5.	Cyprinodontiformes	1	1	1
6.	Synbranchiformes	1	1	1
7.	Perciformes	6	9	13
Total		17	26	43

■ Osteoglossiformes ■ Clupeiformes ■ Cypriniformes
■ Siluriformes ■ Cyprinodontiformes ■ Synbranchiformes

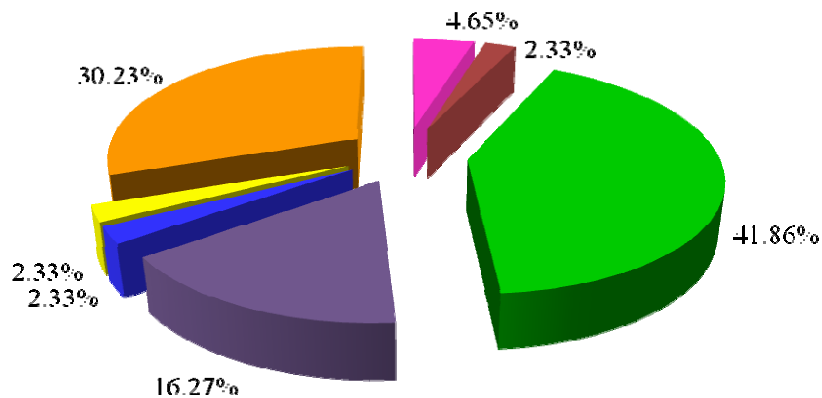


Figure (2) Percentage of fish species composition by orders during the study period

Distribution of fish species in study area

Ten dams were surveyed in the study area. In the rainy season, the compositions of fish species were observed to be the largest in Dam 10, the smallest species in Dam 1. In the hot and cold seasons, the largest fish species were studied in Dam 9 and Dam 10 while the smallest species in Dam 1 (Figure-3).

Out of 43 species, three species; *Chela fasciata*, *Branchydanio sondhi* and *Channa panaw* were collected at all dams in the Park while only one species *Anabas testudineus* was collected only from Dam X in the Park during the study period (Table 2).

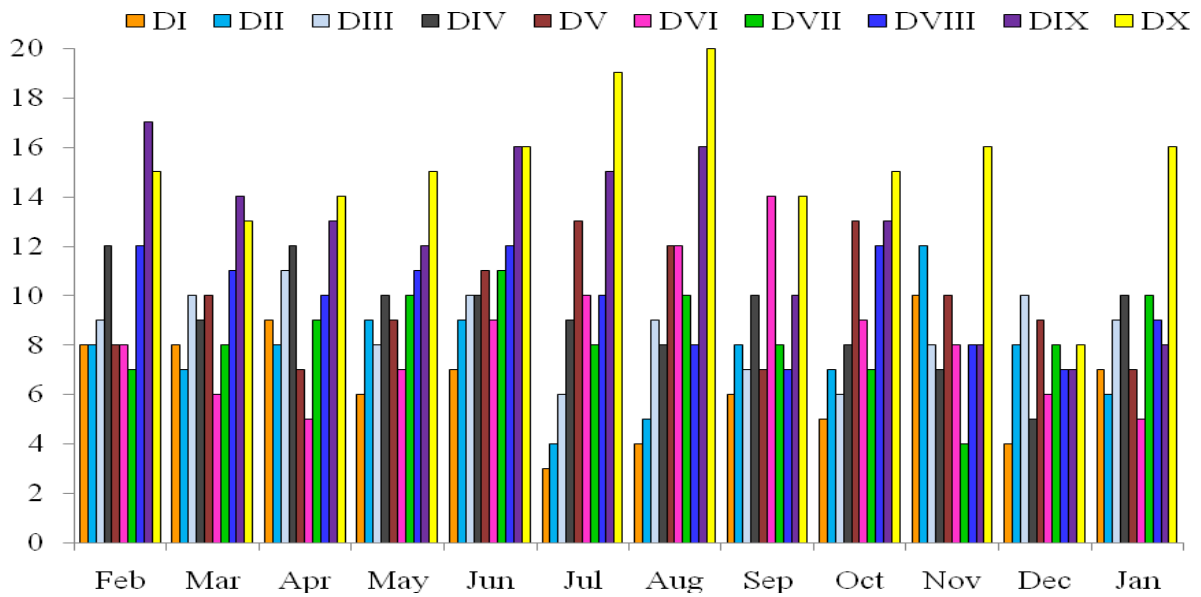


Figure (3) Distribution of fish species in each dams from the study area

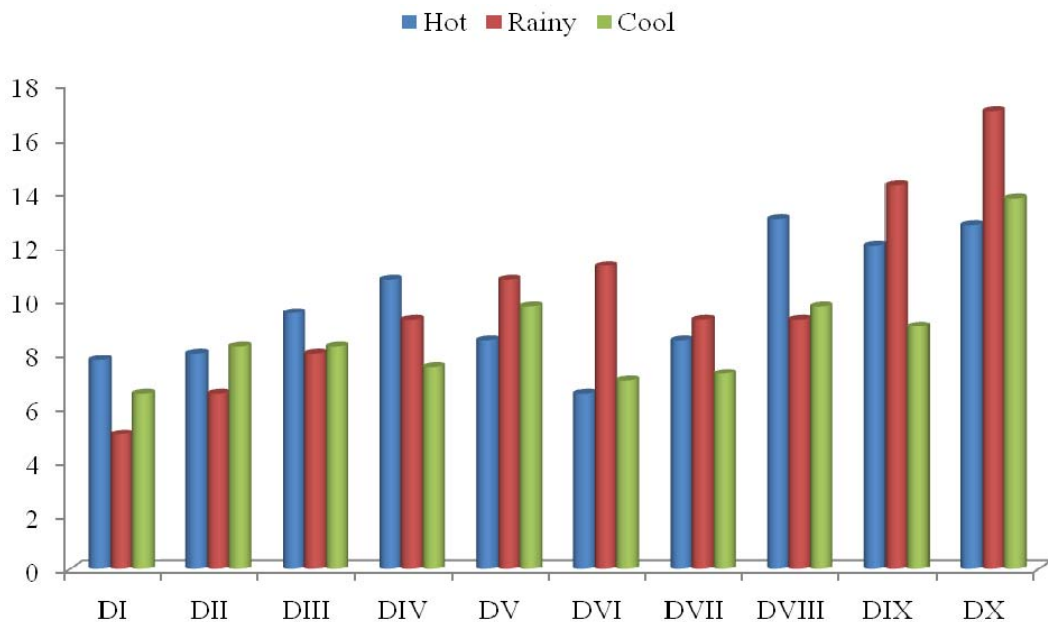


Figure (4) Seasonal occurrence of fish species in each dams from the study area

Seasonal occurrence of fish species

Monthly records were observed that the maximum fish species were collected in August while the least in September during rainy season. In the hot season, the fish species were recorded to be the highest in May and the least in March. In the cold season, the fish species were found to be the highest in October and the least in December. The fishes were mostly recorded in the rainy season (Figures 4 & 5).

Of the studied species, *Ilisha filigera* of order Clupeiformes, *Puntius ticto*, *Chela fasciata*, *Amblypharyngodon microlepis* and *Branchydanio sondhii* of order Cypriniformes, *Badis badis*, *Channa striatus*, *C. panaw* of order Perciformes were found throughout the study period. Number of species varies in relation to the environmental factors; temperature, rainfall and humidity.

Of the various environmental cues necessary to induce spawning in native fishes, specific water temperatures are one of the most critical. Changed temperature regimes can alter growth rates and production of food within the dam. A variety of environmental factors may also be responsible for fish deaths. The relationship between environmental factors and fish species were shown in Figures 6 and 7.

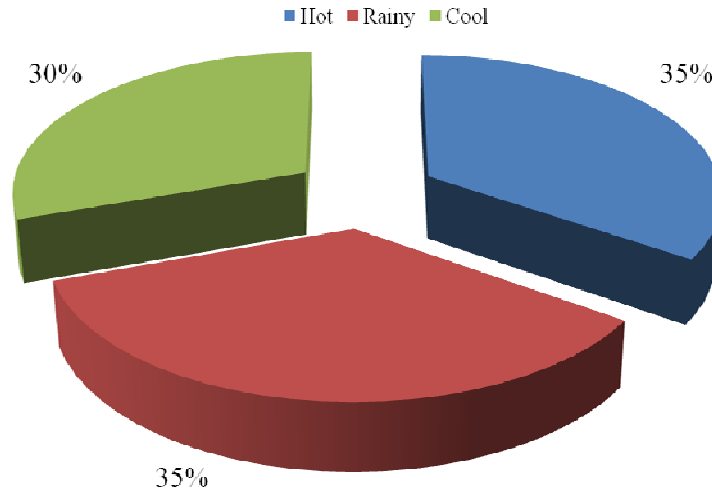


Figure (5) Seasonally recorded the percentage of fish species in the Hlawga Wildlife Park

Species occurrence in relation to their environmental condition

Various species of fish inhabit all sorts of water. However some fishes are of restricted distribution. In Dam I, 16 species were collected in the study period. The lowest fish species were observed in this dam during study period. Twenty four species were collected from Dam II and III in the study period. In Dam IV and VI, 32 species were recorded. Twenty seven species were observed from Dam V and 29 species from Dam VII. Thirty four species were collected in Dam VIII and IX and the 48 species in Dam X. Therefore, Dam X was recorded to possess the highest species of fish.

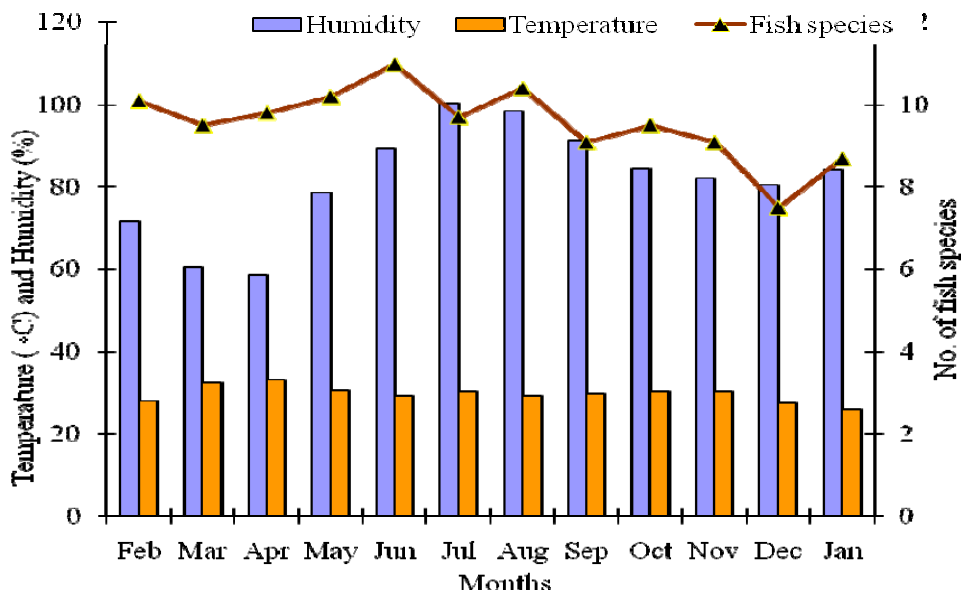


Figure (6) Monthly recorded fish species associated with the humidity and temperature

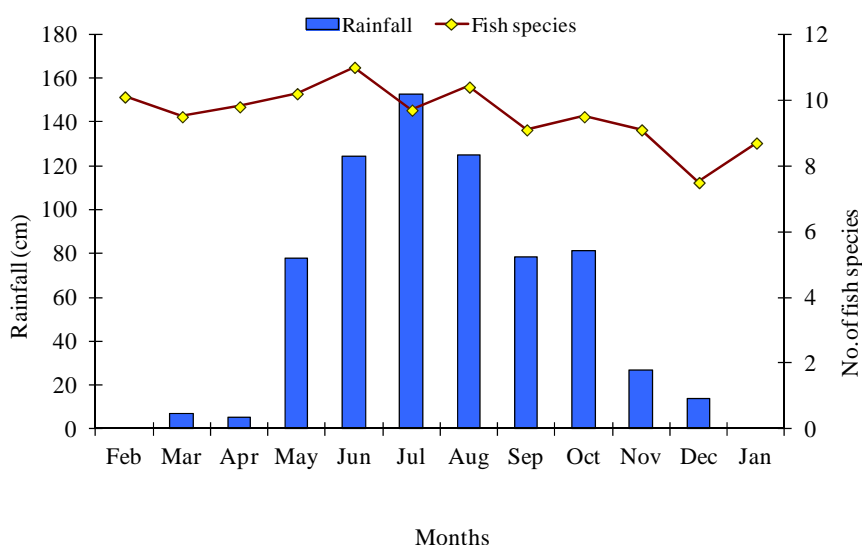


Figure (7) Relationship between monthly recorded fish species and rainfall

Table (2) Distribution of fishes in Hlawga Wildlife Park

No.	Scientific Name	I	II	III	IV	V	VI	VII	VIII	IX	X
1	<i>Notopterus chitala</i>					✓	✓	✓			✓
2	<i>N. notopterus</i>					✓		✓	✓		✓
3	<i>Ilisha filigera</i>	✓	✓	✓	✓		✓			✓	✓
4	<i>Labeo calbasu</i>								✓		✓
5	<i>Osteobrama vigorsii</i>				✓	✓	✓	✓	✓		✓
6	<i>Puntius amphibius</i>			✓	✓	✓	✓				
7	<i>P. bimaculatus</i>								✓		✓
8	<i>P.chola</i>			✓	✓	✓		✓	✓	✓	✓
9	<i>P.denisonii</i>	✓			✓	✓					✓
10	<i>P.dorsalis</i>	✓							✓		
11	<i>P.guganio</i>							✓	✓		✓
12	<i>P.sophore</i>			✓	✓	✓			✓	✓	
13	<i>P.ticto</i>		✓		✓				✓	✓	✓
14	<i>P.titteya</i>			✓	✓		✓		✓	✓	✓
15	<i>P.vittatus</i>				✓		✓		✓	✓	✓
16	<i>Chela fasciata</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
17	<i>Amblypharyngodon microlepis</i>		✓	✓	✓	✓	✓	✓	✓		✓
18	<i>Branchidanio choprai</i>	✓	✓	✓	✓		✓		✓	✓	✓
19	<i>B.sondhii</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
20	<i>Rasbora rasbora</i>				✓	✓	✓	✓	✓		✓
21	<i>Lepidocephalus annandalei</i>	✓	✓	✓	✓	✓		✓		✓	✓
22	<i>Mystus montanus</i>						✓				✓
23	<i>Ompok malabaricus</i>			✓		✓		✓	✓		✓
24	<i>O. macrophythalmus</i>					✓			✓		✓
25	<i>O. pabo</i>		✓	✓	✓		✓	✓			✓
26	<i>Pseudeutropius atherinoides</i>							✓	✓		✓
27	<i>Clarias batrachus</i>		✓	✓	✓		✓	✓			✓
28	<i>Heteropneustes fossilis</i>		✓	✓	✓		✓		✓	✓	✓
29	<i>Strongylura strongylura</i>						✓			✓	✓
30	<i>Monapterus indicus</i>					✓				✓	✓
31	<i>Chanda nama</i>		✓		✓	✓		✓	✓		✓
32	<i>Ambassis ranga</i>	✓	✓				✓	✓		✓	✓
33	<i>Pseudambassis notatus</i>	✓	✓	✓	✓	✓				✓	✓

34	<i>Badis badis</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
35	<i>Anabas testudineus</i>										✓
36	<i>Colisa fasciatus</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
37	<i>Channa gachua</i>	✓	✓			✓	✓	✓		✓	
38	<i>C. melasoma</i>		✓			✓		✓	✓		✓
39	<i>C. orientalis</i>						✓	✓			✓
40	<i>C. panaw</i>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
41	<i>C. striatus</i>	✓	✓	✓	✓		✓	✓	✓	✓	
42	<i>Macrogathus zebrinus</i>								✓		✓
43	<i>Mastacembelus armatus</i>							✓	✓		✓

Table (3) Seasonal variations of the depth (meter) of dams in the Hlawga Wildlife Park

Dams	I	II	III	IV	V	VI	VII	VIII	IX	X
Wet Season	3.66	3.66	3.66	3.66	7.62	4.57	4.57	4.57	4.57	7.62
Dry Season	1.21	2.45	3.04	3.04	6.4	3.95	3.65	3.65	3.02	6.1

Discussion

In the present study, the fish species recorded from 10 dams in the Hlawga Park included both native and introduced exotic species. A total of 43 species of 26 genera and 17 families belonging to seven orders were identified. Cast net and conical set net were mostly chosen as fishing gear in this study.

The species of the order Cypriniformes predominate the fish species of the remaining recorded orders. A single species was respectively recorded from the orders Clupeiformes, Cyprinodontiformes and Synbranchiformes. Among the 43 species of fish recorded, nine species were found throughout the study period.

Of the recorded species, four species; *N. notopterus*, *N. chitala* of order Osteoglossiformes, *L. calbasu*, *P. dorsalis* of order Cypriniformes were recorded only in the rainy season. However, all recorded fish species were higher in the rainy season than in the other seasons mainly in Dam I and Dam II as the level of the water in these dams was very low in the cold and hot seasons.

Fluctuating water levels caused rapid alterations in the habitats and this could affect the lives of many organisms. Rapid decrease in water levels may result the hatching rate of eggs and life span fish fry (Thoney, et al., 2004).

Most fish species recorded in this study were from Dam X. This could be due to the fact that Dam X was established since 1922 before the establishment of the Hlawga Wildlife Park. Furthermore, the surface area of this dam is wider and deeper than other dams in the park.

Another assumption is that the introduced exotic fish species recorded in this dam is possibly due to the release of live fish by the people as it is one of the virtues of Buddhism to save the lives of living organisms.

If introduced exotic fishes predominate the native fish species, the introduced ones could be invasive and wipe out the native fish species. Therefore, public awareness should be made and conservation aspect should be properly approached.

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