

BIODIVERSITY AND SOCIO-ECONOMIC ASSESSMENT

ON

MOEYUNGYI WETLAND WILDLIFE SANCTUARY



Biodiversity And Nature Conservation Association

(July 2014)

BIODIVERSITY AND SOCIO-ECONOMIC SURVEY
OF
MOEYUNGYI WETLAND WILDLIFE SANCTUARY



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The survey is funded by Amatae

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ACKNOWLEDGEMENTS

The importance of wetlands in Moeyungyi Wetland WS has been greatly emphasized. The objective of this survey is to promote that the full participation of all stakeholders is essential for reviving wetland goods and ecological services for the good of humans and the environment. The socio-economic survey was conducted to generate baseline data on community, its livelihood base, institutional and legal issues in order to create a foundation upon which evaluations can be made on the progress for future studies.

We thank the Director General of the Forest Department for permission to conduct the surveys in Moeyungyi Wetland WS which is under his jurisdiction. We are also grateful to those who participated in the surveys, both biological and social surveys.

We greatly appreciated the financial support provided to BANCA by the Amatae Programme which made it possible for this study to be materialized. We would also like to thank all respondents in the Moeyungyi Wetland area for sharing information and cooperation during the field visits.

Special thanks go to the Park Warden and staff of the Moeyungyi Wetland WS for their continuous support during the desk studies and also valuable suggestions for the field studies.

BANCA

EXECUTIVE SUMMARY

Wetlands cover approximately 6% of the Earth's surface and provide to the human population with goods and services such as food storage, water quality sustenance, agriculture production, fisheries and recreation. However, around the world wetlands are being lost and degraded due to economic development resulting in increased pressure to drain and reclaim land for agriculture, settlement and other uses.

They may, therefore, range from permanent to seasonal lakes, seasonally waterlogged soils, and estuarine systems to marine systems, with particular emphasis on the importance as waterfowl habitats.

Five major wetland types are generally recognized:

- marine (coastal wetlands including coastal lagoons, rocky shores, and coral reefs);
- estuarine (including deltas, tidal marshes, and mangrove swamps);
- lacustrine (wetlands associated with lakes);
- riverine (wetlands along rivers and streams); and
- palustrine (meaning “marshy” – marshes, swamps and bogs).

In 1996 Wild Bird Society of Japan made discussions with the Forest Department of Myanmar for conservation of wetlands and threatened bird projects in Myanmar. The discussions were aimed at compiling the Red Data Book of Asian birds and the possibility of Myanmar ratifying the Ramsar Convention. Three wetland management training courses had been conducted at the Moeyungyi Wetland Wildlife Sanctuary in 1998, 2000 and 2001. A baseline study of the environment of Moeyungyi WS was also conducted. The outcome of these activities paved the way for the listing of Moeyungyi Wetland Wildlife Sanctuary as the first Ramsar Site in Myanmar.

Moeyungyi Wetland WS is located in the southern part of Bago Region; the western and southwestern parts belong to Bago Township and the southern and eastern parts to Waw Township. It lies between north latitudes 17° 30' and 17° 36' and between east longitudes 96° 33' and 96° 39'. The Moeyungyi WS facilitates transport of people and goods by boats from villages at the perimeter of the wetland. Natural wetlands have also been providing services as suitable “field laboratories” for research, education and environmental monitoring.

Currently the degradation and loss of wetlands is more rapid than that for other ecosystems. Wetland-dependent biodiversity in many parts of the world is in continuing and accelerating decline. The wetlands of Moeyungyi offer immense potential for development of nature-oriented tourism also.

Moeyungyi Wetland Wildlife Sanctuary is one of the 99 wetlands sites in Myanmar (Ministry Of Environment Japan, 2004) designated as a Wildlife Sanctuary in 1988 with the sole objective of protecting the seasonal migratory birds and resident bird species as well as for conserving the ecosystem of the wetland habitat. People have settled around the wetland in 17 villages many years ago. The warm wetland habitat attracts various kinds of birds, including the migratory birds from the Arctic Region for wintering, which provides a good indicator of site significance. Moeyungyi is under those flyways acting as a crucial sanctuary for both migratory and resident water birds.

Moeyungyi Wetland Wildlife Sanctuary comprises a floodplain and storage reservoir that is important for flood control. The site now functions as a source of fresh water for downstream areas where rice cultivation takes place. It floods in the wet season May-October and from October to March hosts over 20,000 migratory water birds. These include the globally threatened Baer's Pochard (*Aythya baeri*), Sarus Crane (*Grus Antigone*) and Greater Spotted Eagle (*Aquila clanga*), as well as >1% of the regional population of the Northern Pintail (*Anas acuta*).

Previous Surveys in Moeyungyi Wetland Wildlife Sanctuary

A desk survey was made by a team of consultants in the fields of Avifauna, Mammals, Fish, Entomology, Flora, Herpeto fauna and Mammals in 2013 December. Desk studies were carried out at the following departments and institutions:

- Nature and Wildlife Conservation Department (NWCD),
- Moeyungyi Wetland WS
- Seinyatu Library at Yangon
- Zoo Department at Bago University
- Zoo Department at Yangon University
- Wildlife Conservation Society (WCS)
- Myanmar Nature and Bird Society (MBNS)

Based on the desk survey during 1998, a socio-economic study was performed by NWCD but reports were not produced. In 2001, a wetland survey was organized by Ministry of Environment (Japan) but social survey was not included in the program. It was also observed that no social surveys were conducted by Yangon University as well as Bago University.

Current Surveys

The current biological studies and socio-economic studies were conducted from 24th February to 2nd March 2014 by the following teams of scientists from BANCA and Bago University.

A. SURVEY TEAMS

Survey Field	Team Members
Avifauna	Lay Win and Saw Moses (BANCA)
Mammal	Swe Swe Aung and Thaw Zin (BANCA)
Herptofauna	Min Kyaw Thura and Min Thein Htet (BANCA)
Flora	Dr. Khin Swe Oo, Kyaw Zay Moe (Bago University) and Thet Tun (BANCA)
Fishery	Moe Moe Myint, Zaw Lin Htun and Tint Wai (BANCA)
Entomology	Naing Naing Win and Kyaw Naing Oo (BANCA)
Socio-economic	Dr. Min Aung Pan (Bago University), Ma Thinzar Phwe and Ma Swe Zin Myint

The data collection was randomly conducted by four ways:

- 1) Capturing (such as pitfall trap);
- 2) Observing in the field (such as quadrats);
- 3) Observation of track and signs such as footprints, scats, feeding signs in their natural habitats, and
- 4) Interview survey.
- 5) Points transect.

Results

Avifauna

During the survey, a total of 133 bird species were recorded out of which 1 was found out to be Vulnerable (VU) and 4 Near Threatened (NT) species (a total population of 18,364 of bird). The team managed to cover a relatively large area. The large number of birds can be seen due to the wintering of migratory birds.

Mammals

A total of 12 mammal species belonging to 9 genera, 6 families and 4 orders were captured and recorded. 1 species of Insectivores, 4 species of Bats, 1 species of Carnivores and 6 species of Rodents were recorded. There is no endemic or globally threatened species of mammals according to the IUCN Red list (2013).

Herpetofauna

A total of 24 species of amphibians and reptiles were captured or observed (6 species of frogs, 1 turtle, 8 lizards and 9 snakes). According to the conservation status by IUCN Red List (2013), one turtle (*Morenia ocellata*) was recorded as Vulnerable (VU), three species of frogs and five species of snakes were as Least Concern (LC). Moreover, the turtle is an endemic species of Myanmar

Flora

A total of 74 plant species belonging to (33) families were identified. In this study, some specimens were found in missed local names when specimens were matched with available literatures. There is no globally threatened flora species according to the IUCN Red list (2013).

Fish

A total of 37 fish species were observed during the survey period. Altogether 37 species, 31 genera under 23 families were recorded. There are five species recorded in this survey which

assumed by the conservation status of IUCN Red List (2013) as Near Threatened (NT). The rest 28 species are recorded as Least Concern (LC).

Entomology

A total of 41 different butterfly species belonging to 8 families and 89 genera under the order Lepidoptera were recorded in the study area. According to the IUCN Red data list 2013, 4 species of butterfly namely; *Eurema andersoni*, *Eurema brigitta*, *Euploea core* and *Junonia almanac* were listed as Least Concern (LC). Nine families consisting of 14 species of beetle were recorded in the study are during the survey period.

Socio-economic Surveys

Questionnaire surveys were conducted by socio-economic team from 24-2-2014 to 2-3-2014. The 8 villages around the wetland have 1,117 households of which 160 were selected as sample households to which the questionnaires were distributed according to the sampling numbers. It represents more than 10 percent of the total households. The responses to 120 questionnaires were analyzed together with information from open talks and discussion with the local inhabitants. Therefore, the analysis was solely based on the primary data for the assessment by using simple statistical methods as well as certain UNDP's indicators and MHRD's indicators.

Socio-economic data of Moeyungyi Wetland Wildlife Sanctuary

Particulars	Waw Township				Bago Township			
	Tarkhwa	Hpalauk	Kapin	Punchaung	Pauktaw (or) Hlayseik	Hpalauktan	Thoneeinsu	Tarsone
Population	55 (25M, 30F)	264 (107M, 157F)	1741 (859M, 882F)	1080 (400M, 680F)	95 (40M, 55F)	260 (120M, 140F)	1141 (551M, 590F)	1285 (610M, 675F)
Households	18	47	287	200	37	62	228	238
-brick buildings				4	0	7	20	30
-wooden buildings				75	2	30	30	100
-wood and bamboo buildings				120	35	25	178	95
Education	-	Primary	Primary	Primary	-	-	Primary	Primary
Health	Pyinbongyi dispensary or traditional medicine practitioner in Kapin Village. For emergency or serious cases, Waw Township Hospital.							
Settlement Plan	On the shore of the wetland and the shapes of villages are oriented by the alignment of the shore.							

Particulars	Waw Township				Bago Township			
	Tarkhwa	Hpalauk	Kapin	Punchaung	Pauktaw (or) Hlayseik	Hpalauktan	Thoneeinsu	Tarsone
Recreation								
-TV	2	10	200	-	3	50	50	-
-DVD Player	2	-	-	-	-	-	-	-
-Satellite Dish	-	-	2	3 (1 Skynet)	-	5	6	-
Agriculture (% of Households)	11	32	61	10	5	16	13	21
Fishery (% of Households)	78	60	39	85	81	76	22	14
	18% of total fishery households practices electric shock fishing.							
Income and Expense (Sample size – 120 HH)	Daily Income 26% - <3000 MMK 58% - >3001 - <6000 MMK 16% - >6001 MMK				Daily Expense 18% - <2000 MMK 64% - >2000 - <4000 MMK 18% - >4000 MMK			
Energy (Sample size – 120 HH)	Electricity – 8% Charcoal – 10% Wood – 76% Others – 6%							
Water Use (Sample size – 120 HH)	Tube well – 35% Lake's water – 13% Wetland water – 52%							
Small Scale Industry	-	-	2 rice mills, ngapi industry	1 rice mill, ngapi industry	Dried pain industry,	Cheroot industry	Cheroot industry, lotus textile industry	-
Sanitation Awareness (Sample size – 120HH)	Fly-proof toilet – 28%							

Issues and Threats

Major issues and threats observed during the field surveys of Moeyungyi Wetland WS indicated that the following threats are currently exerting adverse impacts towards the objectives of managing the Moeyungyi Wetland WS.

- Bird hunting with nets
- Electric shock fishing
- Invasive species
- Insect catching using mistnets
- Trapping small mammals for food
- Trading of Turtles and Snakes to China
- Land encroachment (paddy field)
- Use of fertilizers and pesticides
- Indiscriminate dumping of solid and liquid waste
- Raising of Livestock
- Flood during the rainy season
- Infrastructure development
- Water Use
- Fuel wood collection
- Population growth

Ranking threats

To rank threats, WCS has developed criteria against which each threat is assessed. Within the Living Landscapes Program, it is strongly advocated that criteria assess only the level of threat and not the feasibility of intervention. This ensures that focus is made on the factors that most likely jeopardize the conservation of wildlife and wild places rather than that are easiest to address. These factors are severity, urgency, recovery time once the threat is abated, proportion of the area affected, and the probability that the threat will occur (WCS, 2002).

Once the criteria for assessing the severity of threats and/or feasibility of addressing them, the next step is to rank them. Using the Living Landscapes Program's criteria and ranking system, the total score for each threat using the following equation:

$$\text{[Total= (Urgency+Recovery) x Severity x Proportion of Area affected x Probability]}$$

and rank the threats according to their scores, and identify the most important threats to conservation at the site.

Assessment of Threats

No.	Threats	Severity	Urgency	Area	Recovery	Probability	Total	Rank
		(0-3)	(0-3)	(0-4)	(0-3)	(0-1)		
1.	Bird Hinting/Trapping with nets	2	3	4	2	1	40	2
2.	Electrc shock fishing	3	3	4	2	1	60	1
3.	Invasive species	1	2	4	2	1	16	6
4.	Insect cacthing using mistnets	2	2	2	1	1	12	7
5.	Trapping small mammals for food	1	2	2	1	1	6	10
6.	Trading of Turtles and snakes to China	2	3	3	2	1	30	3
7.	Land encroachment (paddy field)	2	3	3	2	1	30	3
8.	Use of fertilizers and pesticides	2	3	2	2	1	20	5
9.	Indiscriminate dumping of solid and liquid waste	2	2	2	1	1	12	7
10.	Raising of Livestock	2	3	2	1	1	16	6
11.	Flooding during the rainy season	1	2	4	1	0.75	9	8
12.	Infrastrucure development (Resort)	1	1	2	1	1	4	11
13.	Water Use	2	1	4	2	1	24	4
14.	Fuel wood collection	1	2	2	2	1	8	9
15.	Population growth	1	3	4	2	1	20	5

Total = (Urgency + Recovery) x Severity x Area x Probability) Source: WCS (2007)

Priority Ranking of Assessment of Direct Threats

Sr.	Rank Scores	Priority Ranking	Remarks
1.	1-3	Very High	
2.	4-6	High	
3.	7-9	Moderate	
4.	>9	Low	

Ranking Results

Very High	High	Moderate	Low
Bird Hinting/Trapping with nets	Invasive species	Insect catching using mistnets	Trapping small mammals for food
Electric shock fishing	Use of fertilizers and pesticides	Indiscriminate dumping of solid and liquid waste	Infrastructures development (Resort)
Trading of Turtles and snakes to China	Raising of Livestock	Flooding during the rainy season	
Land encroachment (paddy field)	Water use	Fuel wood collection	
	Population growth		

B. RECOMMENDATIONS FOR FUTURE CONSERVATION MEASURES

Electric Shock Fishing [Priority Ranking: Very High]

Recommendations

- Enforce the law for protection around Moyungyi wetland area to stop illegal activities including electric-shock fishing, use of destructive fishing gears, and overexploitation on the extraction of fish resources.
- *Tilapia mossambica* (Tilapia) should be treated as controlled species with no more input to wetland.
- Environmental Awareness program should be promoted for grassroots' level in the region.

Bird Hinting/Trapping with Nets [Priority Ranking: Very High]

Recommendations

- Bird hunting should not be allowed in the Moeyungyi Wetland Wildlife Sanctuary
- Bird survey should be done annually in winter season (open season) to collect up-to-date data in order to understand the changing habitat for resident as well as migratory birds.
- Publish data on annual counts and regular surveys should be released to all interested persons.
- For capacity building trainings should be organized for NWCD staff as well as all stakeholders pertaining to wildlife conservation matters.
- Workshops should be conducted for local communities concerning environmental education programs.

Trading of Turtles and Snakes [Ranking: Very High]

- The herpetofauna species depend on season as some species are active only during the rainy season. Hence, the survey work should be carried out throughout the whole year.
- Enough time should be allotted to carry out for the herpetofauna survey.

Land encroachment (paddy field) [Priority: Very High]

quite a serious threat.

Recommendations

- As 30 hh out of 120 hh included in the study are engaged in farm work representing 25% of the household under study no further cultivation encroachment should be allowed in the Moeyungyi Wetland WS.
- Chemical fertilizers should be substituted with organic fertilizer if situations are favorable.
- Educate local communities not to use pesticides and its negative impacts on the environment.
- As the water spread of the Moeyungyi Wetland WS is getting smaller, agricultural land should not be extended further horizontally: instead, the farmers should concentrate vertically on the increase of the yield per unit area.

Water Use [Priority: High]

Recommendations

- Encourage to use fly-proof latrines for all villages in the environs of Moeyungyi Wetland WS so as not to pollute the water sources
- Contact with concerned authorities for regulating the water volume particularly during the summer where the water level is low.
- If Moeyungyi Wetland WS is to be used as portable water, it should be either boiled or use of water purifiers for safe portable water.
- To assess the current status of water quality in Moeyungyi Wetland WS for finding out whether it is within the threshold values.

Raising of Livestock [Priority: High]

Recommendations

- A research study should be organized to find out the grazing regime of the animals that has least impact on the vegetation of Moeyungyi Wetland WS.
- Proper waste disposal techniques should be adopted
- Local communities should be educated on proper waste disposal techniques by the staff of Moeyungyi Wetland WS.

Population Growth

Priority: High

Recommendations

- Wait for the population census data to have the actual population data for the villages in the environs of Moeyungyi Wetland WS.
- Socio-economic data should be collected at 5 year interval to find out the changes in socio-economic status of the villages

Indiscriminate dumping of solid and liquid waste

Priority: Moderate

Recommendations

- Prior should be taken to organize more fly-proof latrines for villages in the vicinity of Moeyungyi Wetland WS.
- Chemical fertilizer application should be phased out step by step to use organic fertilizer instead.
- Also, chemical pesticides should be replaced gradually by using organic type natural pesticides.
- Waste management system should be developed at Moeyungyi Wetland Resort Hotel.

Flooding during rainy season

Priority: Moderate

Recommendations

- Removal of vegetation cover should be controlled around Moeyungyi Wetland WS.
- Develop first growing fire wood plantations for the community living at the vicinity of Moeyungyi Wetland WS.
- Firewood-saving stoves should be promoted for the villages in the vicinity of Moeyungyi Wetland WS.

Fuel wood Collection

Priority: Moderate

Recommendations

1. As fuel wood will still be the energy source for the villages, it is necessary to establish fast growing tree plantations with a very short rotation.
2. Educate local communities on the use of energy efficient cook-stoves for saving fire wood for cooking.

Trapping Small Mammals

Priority: Low

Recommendations

- Suitable trees need to be supported for some small mammals as food source.
- It is necessary to enforce the wildlife law in and around the Moeyungyi WS so as to prevent from illegal activities being done.
- Also, local people should be educated for the effective protection of the WS through environmental education and extension programs.

Infrastructure Development

Priority: Low

Recommendations:

- Environmental Management Plan should be developed for Moeyungyi Resort Hotel
- Corporate Social Responsibility program shall be adopted to establish closer links with the tourism staff, staff of NWCD and the community
- Create income generation for local communities by training them to become bird-watching guides with the full participation of travellers, locals and entrepreneurs in a triple-win situation
- Promote capacity building of NWCD staff awareness and education programs on the coexistence of tourism and conservation.

Institutional Arrangement

Recommendations:

- At least budget allotment for Moeyungyi Wetland WS should be provided to cater the appointment of daily staff level of 2007.
- Training should be arranged for Park Warden and Staff for management level and operational trainings respectively by organization like WCS occasionally when they conduct surveys at Moeyungyi Wetland WS.
- Particularly for effective patrolling to monitor and control threats and wildlife which is the most important operation for Moeyungyi Wetland WS, the SMART (Spatial Monitoring and Reporting Tool) patrolling system should be introduced with the assistance of WCS.

SMART have 2 levels of Training, basic level training for junior staff and advanced level training for senior staff.

- Funding for community relations should be organized from CSR program from Moeyungyi Wetland Resort Hotel.

- Sufficient funds should be acquired for environmental education and outreach activities through CSR programs and interested donors.
- Instead of working on annual work plan, a proper ‘Moeyungyi Wetland WS Management Plan’ should be developed at least on a 4 year-plan which should be implemented, updated on a regular basis and evaluated at the end of the plan period. Prior action should be given on research, surveys, and extension programs for the local communities and effective patrolling activities.

C. DISCUSSION

Source	Avifauna	Mammal	Herptofauna (Amphibians + Reptiles)		Flora	Fishery	Entomology (Butterfly + Insects)	
WCS	128 (2007) 139 (2008) 119 (2009) 133 (2011)							
Yangon University	87 (2007)					33 (2004 – 2005)		
Bago University	52 (2008 – 2009)	9 (2008 – 2009)	12 (2008)	20 (2008)		36 (2008 – 2009)	37 (2009)	16 (2008)
NWCD, Moeyungyi	126 (2008 – 2013)		8 (2003)	20 (2003)		36 (2003)	33 (2003)	
BANCA (2014)	133	12	24		74	37	41	14

It can be observed from the above table that previous surveys are concentrated on avifauna surveys as Moeyungyi Wetland WS is quite famous for the presence of migratory waterbirds and habitats which also constitute the main attraction for tourists.

Based on the above mentioned surveys Moeyungyi Wetland WS as a RAMSAR site is still significant for conservation of birds and aquatic life. The socioeconomic survey indicated that about 77% of the populations are dependent of Moeyungyi Wetland WS for their livelihood. By occupation 49% engaged in fishery while 25% are engaged in agriculture with the rest for services and others. With the increase in population in the near future more and more people will depend on the wetland for their livelihood.

It is also realized from the study that water pollution is also a serious threat in the Moeyungyi wetland. Likewise, illegal means of fishing like electric-shock fishing will lead to the depletion of fish resources in the very near future.

The socio-economic studies carried out in this study indicated that the livelihood of poor communities living near the wetlands should be given due consideration so that their dependence on wetland resource can be made sustainable. This can be accomplished through education programs for the effective protection of the WS through environmental education and extension programs.

As human activities are responsible for such kind of negative impacts mentioned already, NWCD should coordinate with relevant stakeholders such as local administrators, academia, NGOs, local communities and donors to effectively manage the one and only listed ‘Ramsar site’ of Myanmar

BIODIVERSITY AND SOCIO-ECONOMIC SURVEY OF MOEYUNGYI WETLAND WILDLIFE SANCTUARY

1. THE WETLAND

Wetlands cover approximately 6% of the Earth's surface and provide to the human population with goods and services such as food storage, water quality sustenance, agriculture production, fisheries and recreation (Acreman et.al., 1996). However, around the world wetlands are being lost and degraded due to economic development resulting in increased pressure to drain and reclaim land for agriculture, settlement and other uses.

1.1 Definition of Wetlands

The Ramsar definition (Ramsar, 1971) on wetlands is the most widely used and defines as areas of marsh, fen, peat land or water; whether natural or artificial, permanent or temporary with water that is static or flowing, fresh, brackish or salty including areas of marine water, the depth of which at low tides does not exceed six meters.

They may, therefore, range from permanent or seasonal lakes, seasonally waterlogged soils, and estuarine systems to marine systems. This definition basically covers "natural", "artificial" and "marine" wetlands as long as the depth does not exceed 6 m at low tide. Whereas the Ramsar (1971) emphasizes on wetlands in regards to their importance as waterfowl habitats,

1.2 Convention on Wetlands

The official name of the treaty, *The Convention on Wetlands of International Importance especially as Waterfowl Habitat*, reflects the original emphasis upon the conservation and wise use of wetlands, primarily as habitat for water birds. Over the years, however, the Convention has broadened its scope of implementation to cover all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are vital for biodiversity conservation and for the well-being of human communities, thus fulfilling the full scope of the Convention text.

The Convention entered into force in 1975 and now (as of January 2013) has 163 Contracting Parties, or Member States, in all parts of the world. The List of Wetlands of International Importance (the "Ramsar List") presently designated more than 2,060 wetlands for special protection as "Ramsar Sites", covering 197 million hectares (1.97 million square kilometres).

Five major wetland types are generally recognized:

- marine (coastal wetlands including coastal lagoons, rocky shores, and coral reefs);
- estuarine (including deltas, tidal marshes, and mangrove swamps);
- lacustrine (wetlands associated with lakes);
- riverine (wetlands along rivers and streams); and
- palustrine (meaning "marshy" – marshes, swamps and bogs).

In addition, there are human-made wetlands such as fish and shrimp ponds, farm ponds, irrigated agricultural land, salt pans, reservoirs, gravel pits, sewage farms and canals.

1.3 Wetland Services, Functions and Values

The wetland facilitates transport of people and goods by boats for local inhabitants residing at the perimeter of the wetland. Natural wetlands have also been providing services as suitable “field laboratories” for research, education and environmental monitoring.

The benefits of wetland concerning climate change mitigation still remain uncertain. On the one hand, wetland acts as a carbon sink. However, on the other, wetland micro-organisms emit other greenhouse gases, especially methane.

Wetland functions are those activities or actions, which occur naturally in wetlands as a result of the interactions between ecosystem structure and process. Those functions include: floodwater control, nutrient flow, sediment and contaminant retention; food web support, shoreline stabilization and erosion controls; storm protection and stabilization of local climatic conditions, particularly rainfall and ambient temperature.

Another significant benefit from wetlands is the improvement of freshwater quality, in particular retention, removal and transformation of nutrients. Furthermore they can capture heavy metals and complex organic pollutants. The conservation of a habitat for target species was the main aim of the creation of wetlands. The habitat attracts a wide range of species and has high biodiversity values.

Currently the degradation and loss of wetlands is more rapid than that for other ecosystems. Similarly, the status of both freshwater and, to a lesser extent, coastal species is deteriorating faster than that of species in other ecosystems. Wetland-dependent biodiversity in many parts of the world is in continuing and accelerating decline. The wetlands offer immense potential for development of nature-oriented tourism also.

2. MOEYUNGYI WETLAND WILDLIFE SANCTUARY

In 1996 Wild Bird Society of Japan made discussions with the Forest Department of Myanmar for conservation of wetlands and threatened bird projects in Myanmar. The discussions were aimed at compiling the Red Data Book of Asian birds and the possibility of Myanmar ratifying the Ramsar Convention. Three wetland management training courses had been conducted at the Moeyungyi Wetland Wildlife Sanctuary in 1998, 2000 and 2001. A baseline study of the environment of Moeyungyi WS was also conducted. The outcome of these activities paved the way for the listing of Moeyungyi Wetland Wildlife Sanctuary as the first Ramsar Site in Myanmar.

Moeyungyi Wetland WS has been identified as one of the 19 sites qualified for Global Conservation Significance according to various criteria (Ministry Of Environment Japan, 2004): See table 1 and 2.

Table 1 Criteria for Global Conservation Initiative of of Moeyungyi Wetland

No.	Site	Fulfillment of Criteria for Global Conservation Initiative	Remarks
1.	Moeyungyi Lake	<ul style="list-style-type: none"> Ramsar Site 	High Tourism Value
		<ul style="list-style-type: none"> Important Bird Area 	
		<ul style="list-style-type: none"> Anatidae Network Site 	

Table 2 Moeyungyi Wetland- Globally and Nationally Significant Wetland

Sr.	Site	Justification			Conservation Value
		1% Criterion (Water Birds)	Species	Other Values	
1.	Moeyungyi Lake Max Spp:34 Max No. 27,524		VU: Spoon Billed Pelikan, Sarus Crane, Baers Pochard, Greater Spotted Eagle Others: Eurasian Spoonbill (2)		Endemic Bird Area EBA 132 National IBA (Criteria A1 &A4) Ramsar Site (Criteria 1,2,3,4,5,6,7,8) Anatidae Network (Criteria 1 and 3)

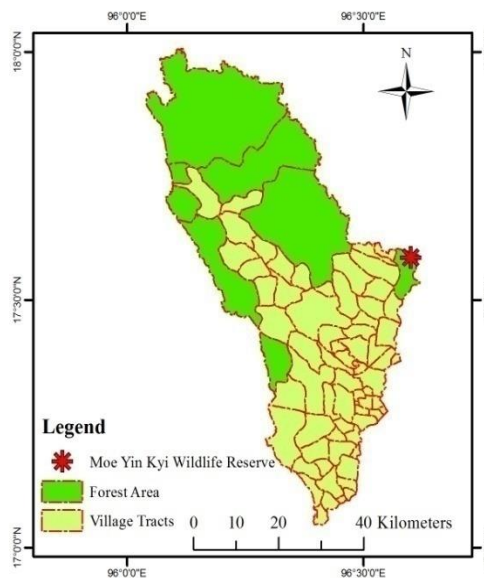
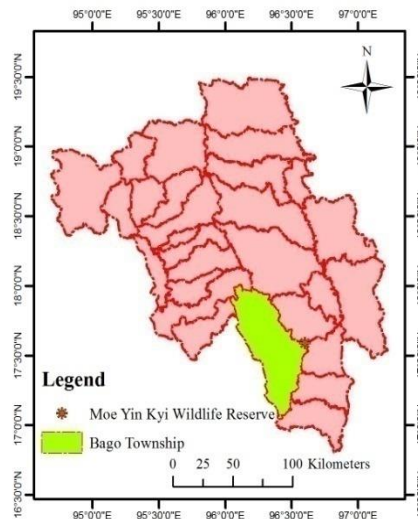
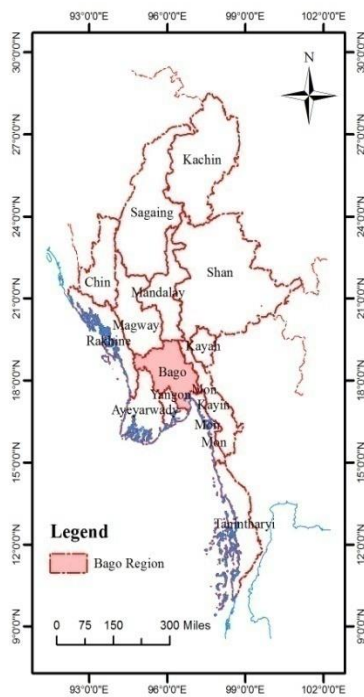
Source: MOEJ (2004) See Appendix 1 for details

Moeyungyi Wetland Wildlife Sanctuary is one of the 99 wetlands sites in Myanmar (Ministry Of Environment Japan, 2004) designated as a Wildlife Sanctuary in 1988 with the sole objective of protecting the seasonal migratory birds and resident bird species as well as for conserving the ecosystem of the wetland habitat. People have been settled around the wetland in 17 villages many years ago. There are diverse terrestrial and aquatic animals, birds, insects and natural vegetation in and around the Moeyungyi Wetland WS. The warm wetland habitat attracts various kinds of birds, including the migratory birds from the Arctic Region for wintering, which provides a good indicator of site significance. Moeyungyi is under those flyways and it becomes a crucial sanctuary for both migratory and resident water birds.

Moeyungyi Wetland Wildlife Sanctuary comprises a floodplain and storage reservoir that is important for flood control. Originally it was constructed in 1904 in the form of a rectangular man-made water storage reservoir by bunding, to provide water to the Bago-Sittaung canal (linking the Bago and Sittaung rivers) for transport of timber by boat. The site now functions as a source of fresh water for downstream areas where rice cultivation takes place. It floods in the wet season May-October and from October to March hosts over 20,000 migratory waterbirds. These include the globally threatened Baer's Pochard *Aythya baeri*, Sarus Crane *Grus antigone* and Greater Spotted Eagle *Aquila clanga*, as well as >1% of the regional population of the Northern Pintail *Anas acuta*. The site is also important for supporting the vulnerable Myanmar Eyed Turtle *Morenia ocellata*. The local communities use the site for fishing, grazing, duck-rearing and some paddy-growing; and there is a small tourist facility to accommodate birdwatchers. Moeyungyi Ramsar site No. is 1431 (MOEJ, 2004).

2.1 Location and Size

Moeyungyi Wetland WS is located in the southern part of Bago Region; the western and southwestern parts belong to Bago Township and the southern and eastern parts to Waw Township. It lies between north latitudes 17° 30' and 17° 36' and between east longitudes 96° 33' and 96° 39'. The northern boundary demarcates between the wetland and Daik-Oo Township. It lies immediately the east of Yangon-Mandalay Highway between mile-post 63 and 70. The wetland is 16.7 feet deep when the water level rises to the brim. The frame or the width of the embankment is 8 feet. The wetland covers an area of 40 square miles or 256,000 acres.



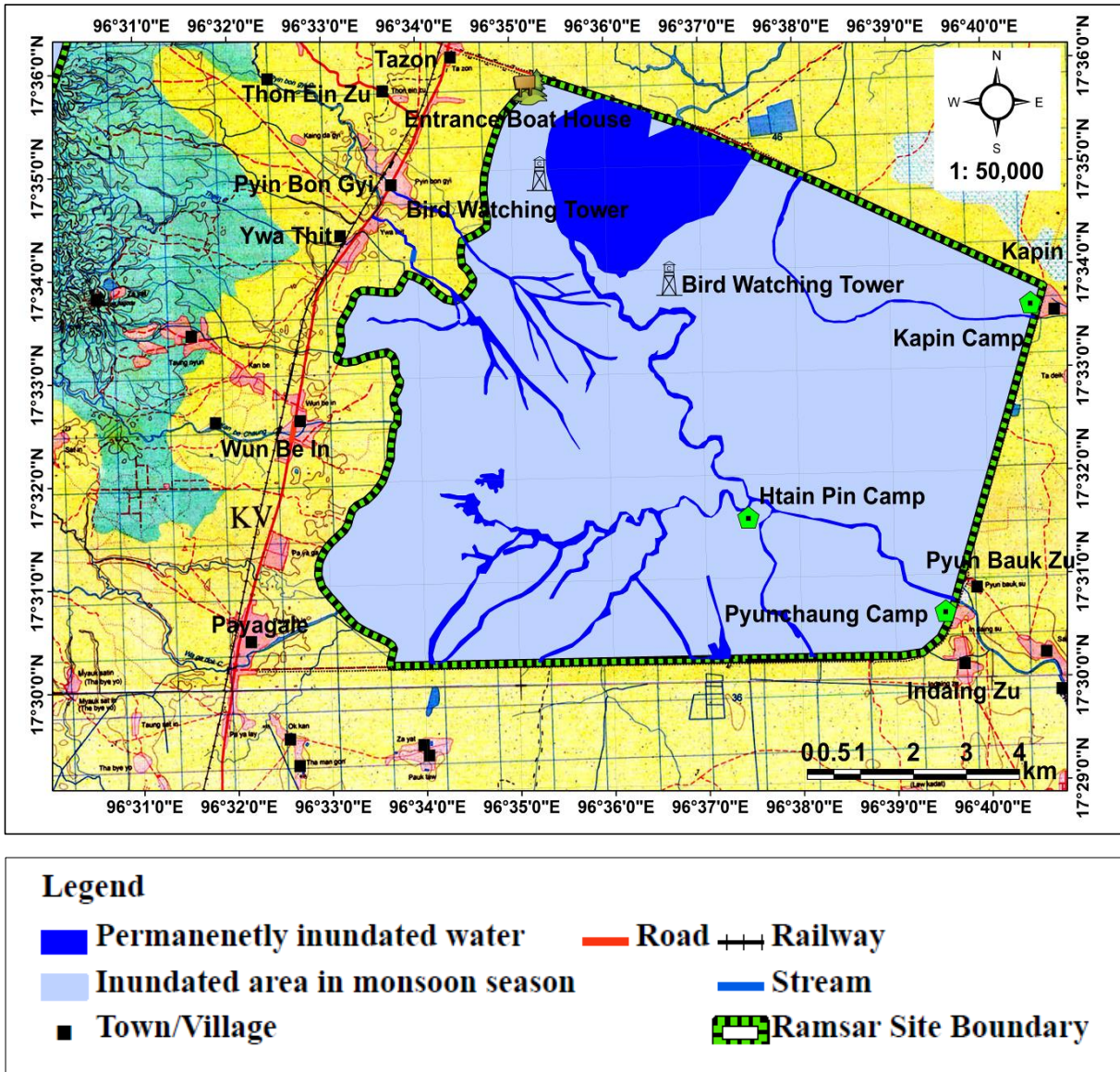


Figure 1 Location Map of Bago Region and Moeyungyi Wetland Wildlife Sanctuary

2.2 Topographic Feature and Relief

Generally Moeyungyi Wetland WS lies in a low, flat plain, being part of lower Sittaung valley. However, the land slopes slightly towards the west to the foothill of the Bago Yoma. It is the southern continuation of Daik-U-Pyuntansar plain characterized by deep water fields. The creeks which drain into the wetland are Sinsu-Phayarlay, U Kaung Ywathit, Wunbae wetland, Yetarshay and Pyinbongyi which take their sources over the mountain spurs of Bago Yoma.

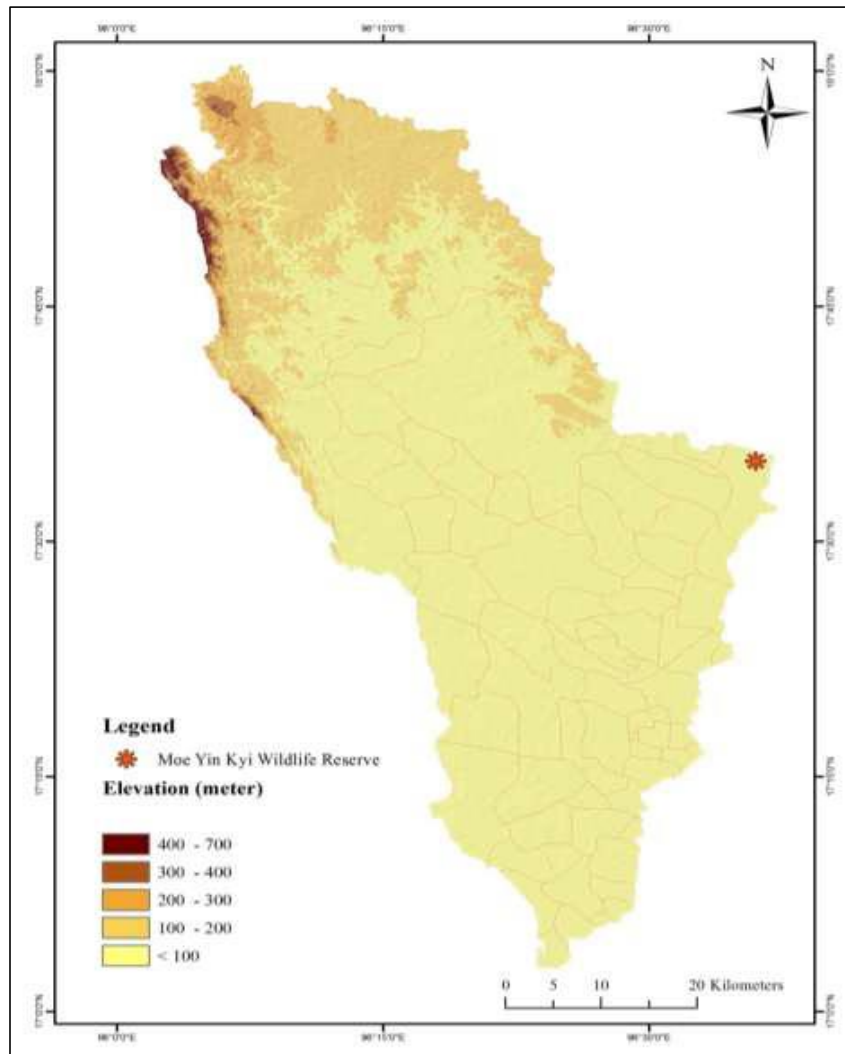


Figure 2 Topography around Moeyungyi Wetland WS

2.4 Climate

Moeyungyi Wetland WS falls within the tropics and temperatures fairly high throughout the years with a mean annual temperature of 26.95°C. The mean monthly temperature is highest in April with 30.5°C and lowest in January with 23.72°C. The mean monthly maximum temperature is highest in April with 38°C and the mean monthly minimum temperature is lowest in August with 29.4°C. With an annual rainfall of 3543.05 mm, the study area experiences the Tropical Monsoon climate, characterized by alternate wet and dry season. The summer monsoon rain refills the water of the wetland and provides flooded fields for successful growing of paddy crops that thrive under the rainy condition. Plants of different species grow rapidly in the rainy season. In the dry season, the water of wetland serves as the main source of water. After the retreat of southeast summer monsoon wind, the cool, dry northeast wind dominates the area. In winter months, the wetland itself and the areas around the wetland are warmer than the surrounding areas as large water body cools more slowly than the land areas. Moeyungyi Wetland WS serves as a significant link in flying network route of Asian Winter Migratory Birds during the period from December to February. When the water level of the wetland recedes in the dry season, the local inhabitants depend more on catching fish from the wetland.

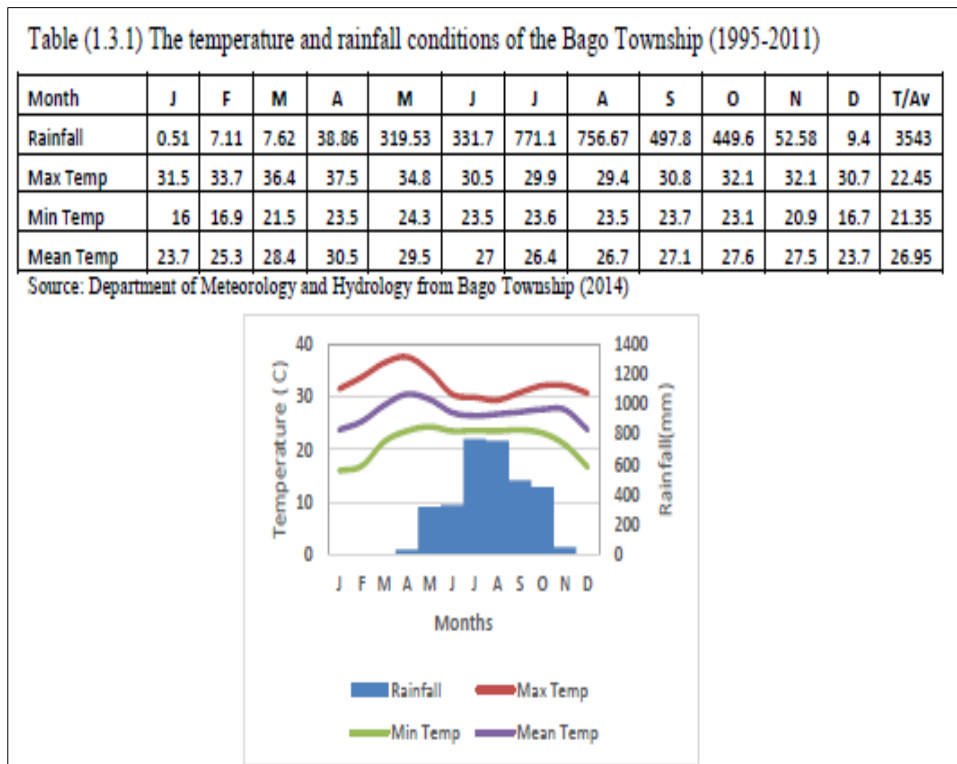


Figure 3The Climatograph conditions of the Bago Region

2.5 The natural vegetation

The natural vegetation of the study area is more associated with the water body of the wetland, in addition to its low relief and periodical changing of monsoon climate. Therefore, hydrophytes of different species in and near the wetland, essentially includes plants of Arum family (Pain), reeds, water-hyacinth, water-lily and raw grasses. A certain kind of grasses bear fruits richly in the winter and this is one of the reasons that the wetland can attract more birds in winter. The sacred lotus plants *Nelumbium speciosum* or Padonmar lily grow in thick groups. Some local inhabitants gather the stalks of the lilies for producing small strands useful for making valuable textile. Plants of Arum are also cut for sale by the locals. The dry Kaing (reed) plants are used as fuel. Reeds and other hydrophytes serve as favorable habitat for the reproduction processes of the aquatic animals. The natural vegetation of the wetland, to some extent, supports the livelihood of some local inhabitants.

2.6 Soils

The original dominant soils are that derived from alluvium and thus meadow gley soils and meadow alluvial soils cover the floor of Wetland upon which a substantial amount of sediments is deposited by mountain torrents, causing serious silting. This leads to lowering the depth of the wetland, though it enriches the soil fertility.

3. PREVIOUS SURVEYS IN MOEYUNGYI WETLAND WILDLIFE SANCTUARY

3.1 Biodiversity Surveys

A desk survey was made by a team of consultants in the fields of Avifauna, Mammals, Fish, Entomology, Flora, Herpetofauna and Mammals in 2013 December. Desk studies were carried out at the following departments and institutions:

- Nature and Wildlife Conservation Department (NWCD),
- Moeyungyi Wetland WS
- Seinyatu Library at Yangon
- Zoo Department at Bago University
- Zoo Department at Yangon University
- Wildlife Conservation Society (WCS)
- Myanmar Nature and Bird Society (MBNS)

The following table represents the biodiversity survey data by organizations and respective periods. Detailed data from previous surveys are provided in attached Annex.

(number/period)

Source	Avifauna	Mammal	Herptofauna (Amphibians + Reptiles)		Flora	Fishery	Entomology (Butterfly + Insects)	
WCS	128 (2007) 139 (2008) 119 (2009) 133 (2011)				Nil			
Yangon University	87 (2007)				Nil	33 (2004 – 2005)		
Bago University	52 (2008 – 2009)	9 (2008 – 2009)	12 (2008)	20 (2008)	Nil	36 (2008 – 2009)	37 (2009)	16 (2008)
NWCD, Moeyungyi	126 (2008 – 2013)		8 (2003)	20 (2003)	Nil	36 (2003)	33 (2003)	

3.2 Socio-economic Studies in Moeyungyi WS

There are about 17 villages in the vicinity of Moeyungyi Wetland WS and the livelihood of villagers relies wholly or partly on the wetlands. The villagers earned their living by cultivating summer paddy, fishing, raising cows, buffaloes and ducks. Though Moeyungyi WS is protected by Wildlife Protection Law of 1994, due to population pressure, poverty and lack of knowledge on environmental conservation, the wetland resources has been overused and as a result there are serious environmental impacts currently being faced with.

Based on the desk survey during 1998, a socio-economic study was performed by NWCD but reports were not produced. In 2001, a wetland survey was organized by Ministry of Environment (Japan) but social survey was not included in the program. It was also observed that no social surveys were conducted by Yangon University as well as Bago University.

A Ph.D. thesis on “Human Impact on Fish Community and Moeyungyi Wetland Wildlife Sanctuary” was submitted by Dr. Myint Myint Khine but did not include socio-economic survey. Also it was found out that no social survey conducted by any government organizations like Forest Department (Yangon /Bago) and other related Ministries.

During 2010-2011 with the assistance of Moyungyi Wetland WS Park Warden “A Survey on the Reliance of WS by villagers in Bago and Waw townships” was conducted.

Table 3 Reliance of WS by villagers from Bago and Waw townships

Sr.	Village Name	Population	Fisherman %	Cultivator %	Property%			Fisherman %	Cultivator %
					Boat	Buffalo	Duck		
1.	Pyin-bon-gyi	10,679	300 (3%)	106 (1%)	225 (2%)	1074 (15%)	2500 (23%)	2	6
2.	Phaya-gale	8,300	2138 (25%)	133 (2%)	84 (4%)	1137 (14%)	2008 (24%)	6	5
3.	Wum-be-wetland	7195	122 (2%)	45 (0.62%)	46 (0.63%)	570(8%)	7000 (97%)	1	3
4.	Pyun-chaung	1358	600 (44%)	10 (0.73%)	150 (11%)	110 (8%)	1000 (73%)	5	2
5.	Indaing-su	1605	500 (31%)	50(3%)	300 (18%)	730 (45%)	2500 (155%)	4	4
6.	Kapin	1500	400 (26%)	3(0.2%)	300 (20%)	470 (31%)	700 (46%)	3	1

The above table indicates that fisherman relies more on Moeyungyi Wetland WS for their livelihood.

4. OBJECTIVES OF THE STUDY

1. The aim of the survey was to collect up-to-date baseline data on the fauna and flora of Moeyungyi Wetland WS including birds, fish, insects, reptiles and amphibians, aquatic plants and mammals.
2. The collected information will be used to help determine conservation priorities for effective conservation of Moeyungyi Wetland WS.
3. To conduct socio-economic survey of selected villages in the vicinity of Moeyungyi Wetland WS, so as to make recommendations for developing legal and institutional measures to promote Wetland Conservation and Wise Use.

5. CURRENT BIOLOGICAL SURVEYS

The current biological studies were conducted from 24th February to 2nd March 2014 by the following teams of scientists from BANCA and Bago University.

- Avifauna: Lay Win and Saw Moses (BANCA)
- Mammals: Swe Swe Aung and Thaw Zin (BANCA)
- Herpetofauna: Min Kyaw Thura and Min Thein Htet (BANCA)
- Flora: Dr. Khin Swe Oo, Dr. Kyaw Zay Moe (Bago University) and Thet Tun (BANCA)
- Fish: Moe Moe Myint, Zaw Lin Htun and Tint Wai (BANCA)
- Entomology: Naing Naing Win and Kyaw Naing Oo (BANCA)
- Social Survey: Dr. Min Aung Pan, Ma Thinzar Phwe and Ma Shwe Zin Myint (Bago University)

The habitats representing Moeyungyi Wetland WS during the survey is as follows:

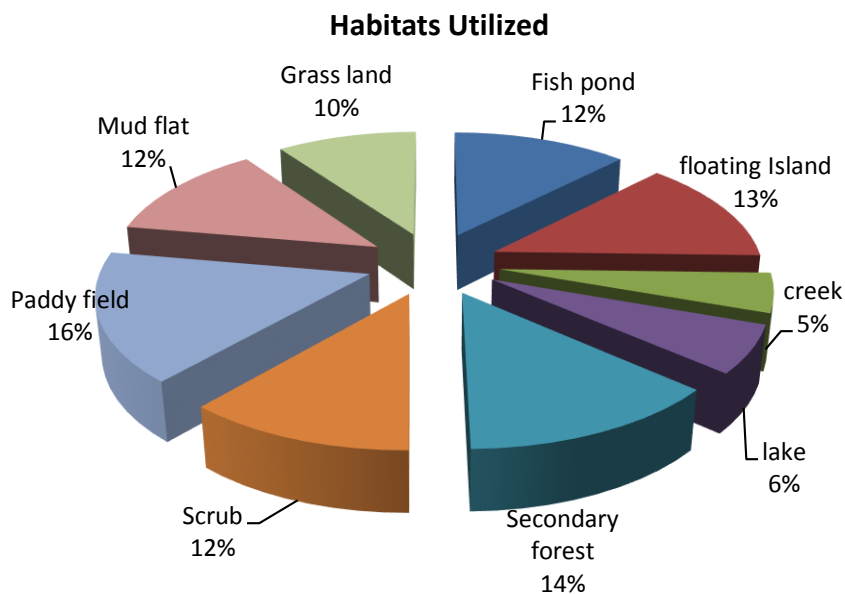


Figure 4Habitat representing Moeyungyi Wetland WS during the survey

5.1 Avifauna

Principle Investigator: Lay Win and Saw Moses (BANCA)

5.1.1 Methodology

Bird surveys were carried out according to the following methods:

The team conducted the survey by using boats to cover selected sites in the lake as well as on foot along the banks. The birds were observed in different habitats such as fish pond, floating island, creek, lake, secondary forest, scrub land, paddy fields, mudflats and grass lands.



Fish Pond



Floating Island



Floating island



Small Pond



Scrub land



Paddy field and secondary forest

Birds recorded were noted down together with GPS locations and also significant facts such as habitats and number of birds. Random recordings were also made along the waterways and embankment. Visual sighting with binoculars and auditory surveys were conducted along the banks and water ways. The team also used mist nets to identify reed warblers and release them, after recordings were made. Each bird identified was noted down and the quantity was also recorded.

5.1.2 Study Sites

In this survey, there are three parts of the survey areas, the north, the central and the south of the wetland. The team spent more time to search the bird in the north because the habitats there seem to be better than the others.

5.1.3 Results

A total population of 18,364 of birds' from 133 species under 51 families was recorded. The richest 2 species are from the family Ardeidae and the poorest 14 species are recorded from the family Ardeidae, Pelecanidae, Falconidae, Rallidae, Vanellidae, Cuculidae, Tytonidae, Coraciidae, Alcedinidae and Phylloscopidae. Among them, the maximum numbers of individual 3,218 birds were recorded in the species Little Egret *Egretta garzetta* and the minimum number of individual 1 bird was recorded from 14 bird species.

During the survey, a total of 133 bird species were recorded out of which 1 was found out to be Vulnerable (VU) and 4 Near Threatened (NT) species. The team managed to cover a relatively large area. The large number of birds can be seen due to the wintering of migratory birds.

Conservation Status: Reference to IUCN Red list (2013), 5 species of globally threatened species was recorded in this study.

Vulnerable (VU)

1. Sarus Crane *Grus Antigone*

Two birds were recorded by Saw Moses on 1st March from the north of the lake near Phalouk village at coordinate 17°30'59.56"N, 96°35'30.64"E and the birds use to come and feed in the paddy field everyday near the village according to the information from the villagers.

Near Threatened (NT)

1. Painted Stork *Mycteria leucocephala*

26 birds feeding around the small pond from the north on 25th February, 28 birds flying across the lake on 28th February and 30 birds feeding in the paddy field were recorded.

2. Black-headed Ibis *Threskiornis melanocephalus*

40 birds on 25th February, 8 birds on 26th February, 26 birds on 28th February and 7 birds on 1st March were recorded in the mudflat and fish pond.

3. Spot-billed Pelican *Pelecanus philippensis*

A single bird flew in the small pond during the team observed the other species on 25th February.

4. Oriental Dater *Anhinga melanogaster*

4, 3, 17, 8 and 9 birds were recorded in the floating island and water in the lake on each day of 25th, 26th, 27th, 28th February and 1st March respectively.



Insect catching net



Long-toed stint was caught in the net



Trying to save the bird



Final release of the bird

5.2 Mammals

Principal Investigator: Swe Swe Aung and Thaw Zin (BANCA)

5.2.1 Methodology

The data collection was randomly conducted in four ways:

- (1) Capturing mammals;
- (2) Observing mammals in the field;
- (3) Observation of track and signs such as footprints, scats feeding signs in their natural habitats, and
- (4) Interview survey.

The small carnivores and smaller mammals such as insectivores and rodents were captured by live traps, using both raw and roasted fish as bait. Mist netting was

conducted to capture the bats. Measurements of Head-and-body length (HB), Tail (T), Hind foot (HF), Ear length (E), Forearm (FA) (in bats) were taken for the captured mammals and identified the species based on the characteristics described in the field guide. The method of observing mammals in the field was conducted for the species of arboreal mammals such as squirrels and tree shrews. Track and sign observation was used for some small carnivores. All encountered signs and footprints were examined, photographed and measured on width and length by using vernier calliper. The presence or absence of the very well-known mammal species was confirmed by interviewing local people already familiar with the forest. All data collected in the survey area were recorded in the field data sheets.

5.2.2 Results

A total of 12 mammal species belonging to 9 genera, 6 families and 4 orders were captured and recorded in the Moeyungyi Wetland WS during the survey period of seven days. These are 1 species of Insectivores, 4 species of Bats, 1 species of Carnivores and 6 species of Rodents. Although a staff of WCS informed the presence of squirrels, no squirrels were found on trees of some man-made islets being approached during the survey period. There is no endemic or globally threatened species of mammals according to the IUCN Red list (2013).



Mist netting for bats



Taking measurements



Placing live traps



Notes on small insectivores

Only 1 species of insectivorous mammal was recorded in the survey area.

Genus *Suncus*

Suncus murinus House Shrew - This species is widespread and abundant in disturbed areas; apparently introduced in some areas, including the Philippines (Francis 2008). One alive House (or Musk) Shrew was caught by a live trap in disturbed habitats near Thoneeainsu village environ and one hand captured juvenile House Shrew was collected under the guest house of Moeyungyi Resort.

Notes on Bats

Four species of bats were documented in the study area.

Genus *Rousettus*

Rousettus leschenaultia Leschenault's Rousette-This species is not currently at risk (Francis 2008). The two dead bodies of fruit bat Leschenault's Rousette were collected from the mist nets of local people set for some edible insects especially Giant Water Bug (Local name; Belar).

Genus *Taphozous*

Taphozous longimanus Long-winged Tomb Bat-This species is not currently at risk (Francis 2008). One alive and four dead bodies of Long-winged Tomb Bat were collected from the mist nets of local people.

Genus *Myotis*

Myotis muricola Asian Whiskered Myotis –This species is not currently at risk (Francis 2008). Hand captured Asian Whiskered Myotis was found on tree trunk near the guest house of Moeyungyi resort.

Genus *Scotophilus*

Scotophilus heathii Greater Asian House Bat –This species is not currently at risk (Francis 2008). One alive and one dead body of Greater Asian House Bat were collected from the mist nets of local people.

Notes on small Carnivores

Only one species of Carnivores was recorded during the survey.

Genus *Herpestes*

Herpestes javanicus Small Asian Mongoose –This species is not currently at risk (Francis 2008). IUCN Status: Least Concern ver 3.1 Pop. Trend: unknown. One dead body hunted by local people and one alive Small Asian Mongoose was caught by live trap set in the shrubby habitat near Targwa village. This is the largest mammal of Moeyungyi recorded during the survey period. According to the habitat preference and the information from local people, it can be considered that only the Small Asian Mongoose is present in the survey area. The Mongoose is hunted for food by some local people.

Notes on small Rodents, Rats and Mice

A total of six species of Rat and Mice were documented in the survey area. Of these species, Norway Rat and three species of Bandicoot Rats are hunted for food by most of people live in the villages near Moeyungyi WS.

Genus *Rattus*

Rattus rattus House Rat- not currently at risk; considered as pest in most areas (Francis 2008). One alive specimen was captured by live trap set in herbaceous vegetation near the restaurant of Moeyungyi Resort.

Rattus norvegicus Norway Rat–Not currently at risk; non-native in most of region and usually considered as pest (Francis 2008). A total of three specimens of Norway Rat were collected; two from live traps set in agricultural fields near ThoneEainsu village and one from near Moeyungyi Resort.

Genus *Bandicota*

Bandicota indica Greater Bandicoot Rats - Not currently at risk: very common and considered as pest in some areas; hunted for food (Francis 2008). A total of five alive Greater Bandicoot Rats were captured in wet swampy areas between Thoneeainsu village and Moeyungyi Resort.

Bandicota savilei Savile's Bandicoot Rats - Not currently at risk; locally abundant and considered as pest in some areas; also hunted for food (Francis 2008). Two alive of this species were collected by live traps; one from herbaceous marsh habitat near ThoneEainsu village and one near Moeyungyi Resort.

Bandicota bengalensis Lesser Bandicoot Rat - Not currently at risk; considered as pest in many areas (Francis 2008). One alive Lesser Bandicoot Rat was captured by live trap near Thone Eain su village.

Genus *Mus*

Mus cervicolor Fawn-colored Mouse - Not currently at risk (Francis 2008). One alive was captured in the rice field near Moeyungyi Resort.



House Shrew



Leeschenault's Rousette



Long-winged Tomb Bat



Asian Whiskered Myotis



Greater Asian House bat



Small Asian Mongoose



24 House rat



Norway Rat



Greater Bandicoot Rat



Savile's Bandicoot Rat



Lessser Bandicoot Rat



Fawn-colored Mouse

5.3 Herpetofauna

Principal Investigator: Min Kyaw Thura and Min Thein Htet (BANCA)

5.3.1 Methodology

A random survey was carried out by Herpetology team in the study area and its surroundings. Surveys were made twice a day during day and night periods. Reptiles and amphibians were surveyed by direct observation and focused on aquatic micro-habitats. Visual observations, documented when possible by photographs, were made of some captured specimens that were not collected for preservation. These included protected species and also species for which large series had already been collected. Wherever possible, animals were captured by hand with the aid of long stick caliper. Latitude and longitude of collected localities were recorded using a Garmin GPS map 78 s. Photo records were taken by digital camera (Cannon Sx280 HS with lens 20 x IS). Their morphometric characters and measurement of each specimen were recorded such as sizes, shapes, patterns, spots, stripes, colour and body length in the data sheet. The specimens were measured in the analysis, as snout, vent length (SVL), tail length (TL), head length (HL), head width (HW), tail scale (TS), and scale row (SR) were conducted using caliper and measuring tape.

Pitfall trap

Two arrays were located in each of two habitat types: near the small pond and on land among leaf litter. Arrays were placed in areas with little to no vegetation (Tuberville et al. 2005). Arrays consisted of dark vinyl sheet held in place by wooden dowels or stakes. Two primary transects (each 30 ft long) were placed in each of the appropriate habitats. The primary transect was in the same straight line without any transect.



Figure 5 Study Site close to the Moeyungyi Resort

Three buckets were evenly placed at an interval of 15 ft along the transect line (see below). The buckets were plastic bucket with smooth wet lander wall to prevent the animal from escaping. They were buried in the ground to a depth of 1 ft so the rim was as the same level of ground. A small amount of litter or dry leaves was put in the buckets as a temporary shelter for the animals that were trapped inside the buckets. The buckets were checked once daily in the early afternoon to minimize exposure time for captured individuals. Captured individuals were identified using *A Field Guide to the Reptiles of Thailand and South-east Asia* (Indraneil Das 2010). They were recorded, measured, marked, photographed, and subsequently released back into the area of capture.

5.3.2 Results

A total of 24 species of amphibians and reptiles were captured or observed during the survey period. These included 6 frogs, 1 turtles, 8 lizards and 9 snakes. The 6 species of frog belong to two families Microhylidae and Ranidae; one species of turtle belong to the family Emydidae; 8 species of lizard belong to three families



Placing bucket as a trap



Searching for reptiles



Photo by BANCA

Catching snake with clipper



Placing a trap



Placement of Arrays

Agamidae, Gekkonidae and Scincidae and 9 species of snake belong to five families Natricidae, Homalopsidae Colubridae and Xenopeltidae. Two arrays were placed in two places; near the small pond and on land among leaf litter in the survey area. Three amphibians and three reptile species were trapped in plastic buckets of pitfall traps. But those species were also encountered on ground and among leaf litter respectively. Among them, one species of turtle is endemic species. Among 8 species of snakes, two species are venomous snake. These two species come from only one family Elapidae.

Status and species conservation: According to the conservation status by IUCN Red List (2013), one turtle *Moreniaoccellata* was recorded as Vulnerable (VU), three species of frogs and five species of snakes were as Least Concern (LC). This turtle species was listed in CITES (2013). Moreover, the turtle is endemic species of Myanmar.



Hyloran macrodactyla



Occidozyga lima



Gekko gekko



Eutropis multifasciata



Morenia ocellata



Bungarus fasciatus



Naja kaouthia



44 Dead snakes in fish-net

5.4 Flora

Principal Investigator: Dr. Khin Swe Oo, Dr. Kyaw Zay Moe (Bago University) and Thet Tun (BANCA)

5.4.1 Methodology

In this study, a total of (54) study sites were included in which (24) study sites were data collections of the upland and wetland plants and (30) study sites were sampling points using quadrats in this wetland vegetation

Frequency classes of wetland vegetation

To clarify the relative frequency of different herbaceous plant species for this wetland vegetation, (30) quadrats (10 x 10 m each) were set up for emergent and floating-leaved macrophyte communities and the data were calculated by the following equation for RF% value of the wetland vegetation.

$$\text{RF} = \frac{\text{No. of points of occurrences of the species}}{\text{Total numbers of quadrats studied}} \times 100$$

The spatial location (latitude and longitude) of each quadrat was recorded using a Global Positioning System (GPS). In these 30 quadrats, a total of (18) quadrats was set up for emergent macrophyte community and (12) quadrats for floating-leaved macrophyte community.

Taking photographs, making voucher specimens and specimen collections of both the upland and wetland plants were carried out.

Species identification

The identification was made by available literature in the department of Botany, Bago University and some photo-specimens were matched and verified with International Plant Names Index (<http://www.ipni.org/ipni/plantnamesearchpage>) and other available identification websites. The plant specimens were alphabetically arranged in accordance with their families and presented together with their local names.

5.4.2 Results

A total of 74 plant species belonging to (33) families were identified and presented in which Poaceae (13 species), followed by Asteraceae (8 species), Cyperaceae (6 species), Fabaceae (4 species), Acanthaaceae, Araceae, Nymphaceae (each 3 species), Commelinaceae, Convolvulaceae, Hydro-charitaceae, Lentibulariaceae, and the rest families were only (1) species respectively. In this study, some specimens were found in missed local names when specimens were matched with available literatures. In such a case, these missed local names were omitted and expressed as “Nil”.

Plant relative frequency of wetland vegetation

The relative frequency classes (RF%) of emergent and floating-leaved macrophytes of this wetland was presented. Quadrats were not used in floating macrophytes. Only first class of plants that provide ecological services to the migratory birds or local birds, were included as their food habitats, landing platform or nesting sites. The relative frequency (80-100%) and their constancy (E) classes of plant species from these two communities were extracted and mentioned in this paper.

Flora Survey Photos



5.5 Fish

Principal Investigator: Moe Moe Myint, Zaw Lin Htun and Tint Wai (BANCA)

5.5.1 Methodology

The fishery study group started their studies from Moyungyi resort base camp, gradually visited to selected sampling sites in lake, villages and at fish market, day by day using a motorized local boat and motorbike. The team traveled in the wetland area to collect fish samples and recorded the GPS points of the target sampling sites. Utilized fishing gears of Moyungyi Wetland WS were also recorded during the study period and all recorded data were input into fishing log sheet.

In the survey, the team practiced three kinds of methods in data collection. Interview, market observation and specimen collection was conducted at 13 sampling sites of Moyungyi Wetland WS. Interview, to know current fisheries status of Moyungyi area includes fish species and utilized fishing gears of the study area. For visual observations in the survey, the team practiced three kinds of methods in data collection: interview, market observation and specimen collection were conducted at 13 sampling sites of Moyungyi Wetland area. Interview, to know current fisheries status of Moyungyi Wetland includes fish species and utilized fishing gears of the study area. Visual observation at markets was taken in two markets, Pyinpongyi market and Wanbeiwetland market, to record various local species. Specimen collection was carried out at seven villages, two markets and four fishing sites of Moeyungyi Wetland for species identification.

In the survey, a scoop net and a gill net were used in fishing for small fishes. They lived in lowland water habitat, mostly for juvenile fishes such as *Puntius sp*, *Systemus sp*, *Channa sp* and *Badis sp*. Commercial fish specimen were observed and collected in a target point of Moeyungyi Wetland with the help of fishermen and some market-fish of Pyinpongyi and Wanbei inn were also observed for species composition. Fishermen, village authorities and villagers at each village were interviewed for fish and fishery information.

Status and Species conservation

There are five species recorded in this survey which assumed by the conservation status of IUCN Red List (2013) as Near Threatened (NT). The rest 28 species are recorded as Least Concern (LC). See detailed list in Annex.

List of IUCN Red List of Fish Species

No	Family	Scientific name	Local name	IUCN status
1	Cichlidae	<i>Tilapia mossambica</i> (Peter,1852)	Tilapia/ Ngaphe ma	NT (2007)
2	Cyprinidae	<i>Osteobrama belangeri</i> (Valenciennes,1844)	Nga phe aung/ phan ma	NT (2010)
3	Cyprinidae	<i>Catla catla</i> (Hamilton,1822)	Nga own ton/ nga gaung	NT (2010)
4	Siluridae	<i>Ompok bimaculatus</i> (Bloch,1794)	Nga nu than	NT (2010)
5	Siluridae	<i>Wallago attu</i> (Bloch &Schneider,1801)	Nga but	NT (2010)



Survey at Fish Market



Conversation with fishers



Fish survey photographs



Electric-shock fishing equipment

Collected fish specimens were identified and photographed at the camp and some species were identified on the spot at sampling site. They were tagged and then preserved in 10 per cent formaldehyde solution for further identification at the base camp.

In the identification process, references such as Talwar and Jigra (1991), Inland fishes India and adjacent country, Chavalit vidthayanon, Apichart termvidchakron and Myint Pe,(2005) Inland fishes of Myanmar and Carl J. Ferraris, jr (1995) Identification guide to the commercial inland fishes of Myanmar, TCP/MYA/4553.(draft) were referred.

In the identification process,

- Talwar and Jigra (1991), Inland fishes India and Adjacent country,
- Chavalit vidthayanon, Apichart termvidchakron and Myint pe,(2005) Inland fishes of Myanmar, and
- Carl J. Ferraris, jr (1995) Identification guide to the commercial inland fishes of Myanmar, TCP/MYA/4553 (draft) were referred.

5.5.2 Results

A total of 37 fish species were observed during the survey period and their occurrences in the respective townships are described. A total of 31 species were observed in Bago Township area and 29 species were comprised in the Waw Township of Moeyungyi Wetland boundary. Altogether 37 species, 31 genera under 23 families were recorded.

The highest species composition at fish landing site was found in Pyinpongyi site with 26 species and the lake sites were found to be lowest quantity with 8 species. *Notopterus notopterus* (Nga lar/Nga phe) was the dominant species in the survey area. *Channa punctatus*, *Channa striata* and *Heteropnustes fossilis* were followed as second, *Parambassis ranga*, third and *Osteobrama belangeri*, *Macrognathus aral*, fourth and others 5,6,7,etc respectively.

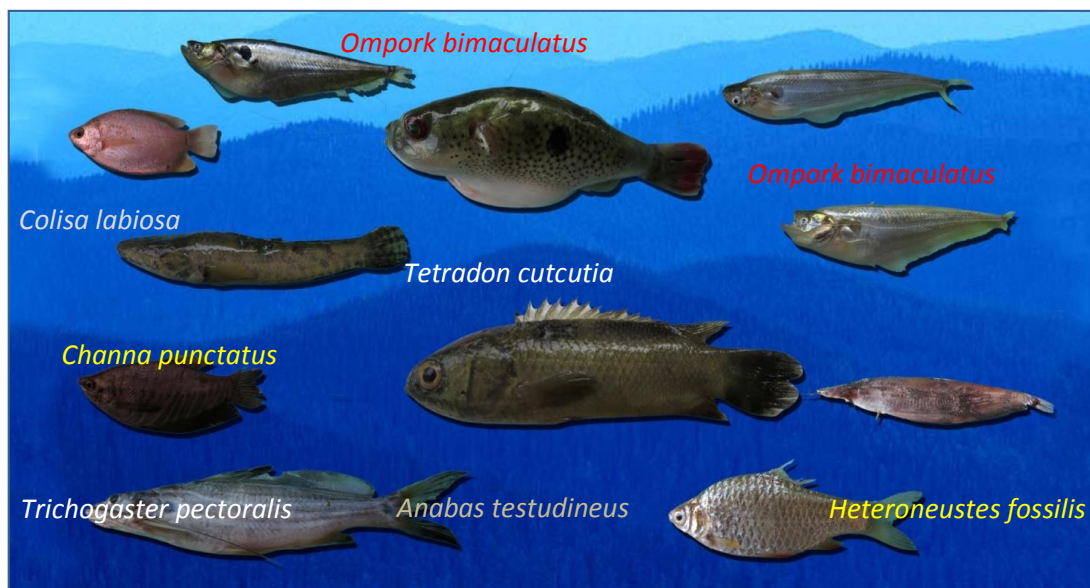


Figure 6 Some Fish Species of Moeyungyi Wetland Bird Sanctuary

Fishing implements

A total of 13 types of fishing gears were recorded in the survey period as small scale fisheries. Push net (Yin ton), Set gill net (Tar pike), long line (Nga myar tann), Pole and line (nga myar tan), Trap (Myone), Beach seine (Swe pike), Stationary bush park (Chone cha) and Electric-shock fishing gears were found primarily in Moeyungyi wetland area during the survey period.



Some Fishing Gears in Moeyungyi Wetlands

5.6 Entomology

Principal Investigator: Naing Naing Win and Kyaw Naing Oo (BANCA)

5.6.1 Methodology

Random survey method was conducted around the Moeyungyi Wetland WS along the trails or pathways. Identification of butterfly species was primarily made directly in the field. In some cases, if the encountered butterflies were not identified directly in the field, they were collected by using the long-handled aerial nets and then, the collected specimens were observed and recorded for their morphological characters such as patterns, spots, stripes and color. Their mouth part was carefully examined and the body and wing's length measured. And photos were taken by using the camera. After that, the specimens were released back to the original place. Unidentified by sighting species were kept separately in the triangle envelopes and recorded the collection date and the location of collected points (GPS coordinates) on the envelopes. All separated envelopes were preserved in the airtight plastic containers to avoid humidity and also put mothballs inside containers to prevent from the growth of mold.



Insect collection with Aerial Nets

Also battery operated light traps were used for collecting insects by placing the light trap in or about the middle of a suitable site (vegetation type) and left over night. All collected insects were identified the following morning and released back.



Equipment used for insect survey

5.6.2 Results

A total of 41 different butterfly species belonging to 8 families and 89 genera under the order Lepidoptera were recorded in the study area representing families of Papilionidae (2 species of 2 genera), Pieridae (16 species of 8 genera), Danaidae (6 species of 2 genera), Satyridae (2 species of 2 genera), Nymphalidae (6 species of 4 genera), Riodinidae (2 species of 2 genera), Lycaenidae (5 species of 4 genera) and Hesperidae (2 species of 1 genera) during the survey period of 7 days

List of some insect species from Moeyungyi Wetland WS



Eurema andersoni



Danaus limniace



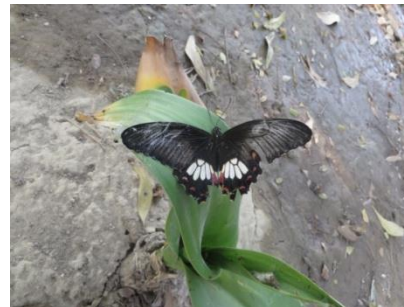
Euploea core



Dysphania militaris



Junonia atlites



Papilio polytes



Lethocerus americanus



Hydrophilus triangularis

Nine families consisting of 14 species of beetle were recorded in the study during the survey period. These families are Scarabaeidae (3 species), Carabaeidae (2 species), Hydrophilidae (1 species), Cicindelidae (2 species), Cerambycidae (1 species), Lucanidae (1 species), Passalidae (1 species), Coccinellidae (2 species) and Buprestidae (1 species). In addition, 5 species of dragonfly and 7 species of other insects (water bug, moth, cricket, spider and red ant) were also encountered.

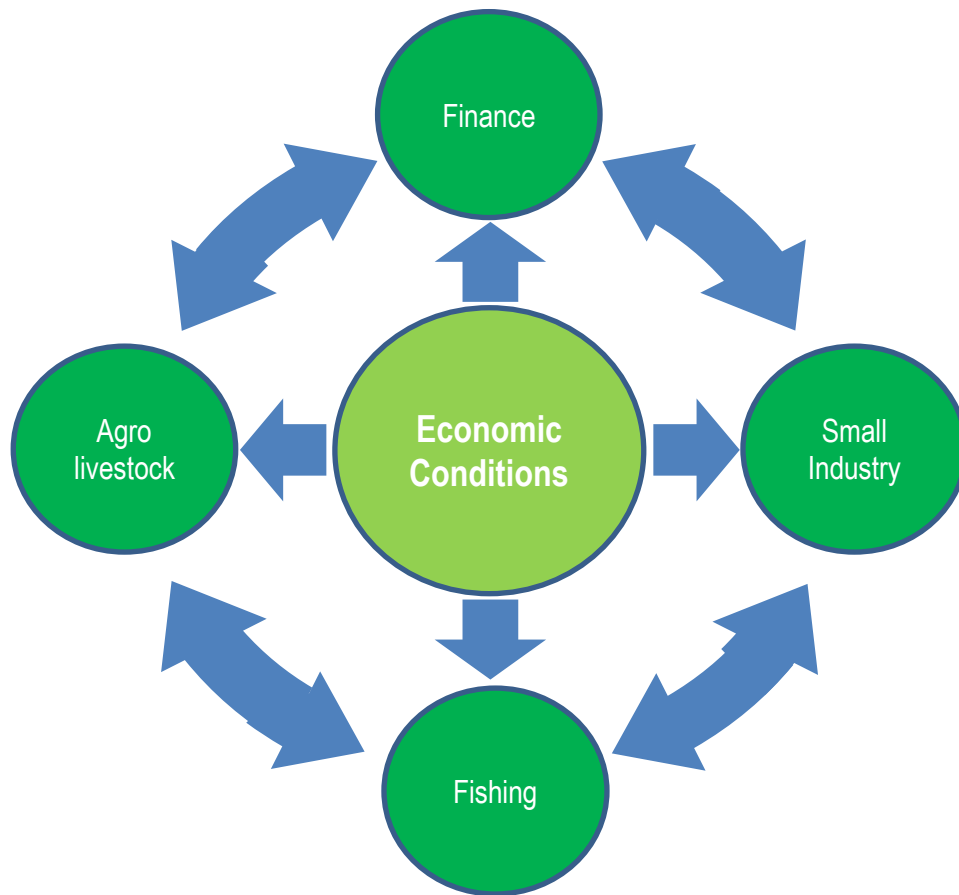
Conservation Status: According to the IUCN Red data list 2013, 4 species of butterfly namely; *Eurema andersoni*, *Eurema brigitta*, *Euploea core* and *Junonia almanac* was listed as Least Concern (LC).

6. SOCIAL SURVEY

Principal Investigator: Dr. Min Aung Pan (Bago University)

6.1 Methodology

Questionnaire surveys were conducted during the period from 24-2-2014 to 2-3-2014. The 8 villages around the wetland have 1,117 households of which 160 were selected as sample households to which the questionnaires were distributed. It represents more than 10 percent of the total households. Some 44 responses were not complete and thus, the responses to 120 questionnaires were analyzed together with information from open talks and discussion with the local inhabitants. Therefore, the analysis was solely based on the primary data for the assessment by using simple statistical methods as well as certain UNDP indicators and MHRD indicators.



Economic Factors

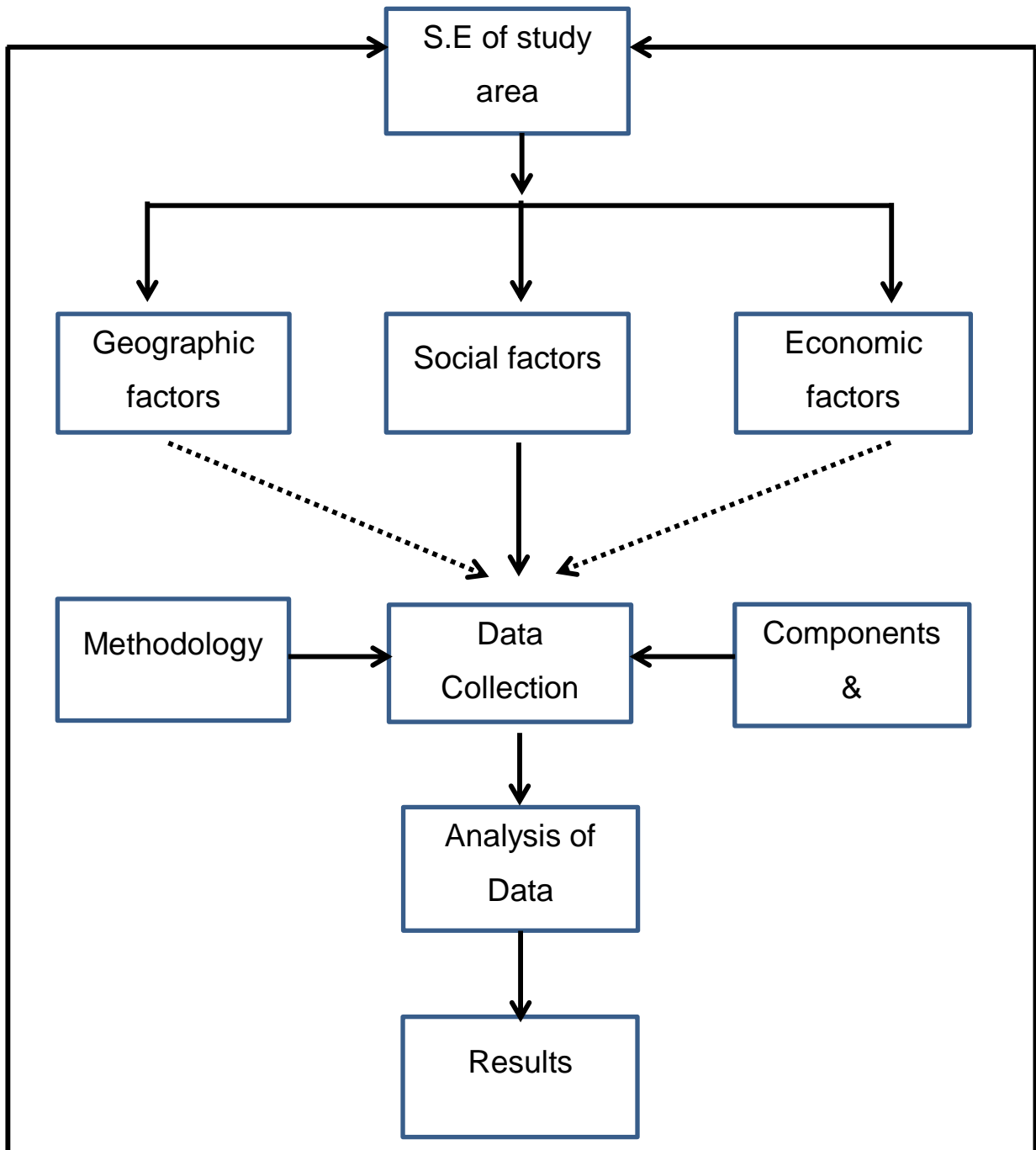


Figure 7 Conceptual Framework of the study area for social survey

COMPONENTS AND INDICATORS OF SOCIO-ECONOMIC IMPACT CONDITIONS

No.	Components	Indicators	Condition	Expression
1	F Family Life	1	Happiness & Satisfaction on Life	Percentage
		2	Public Safety on Life	Percentage
2	ØEducation	3	Literacy	Percentage
		4	Graduated Condition	Percentage
3	"Health	5	Fly Proof Toilet Utility	Percentage
		6	Medical Staff: Population	Ratio
4	"Material Possession	7	Owned House	Percentage
		8	Owned Telephone	Percentage
5	Å Occupation Status	9	Livelihood depend on Inn	Percentage
		10	Main Job Function	Percentage
6	ØFinance	11	Income (per day)	Percentage
		12	Expense (per day)	Percentage
7	Å Human Activities	13	Positive Impacts	Percentage
		14	Negative Impacts	Percentage

Source : F Malaysia QOL (2002)

Ø UNDP's HDI Report (2005)

" Myanmar Human Resources Development Indicators (MOL-2003)

Å Field Survey Observation

Fig. 6.2 Component and Indicators of Socio Economic Impact Conditions

6.2 People in the vicinity of Moeyungyi Wetland Wildlife Sanctuary

6.2.1 Population

The number of population gives hint to the impact potential of people upon the wetland. The area around the wetland altogether has 17 villages of which this study was concerned with only 8 villages, 4 included in Waw Township (Tarkhwa, Hpalauk, Kapin and Puchaung) and another 4 included in Bago Township (Pauktaw or Hlayseik, Hpalauktan, Thoneeinsu and Tarsone). According to fig. 5.1 and fig. 5.2, there are 55 people in TarKhwa, village (25 males and 30 females), 264 people in Hpalauk village (107 males and 157 females), 174 people in Kapin village (859 males and 882 females), 1080 people in Puchaung village (400 males and 680 females), 95 people in Pauktaw (Hlayseik) village (40 males and 45 females), 260 people in Hpalauktan village (120 males and 140 females), 1141 people in Thoneeinsu village (551 males and 591 females), 1285 people in Tarsone village (610 males and 675 females).

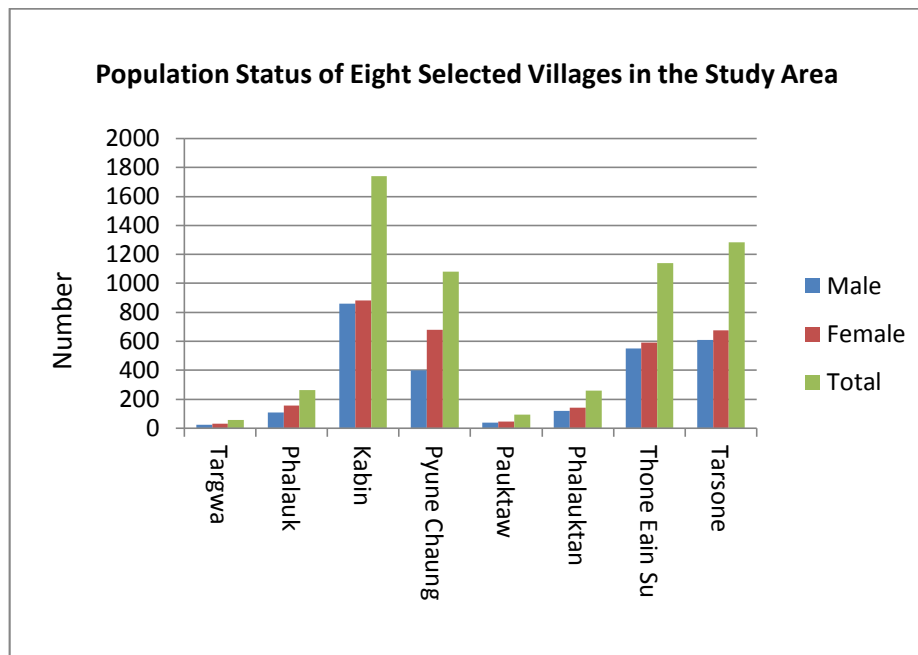


Figure 8 Population Status of Eight Selected Villages in the Study Area

Thus, Kapin village has the largest number of population, followed by Tarsone Village, while Tarkhwa village has the least. Kapin village is located on the eastern shore of the wetland and the inhabitants are engaged in fishery, catching bilas, agriculture and bamboo cutting. Having more jobs for livelihood, the village is more populated than others. The relative large number of population in Tarsone village is attributable to being located besides the Yangon-Mandalay road and engaged in fishery and fish depot and agricultural activity. The small number of population in Tarkhwa village is due to being occupied by people that come from other places with no experience in fishing. According to field surveys, 44 percent of the households came from Htani village (Maubin Township) of Ayeyarwady Region in 2011. Likewise, 43 percent of households in Pauktaw (Hlayseik) village are migrants from Nyaungdone and Maubin Township of Ayeyarwady Region, attracted by the fishery of the wetland.

6.2.2 Race and Religion

Based on the responses to the interviews, all the inhabitants living in the selected 8 villages are Bamars. Being Bamars, all are Buddhist adherents with pagodas, Buddha image, Sima, Monastery and hall for religious purpose in these villages. The cult of "Namkarine", a tradition handed down from Hantharwady Era is common among them, represented by shrine of "Nat" for "Nankarine"



Kapin village monastery

6.2.3 Households and Housing conditions

In the villages included in Waw Township, there are 18 households (1.6%) in Tarkhwa village, 47 households (4.2%) in Hpalauk village, 287 households (26%) in Kapin village and 200 households (18%) in Pyunchaung village. In Bago Township, Pauktaw (Hlayseik) village has 37 households (3.3%), Hpalauk village 62 households (6%), Thoneeinsu village 228 households (20.4%) and Tarsone Village 238 households (21.3%). The house types which reflect the socio-economic status are highly different.

Among the 200 houses in Pyunchaung Village 4 (2%) are brick buildings, 75(38%) wooden buildings and 12 (60%) wood and bamboo buildings: This indicates that the majority are low and moderate income families. In Bago Township, Pauktaw (Hlayseik), being a recently established village, has only 37 houses, including 2 wooden houses (5.4%), and 35, wood and bamboo houses (95%). Most villagers depend on fishery and hence income is fairly low. Hpalauktan village has 62 houses of which 7 are brick houses (11.3%), 30 wooden houses (48.4%) and 25 wood and bamboo houses (40.3%).

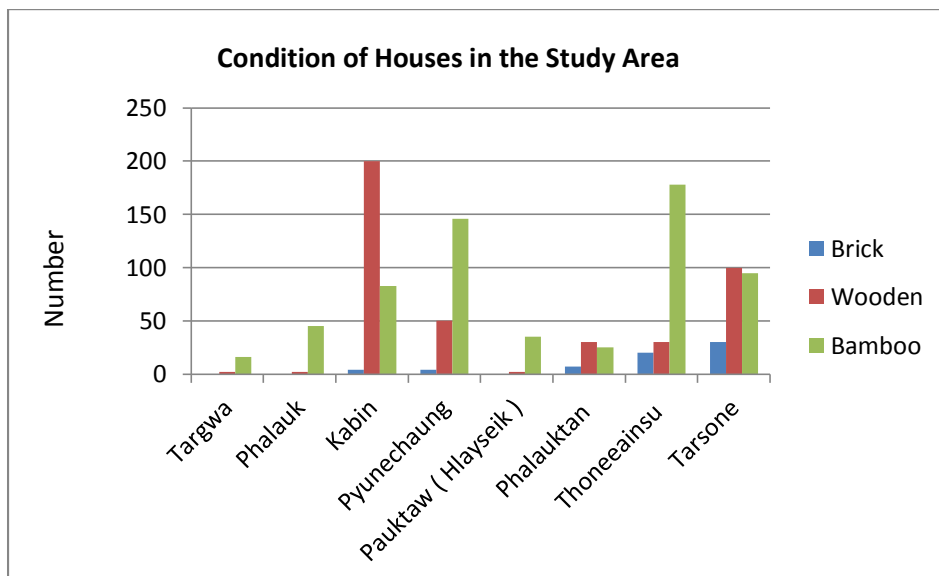


Figure 9 Condition of Houses in the Study Area



Different Housing types in the study area



Cheroot making industry

Thus, the majority has moderate socio-economic status. Thoneeinsu village has 228 houses including 20 brick houses (8.8%), 30 wooden houses (13.6%) and 178 wood and bamboo houses (78%). The village has cheroot making industry, fishery, agriculture and other service activities. However, the majority earn only small income, though a few are fairly well off. Tarsone has 238 houses including 30 brick houses (1.3%), 100 wooden houses (42%) and 95 wood and bamboo houses (40%). The village has farming (agriculture), fishing Industry and others. The majority earns fairly/moderate income for their life.

6.2.4 Education

Education standard and public health care service reflect the socio-economic conditions of the areas concerned. Tarkhwa, Hpalauktan and Pauktaw (Hlayseik) have no school, being very small villages. The children of these villages can attend the schools in the neighboring villages. There is primary school each in Phalauk, Kapin, Pyunchaung, Thoneeinsu and Tarsone villages.

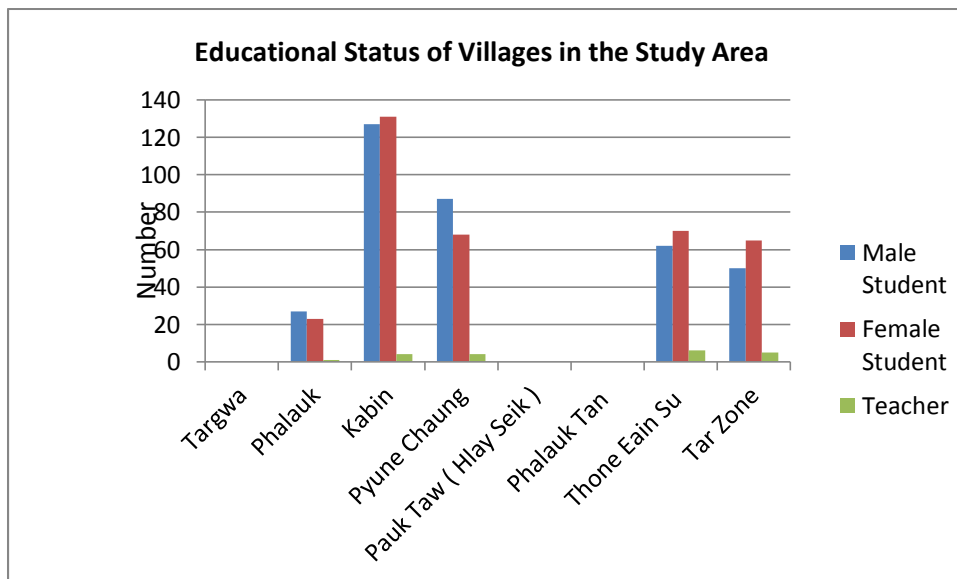


Figure 10 Educational Status of Villages in the Study Area

The primary school in Phalauk was opened on self-help basis in the 2013-14 academic year with 50 students run by a teacher. Thus, the teacher-student ratio is 1:50. Kapin BEPS has 254 students and 4 teaching staffs in 2013-14 and the teacher-student ratio was 1:64. Pyunchaung BEPs had 155 students and 4 teaching staffs and the teacher-student ratio was 1:38. With 132 students and 6 teaching staffs in Thoneeinsu BEPs, the teacher-student was high with 1:22, good for effective teaching. Tarsone BEPS had 115 students and 5 teachers in the 2013-14 academic year, resulting in a teacher-student ratio of 1:23. Except Kapin BEPS, the teacher-student ratios in other schools are fairly high for effective teaching.



Figure 11 Self-help Primary School at one of the villages

6.2.5 Health

Public health care is one of the prime needs for every citizen. Usually most rural areas of Myanmar have no sufficient health facilities and health care personal. There is no rural health care center in the 8 selected villages. Whenever they suffer ill-health they have to go to Pyinbongyi dispensary or to the traditional medicine practitioner in Kapin Village. There is a small local health center near Kapin Village, usually served by a midwife. For emergency or serious cases, they have to go to Waw Township Hospital. The inhabitants of Pauktaw take treatment at Pauktaw Ywama which has a midwife. The lack of rural health care center in these villages is due to being a small village. In general, there are a total of 8 medical staffs in the study area that includes traditional practitioners, midwife, nurse, health assistant etc. Therefore, the health condition of the local inhabitants is not so bad, though the villages have no health related facilities.

6.2.6 Settlement Pattern

Generally the 8 selected villages are located on the shore of the wetland and the shapes of villages are oriented by the alignment of the shore. Hpalauktan, Thoneeinsu and Tarsone villages are located beside Yangon-Mandalay road and thus, they have a linear shape. Tarkhwa and Hpalauk villages have linear shape, being developed along

Pakaing Embankment, whereas Kapin Village has a nucleus shape being aligned by Pakaing Embankment and the sluice gate of the wetland. Pyunchaung Village, located to the southeast of the wetland has nucleus shape, while Pauktaw (Hlayseik) has linear shape, being developed along the southern embankment.

6.2.7 Recreation

People need recreation to relax the stress caused by heavy manual labor, low income and social conflicts. For the rural inhabitants, they relax themselves by watching, TV or DVD, listening radio and playing in the open space. According to field survey records, there are 2 TVs, 2 DVDs in Tarkhwa village, 10 TVs are at Hpalauk village, 200 TVs and 2 Satellite Dishes in Kapin village, 50 TVs and 6 Satellite Dish in Thoneeinsu village, one Skynet Dish and 2 Satellite Dish in Pyunchaung village, 50 TVs and 5 Satellite Dish in Hpalauktan village and 3 TVs in Pauktaw village.

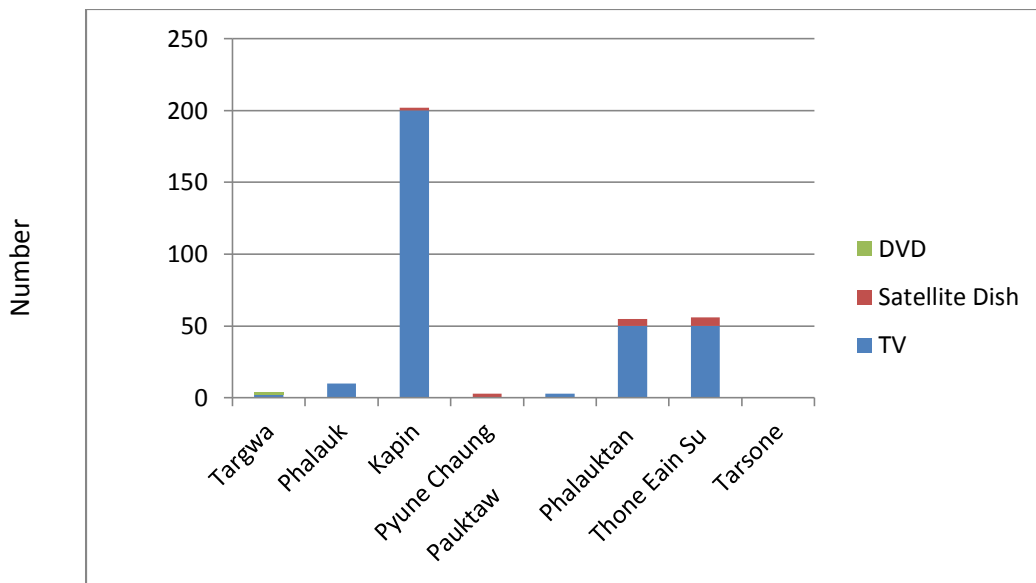


Figure 12 Recreational Media at Villages



A house with a satellite dish

7. ECONOMIC FACTORS

7.1 Agriculture

In Waw Township, there are two peasant households (11%) out of 18 in Tarkhwa Village, 15 (32%) out of 47 in Hpalauk Village, 174 (61%) out of 287 in Kapin Village, and 20 (10%) out of 200 in Pyunchuang Village. Among the 4 selected villages in Bago Township, 2 (5%) out of 37 households in Pauktaw (Hlayseik) Village, 10 (16%) out of 62 households in Hpalauktan Village, 30 (13%) out of 228 households in Thoneeinsu Village, and 50 (21%) out of 238 households in Tarsone Village mostly depended on agriculture.

The areas encroached over the wetland area are 20 acres by Hpalauk Village, 10 acres by Kapin Village, 100 acres by Pyunchuang Village, 89 acres by Phalauktan Village, 10 acres by Thoneeinsu Village, totaling 229 acres. The total encroachment area over the wetland is 1080 acres, covering (21%) of the Moeyungyi Wetland area.

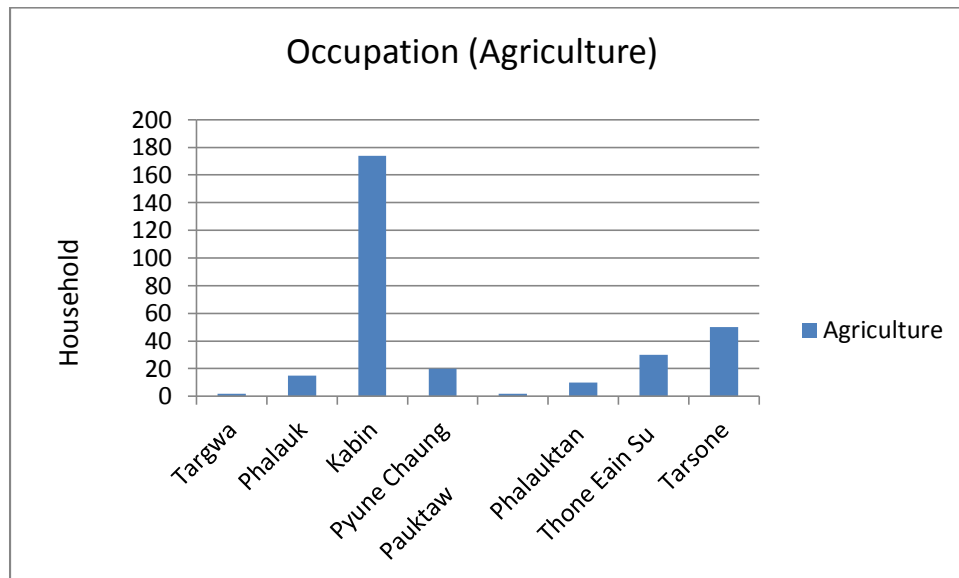


Figure 13 Number of Households engaged in Agriculture



Water supply for Agriculture in summer



Sluice gate for irrigation water

In Waw Township, there are two peasant households (11%) out of 18 in Tarkhwa Village, 15 (32%) out of 47 in Hpalauk Village, 174 (61%) out of 287 in Kapin Village, and 20 (10%) out of 200 in Pyunchuang Village. Among the 4 selected villages in Bago Township, 2 (5%) out of 37 households in Pauktaw (Hlayseik) Village, 10 (16%) out of 62 households in Hpalauktan Village, 30 (13%) out of 228 households in Thoneeinsu Village, and 50 (21%) out of 238 households in Tarsone Village mostly depended on agriculture.

According to the responses to the questionnaires distributed to 30 farming households out of 120 in the 8 selected villages, 2 household (7%) in Tarkhwa Village grow (50%) short-lived and medium-lived paddy varieties each half the land holdings are less than 5 acres each and the another half more than 10 acres each, of which (50%) yield 25-50 baskets per acre and the remaining half (50%) over 50 baskets per acre. Both households (100%) had more than 10 years in farming experience and both are the land owners. Buffaloes are used in the farm work. Paddy is grown in the rainy season as well as in summer. Both households use chemical fertilizers and pesticides.

7.2 Fishery

Fishing is main industry in the study area. In Waw Township there are 14 fishing households (78%) out of 18 in Tarkhwa village, 28 (60%) out of 47 in Hphalauk village, 113 (39%) out of 287 in Kapin village, and 170 (85%) out of 200 in Pyunchuang village. Among the 4 selected villages in Bago Township, 32 (81%) out of 37 households in Pauktaw (Hlayseik) Village, 47 (76%) out of 62 households in Hpalauktan Village, 50 (22%) out of 228 households in Thoneeinsu Village and 34 (14%) out of 238 households in Tarsone village depend on fishery.

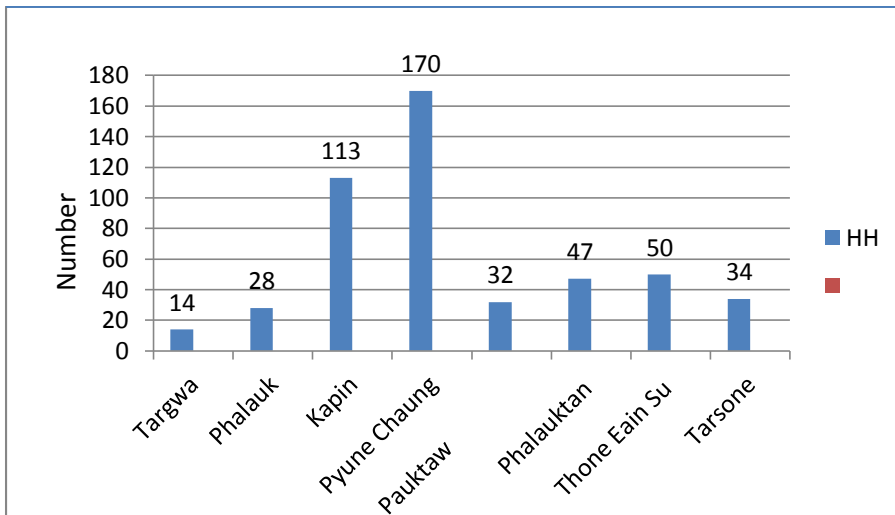


Figure 14 Number of Fishing HH and percentage of total HH

In summary, there are 1,117 total households in the study area that include 303 household of farming (27%) of total households, 488 households of fishing (44%) of total households, 398 households of traditional fishing (36%) of total households, 88 households of electric shock fishing (8% of total households and 18% of total households fishing) and others 326 (29% of total households.) Therefore, we can say that the 8 selected villages are mostly depend on fishing industry

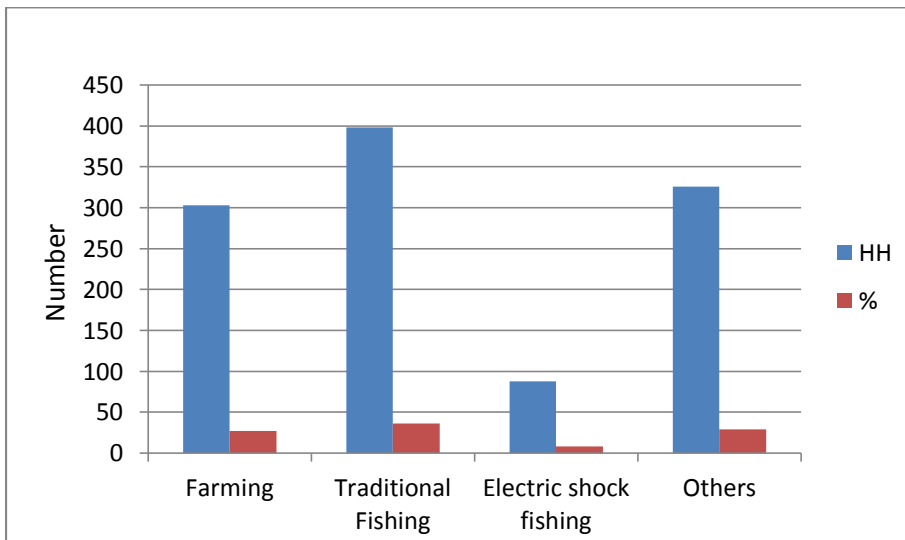


Figure 15 Farming, Fishing and Others in the study area

7.3 Occupation and Ownership

Working condition of occupation whether good or bad indicates in sense, the economic activities of the people concerned. Occupation differs as agriculture, fishing industry, services and others. According to Annex 2 and field survey records, among the 120 sample households, the major occupations are consisted of 30 (25%) agriculture households, 158 (49%) fishing households, 16 (13%) services households and 16 (13%) other households. Migration may reduce for human resource of the study area. Some natives move temporarily to other places for job that include 8 households, 7 persons

out of 120 in 2014. These household migrated to places like 2 to Malaysia, 3 to Thailand, 2 to Yangon and 1 to Mon State. Fishing is the main occupation in the study area.

Ownership is one of the most important indicators to measure the economic activities of the study area. The economy depends on largely on the ownership of the basic necessities, namely house and other facilities such as, motor car, telephone, TV set, satellite dish, boat, htawlargi, electrical household appliances. Among these facilities ownership of the house and telephone are the most important to measure economic activity of the study area. According to the Annex 5b, 119 owned houses (99% of total sample households) and 20 households owned telephone (17% of sample total households) of the study area.

Therefore, the inhabitants are mostly strong condition for the ownership of housing but, it has a little weak condition concerning possession of telephone.

7.4 Income and Expense

Income and expense are important for the local communities. Income and expense are concerned with economic condition of the communities. The status in terms of daily income condition for the households is:

High = >Ks 6001,

Moderate = Ks 3001-6000 and

Low = <Ks 3000

According to field survey there were 31 (26%) out of 120 households as <Ks 3000 per day income, 70 (58%) out of 120 households between Ks 3001-6000 per day income and 19 (16%) out of 120 households > Ks 6001.

Likewise, the status in terms of expenditure condition for the households is :

High = >K4000

Moderate: K 2000-4000

Low = <K2000

There were 21 (18%) out of 120 households with less than Ks 2000 per day expense, 77 (64%) out of 120 households with between Ks 2000-4000 and 22 (18%) out of 120 households as more than Ks 4000.

These incomes mostly depend on wetland from various services such as fishing, agriculture and others.

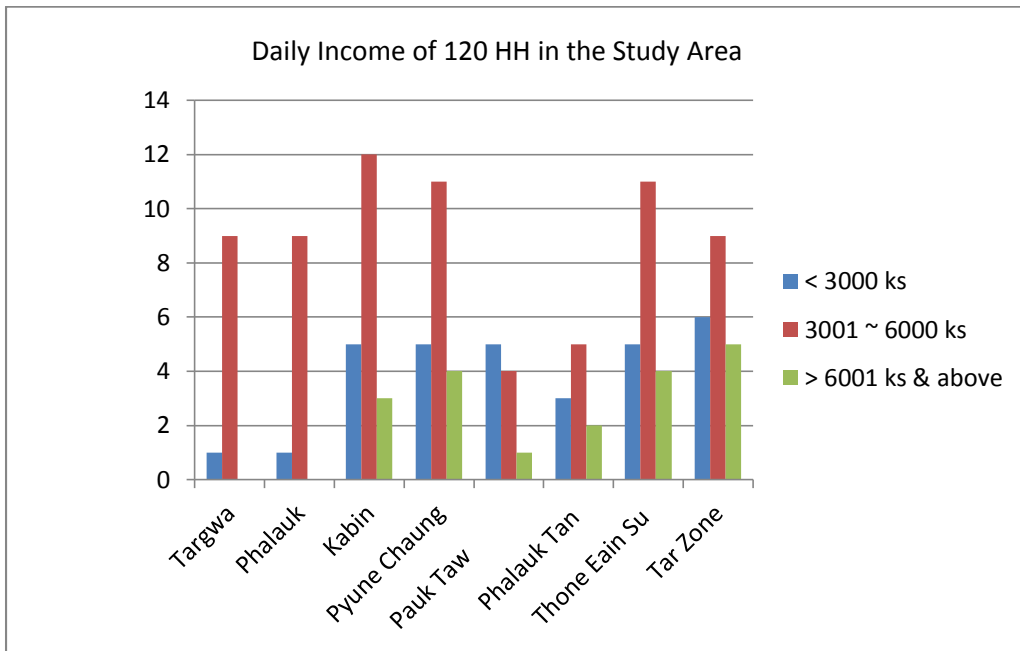


Figure 16 Daily income of 120 HH in the Study Area

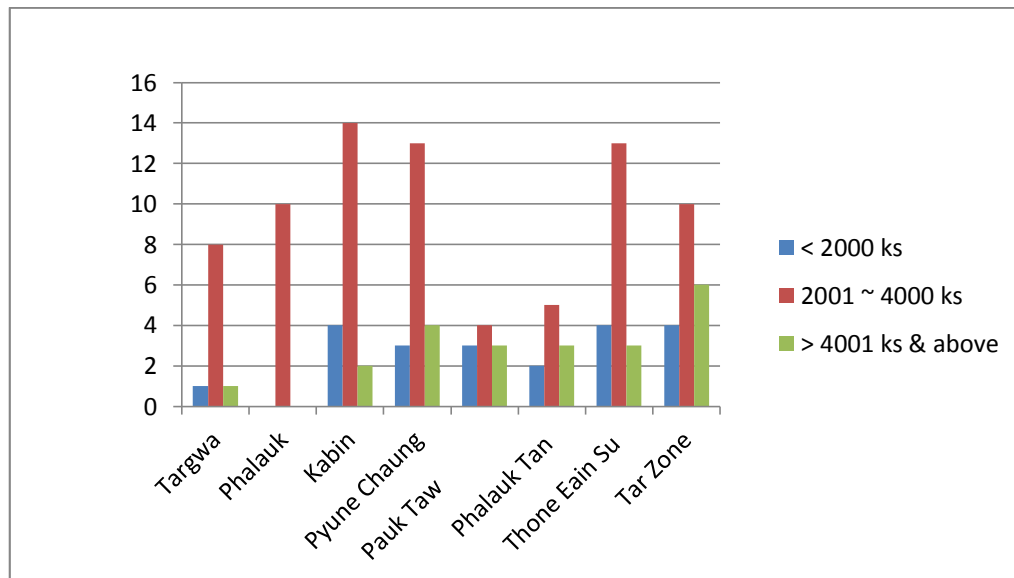


Figure 17 Daily Expenditure of 120 HH in the Study Area

7.5 Energy and Water Use

Energy is so important in the study area that, it is widely used for the communities. It includes such as electricity, charcoal, wood and others. It is used for lighting and for cooking in the study area. According the data shown in Annex 7a there are 9 (8%) out of 120, 12 (10%) out of 120, 92 (76%) out of 120, 7 (6%) out of 120 respectively. Among them, wood is mostly used for cooking in the study area.

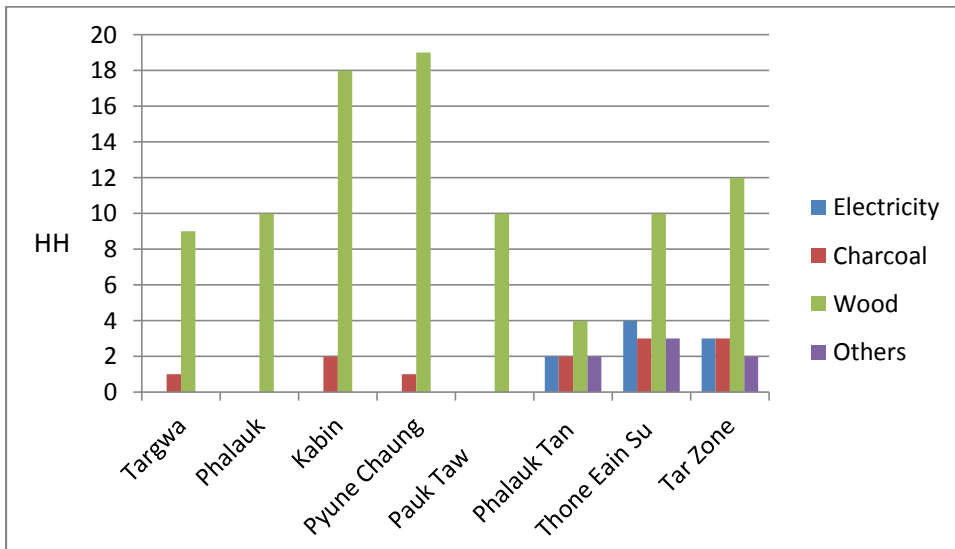


Figure 18 Different types of energy use in the study area



Firewood for cooking

Besides, water use is the basic necessities for the local people in the study area. The availability of safe drinking water is indispensable for the local inhabitants. The inhabitants depend on different water sources, including water from tube well, rain water, lake water and wetland water. Majority of the local communities use water from the Moeyungyi Wetland. Out of a sample 120 households, 42 (35%) households have access to water from tube well, 15 (13%) have access to Lake's water, 64 (52%) households have access to Wetland water. So, we can conclude that the natives are mostly used with wetland water for their daily life.

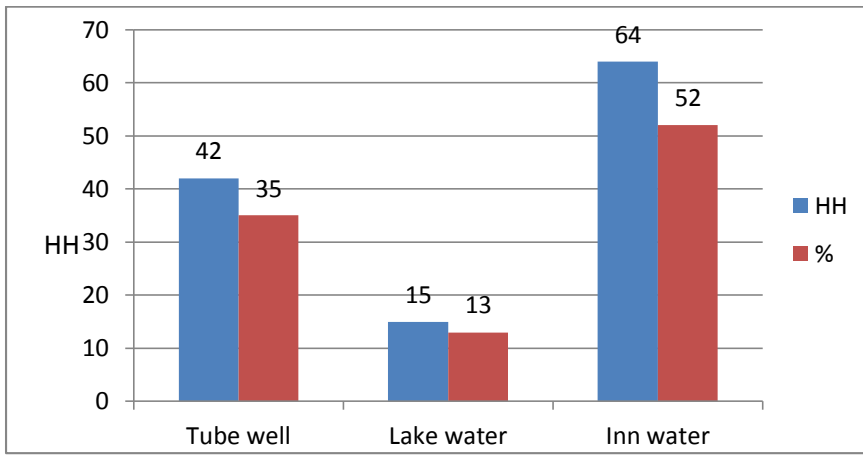


Figure 19 Water consumption of different sources

7.6 Small Scale industry and Transportation

Industry is also partly important for the livelihood of the local communities. It includes, Rice milling, Ngapi industry, Cheroot industry, Lotus textile industry, Dried Pein industry and etc. There are two rice mills at the Kapin Village and one at Pyunchaung Village. There are many Ngapi industries at both Kapin and Pyunchaung Villages. Besides, there are many Cheroot industries in the study area such as, Hpalauktan and Thoneeinsu village. Lotus textile industry lies close to Thoneeinsu Village. Dried Pein industry locates at the Pauktaw (Hlayseik) Village.

Transportation is also needed for the local people. It includes roads and water ways. According to field surveys, the main transport road is along earth embankment known as "Pakaingtar". Phayargyi (Yangon-Mandalay Road), Phayargyi-Waw Road and Waw-Pyunchaung Road, etc. The main vehicles used are bicycle, boat, car and htawlargyi, etc.



Ngapi industry and Rice mill



Lotus industry and some boats for transport

8. ANALYSIS ON THE SOCIOECONOMIC CONDITIONS

8.1 Identification of the socio-economic condition of the 8 selected villages

The socio-economic conditions of the 8 selected villages are analyzed by 7 factors and 14 indicators. The 7 factors are family life, education, health, property ownership, occupation, finance and social activity. 14 indicators include happiness and satisfaction, life security, literacy, education standard (graduates), the use of fly-proof toilet, the ratio between health service personnel (medical staffs) and population, house and telephone ownership, occupation depending on the wetland, major jobs for livelihood, income and expense the positive impact, profit gained from fishery and the negative impact of the use of chemical fertilizers and pesticides.

According to the UNDP classification, economic level is weak/low if the value is between 0.1-0.4 (10%-40%), fairly/moderate between 0.4-0.8 (40%-80%) and strong/high above 0.8 (over 80%). Health care condition in Myanmar is checked by the ratio between the health care personnel and the population. It is good if the ratio is 1:500, moderate if it is 1:1000 and low over 1:1500. In concerned with financial matter, income and expense are classed into 3 levels. The economic activities are checked by the positive impacts and negative impacts on the socio-economic conditions and quality of environment.

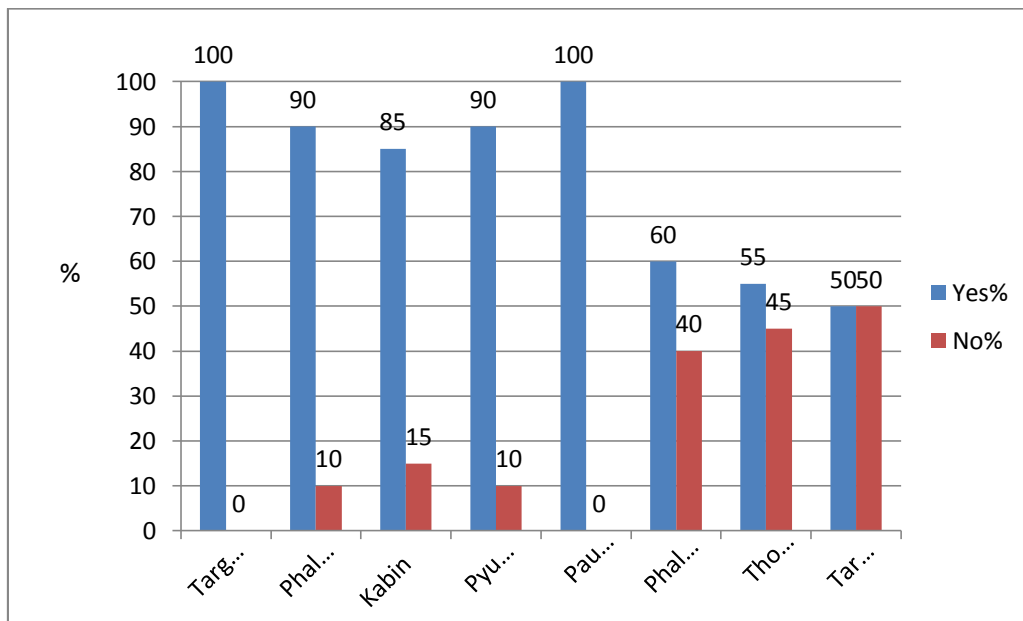


Figure 20 Percentages showing villages depending on MoeyunGyi WS

As regards family life 109 (91%) households said that they were satisfied with their present living condition while are not well accustomed with the new environment. Among the 120 households 116 (97%) households feel secure whereas 4 (3%) households feel less secure. The education of local people is characterized by monastic education and primary school level. However, it can be considered "moderate/fair" for 98 (73%) households and weak for 8 (7%) who were graduated 11 (9%) households gave the negative response, because they came from other places and. As regards sanitation awareness, 34 (28%) households use fly-proof toilet and the majority (86

households or 72%) are less health conscious. The public health care service is moderate as the health service personal and population ratio of 1:716.

Among the 120 households 118 (98%) have their own houses, but telephone ownership is limited to 20 households (11%). As regards occupation, 91 (76%) households somehow depend on the Moeyungyi WS, 58 (49%) households engaging in fishery, 30 (25%) households in agriculture, 16 (13%) households in services, and 16 (13%) households in others.

Household daily income are classed into three levels, 31 (26%) below Ks 3000, 70 (58%) between Ks 3001 and Ks 6000, 19 (16%) above Ks 6001. As regards daily expense, 21 (18%) less than Ks 2000, 77 (64%) between Ks 2001 and 4000, 22 (18%) above Ks 4001. Fishery is perceived as favorable job by the majority (111 households or 93%), among the 30 peasant families 23 (72%) use chemical fertilizers and pesticides. This can impact the Moeyungyi Wetland WS and its immediate environment. Based on 14 indicators or criterion the weak or low condition is presented by 21%, moderate condition by 50% and strong or high condition by 29%. Therefore, the socio-economic conditions of the villages under study can be considered as moderate. The livelihood of the majority of local inhabitants depends on fishing and agriculture related to the Moeyungyi WS.

8.2 Positive Results Derived from the Moeyungyi Wetland to the Local Communities

- (1) **Direct use of Moeyungyi Wetland water-** The local communities can directly use the Moeyungyi wetland water and indirectly through surface well for agriculture and livestock breeding as well as for home consumption.
- (2) **Re-chargeability of groundwater-** The wetland water can somehow recharge the ground water of the adjoining area in the hot dry season. Otherwise the surface wells would dry up in that period.
- (3) **Water storage capability-** The Sinsu Phayarlay, Ukaungywarthit, Wunbae wetland, Yaytarshay and Pynbongyi creeks drain into the Moeyungyi Wetland. In addition, the wetland also receives some water from the Sittoung River through Bago-Sittoung canal.
- (4) **Mitigation of flow velocity and erosion-** The diverse plant species that grow within the wetland can reduce the flow velocity of the streams draining into the wetland and decrease soil erosion, leading to flood mitigation in some low lying villages of Waw and Bago Townships.
- (5) **Serving as storage and controlling barrier-** The wetland itself not only store water received from rains, but also store waters discharged by the streams that flow into and the sediments carried by the streams as well. As a result, some parts of the wetland get shallower, producing suitable fertile land for growing paddy.
- (6) **Provision of fuelwood-** Reeds and, raw grasses and other plants that thrive in the wetland provide fuel to the communities around the wetland.
- (7) **Serving as waterways-** The local inhabitants can easily go from village to village by small boats.
- (8) **Serving as the medium of economic activity-** A great majority of those living around the wetland are engaged in fishing in the wetland for their livelihood.

- (9) **Serving as medium for paddy cultivation**- The local inhabitants grow paddy in the relatively shallow parts of the wetland for food sufficiency.
- (10) **Job generation to the local inhabitants**- The pressure of wetland naturally create jobs for the local inhabitants, particularly fishing and crop growing.
- (11) **Serving as the interesting place for the researchers**- The wetland itself in an interesting place for the researchers of different academic fields.

8.3 The Negative Impacts Caused by the Local Inhabitants

- (1) **Water spread** - the wetland water is gradually getting smaller due to the extension of farmlands by the local people.
- (2) **Use of Chemical Fertilizers and Pesticides** - contaminates the wetland water and threatens the existing biologically diverse plant and animal species and enhances difficulty in conserving the environment of the wetland.
- (3) **Indiscriminate dumping of solid and liquid wastes** - into the wetland degrades the quality of the wetland water and natural beauty of the wetland.
- (4) **Encroachment of the people** - over wetland area reduces the aerial extent of the wetland and increases the level of water pollution.
- (5) **Raising of livestock** - particularly ducks and buffaloes, increases the level of water pollution by the faeces of these animals.
- (6) **Fishing in the wetland by the illegal means** - of electric-shock enhances the depletion and extinction of aquatic animals of the wetland.
- (7) **Flooding every year in the rainy season**, cause damage more or less to the planted crop and the property belonging to the inhabitants around the wetland.



Buffalo Raising



Duck Raising

9. ISSUES AND THREATS

Major issues and threats observed during the field surveys of Moeyungyi Wetland WS indicated that the following threats are currently exerting adverse impacts towards the objectives of managing the Moeyungyi Wetland WS.

Threats found in Moeyungyi WS were insect catching nets which are set in the eastern part of the lake and at least 20 birds a day were killed. Over fishing, livestock grazing close to the lake and extend the paddy field in the lake can disturb birds as well.

Moyungyi wetland is a good habitat for migratory birds and residence birds. Bird hunting practice exists in the area due to demand of local consumers. Potassium cyanide used in bird hunting is so poisonous that it has affect on water bird and fish resources.

Mist nets to catch some edible insects, specifically Giant Water Bug (Vernacular Name, Belar) set by local people are threats to the survival of bats. Approximately, 20 bats were caught by these nets set along the waterways adjacent to PyonChaung village.

Moyungyi Wetland WS environment has faced many threats currently being faced with due to human activities. Four thousand fishermen are involved in fishing with several types of gears. Regardless of any other types of fishing, electric-shock fishing practice is a serious threat on the Moyungyi Wetland aquatic resources. Moreover, introduction of exotic species (i.e., *Tilapia mossambica*) ten years ago will one day become dominant species, resulting in the decline of native species population in the very near future. According to field survey records, among the 120 sample households, the major occupations are consisted of 158 (49%) fishing households, 30 (25%) agriculture households, 16 (13%) services households and 16 (13%) other households and fishing is the major occupation in this area.

Domestic animals grazing are also threats on wetland area because 703 cows / buffaloes and 22,000 ducks are grazing in the wetland area.

Small Asian Mongoose, 3 species of Bandicoot Rat and also Norway Rat are hunted for food. Although these rodents are considered as pests, over-exploitation may lead to the scarcity of natural food source for some animals such as birds and small carnivores.

The main threats of herpetofauna species are illegal trade, especially turtle and snakes. There are brokers or middle men in Waw Township who export these animals to China. Among the snakes, the species Yellow-banded Krait, Monocellate Cobra and Russell Viper are mainly traded. The local people used to consume frogs and snakes that were edible. Moreover, fishing net is a hindrance for snakes because snakes were caught in fishing nets. Some villagers discarded the snakes that were caught in the net. But, some villagers used these captured snakes as animal feed for the domestic pigs.

Encroachment for agricultural purposes is a serious threat in Moeyungyi Wetland WS. As mentioned already the area encroached over the Moeyungyi WS area are 20 acres by Hpalauk Village, 10 acres by Kapin Village, 100 acres by Pyunchaung Village, 89 acres by Phalauktan Village, 10 acres by Thoneinsu Village, totaling 229 acres. The total encroachment area over the Moeyungyi Wetland is 1080 acres, covering (21%) of the Wetland Area.

Use of chemical fertilizers and pesticides also contaminates the lake water and threatens the existing biologically diverse plant and animal species and enhances difficulty in conserving the environment of the lake. The extensive use of fertilizer in agriculture lands can encourage the excessive growth of algae and aquatic submerged plants, which can reduce dissolved oxygen level of environment and harm the aquatic life.

9.1 Ranking Threats

To rank threats, Wildlife Conservation Society (WCS) has developed criteria against which each threat is assessed. Within the Living Landscapes Program (LLP), it is strongly advocated that criteria assess only the level of threat and not the feasibility of intervention. This ensures that focus is made on the factors that are most likely jeopardize the conservation of wildlife and wild places rather than that are easiest to address. These factors are severity, urgency, recovery time once the threat is abated, proportion of the area affected, and the probability that the threat will occur (WCS, 2002).

Once the criteria for assessing the severity of threats and/or feasibility of addressing them, the next step is to rank them. Using the Living Landscapes Program's criteria and ranking system, the total score for each threat using the following equation:

$$[\text{Total} = (\text{Urgency} + \text{Recovery}) \times \text{Severity} \times \text{Proportion of Area affected} \times \text{Probability}],$$

and rank the threats according to their scores, and identify the most important threats to conservation at the site.

Criteria Used by the Living Landscapes Program to assess Threats (WCS, 2002)

SEVERITY	
none or positive	0
measurable effect on density or distribution	1
substantial effect but local eradication unlikely	2
local eradication a possibility	3
URGENCY	
won't happen in >10 yrs	0
could happen between 3-10 years	1
could (or will) within 1-3 years	2
threat is occurring must act now	3
PROPORTION OF LOCAL AREA AFFECTED	
0	0
1-10%	1
11-25%	2
26-50%	3
>50%	4
RECOVERY TIME	
immediate	0
1-10 yrs recovery	1
11-100 yrs recovery	2
100+ yrs or never	3
PROBABILITY	
	0-1

Assessment of Threats

No.	Threats	Severity	Urgency	Area	Recovery	Probability	Total	Rank
		(0-3)	(0-3)	(0-4)	(0-3)	(0-1)		
1.	Bird Hunting/Trapping with nets	2	3	4	2	1	40	2
2.	Electric shock fishing	3	3	4	2	1	60	1
3.	Invasive species	1	2	4	2	1	16	6
4.	Insect catching using mistnets	2	2	2	1	1	12	7
5.	Trapping small mammals for food	1	2	2	1	1	6	10
6.	Trading of Turtles and Snakes to China	2	3	3	2	1	30	3
7.	Land encroachment (paddy field)	2	3	3	2	1	30	3
8.	Use of fertilizers and pesticides	2	3	2	2	1	20	5
9.	Indiscriminate dumping of solid and liquid waste	2	2	2	1	1	12	7
10.	Raising of Livestock	2	3	2	1	1	16	6
11.	Flooding during the rainy season	1	2	4	1	0.75	9	8
12.	Infrastructure development (Resort)	1	1	2	1	1	4	11
13.	Water Use	2	1	4	2	1	24	4
14.	Fuel wood collection	1	2	2	2	1	8	9
15.	Population growth	1	3	4	2	1	20	5

Total = (Urgency + Recovery) x Severity x Area x Probability) Source: WCS (2007)

Priority Ranking of Assessment of Direct Threats

Sr.	Rank Scores	Priority Ranking	Remarks
1.	1-3	Very High	
2.	4-6	High	
3.	7-9	Moderate	
4.	>9	Low	

Ranking Results

Very High	High	Moderate	Low
Bird Hinting/Trapping with nets	Invasive species	Insect catching using mistnets	Trapping small mammals for food
Electric shock fishing	Use of fertilizers and pesticides	Indiscriminate dumping of solid and liquid waste	Infrastructures development (Resort)
Trading of Turtles and snakes to China	Raising of Livestock	Flooding during the rainy season	
Land encroachment (paddy field)	Water use	Fuel wood collection	
	Population growth		

10. RECOMMENDATIONS FOR FUTURE CONSERVATION MEASURES

10.1 Electric Shock Fishing

(Priority Ranking: Very High)

Wetlands provide many services to human and their environment, accompanied by social economical and ecological values. It also provides food, nursery area for juvenile and habitat for commercial important species such as fish, shrimp, shell fish and crab. A nursery is an area or habitat where, on average, juveniles make a larger contribution per unit area to the recruitment of the adult population, and overall contribute more recruits to the population than other areas where juveniles occur. (Dahlgren *et al.* 2006).

In Moyungyi wetland area, fishers used several types of fishing gear and fishing methods to catch fish for daily food and income. Therefore fishers could have serious impact on Moyungyi wetland area. In particular, electric-shock fishing practice is posing serious threat on the Moyungyi wetland aquatic resources. The diversity and habitats of freshwater fishes are threatened by destructive fishing practices, illegal and over exploitation of fish.

A total of 13 type of fishing gears were recorded in the survey period as small scale fisheries. Push net(Yin ton), Set gill net(Tar pike), long line(Nga myar tann), Pole and line(Nga myar tan), Trap(Myone), Beach seine(Swe pike), Stationary bush park(Chone cha) and Electric Shock fishing gears were found in Moyungyi wetland area.

Electric Shock fishing gear is the most threaten gear on aquatic resoruces of Moyungyi wetland area. A total of above 10 fishers have made electric-shock fishing in day time. Therefore it is very difficult to predict how many fishers have made at night time. This practice leads to depletion of fish resources and may extinct to any species in future. Electric-shock fishing gear utilizes a source of electric current, in general a battery, a converter and two bamboo sticks with iron sieve. It functions when electric current passes through anode to cathode and fishes meet shock and die. If some fish escape from the dead, it will lose spawning opportunity in life. The gear is targeted to *Channa sp*, *Monoterus sp* and *Notopterus sp*.

According to recorded information, beach seine (swe pike) stationary bush parks provided catch tremendous amount of fish within the short period that mean these gears were highly affected to the wetland fish population.

Fishing lead to affect on countless number of fishes and other aquatic organism also suffer in the same time, following the results, lake ecosystem may be decreased and reach to worse condition for next generation in future.

As stated earlier there are altogether 1,117 households in the study area that include 302 hh (27%) of farming and 488 hh (44%) fishing. The most striking feature is that 398 hh (36%) of traditional fishing and 88 hh (18%) practice electric-shock fishing indicating that this is a serious threat for the sustainable fish resource in the Moeyungyi Wetland Wildlife Sanctuary.

Recommendations

- Enforce the law for effective protection around Moyungyi wetland area to stop illegal activities including electric-shock fishing, use of destructive fishing gears, and overexploitation on the extraction of fish resources.
- *Tilapia mossambica* (Tilapia) should be treated as controlled species with no more input to wetland.
- Environmental Awareness program should be promoted for grassroots' level in the region.

10.2 Bird Hinting/Trapping with Nets

(Priority Ranking: Very High)

Birds are good indicators, and can be used to identify the most biologically rich areas, as well as environmental changes and problems. They are found in almost all natural habitats, they are high in the food chain and thus reflect changes lower down, a wealth of data have been collected by ornithologists, and their conservation status is well known relative to other taxa. In general, places that are rich in bird species are also rich for other forms of biodiversity.

Studying birds can tell us about the habitats on which we all depend, and the loss of threatened birds from many parts of the region is a measure of a more general deterioration in other biodiversity and the natural environment (BirdLife International, 2005).

Wetland-adapted birds spend all or part of their life cycle on the waters or in the wetlands that dive or swim through the water in pursuit of fish prey. Other birds, including most diving ducks and shorebirds seek invertebrate prey in the sediments of the wetlands. Marsh-dwelling passerine birds search for insects on plants or the soil surface. Some seek a variety of mobile prey including fish, crabs, small mammals and other birds.

An Ornithological investigation on Moeyungyi Wetland Wildlife Sanctuary was carried out by scientists from BANCA. A total of 18,364 birds from 133 species under 51 families were recorded out of which one was considered Vulnerable (VU) and four Near Threatened species (NT). The team managed to cover a relatively large area. Moreover, the large number of bird species can be seen because of the winter migration of birds. Therefore many migrating birds were already seen in this area. The habitats varies from creek (5%), lake (6%), secondary forest (14%), scrub (12%), paddy field (16%), mudflat (12%), grass land (10%), fish pond (12%) and floating island (13%).

As Moeyungyi Wetland WS was designated as Ramsar site for Myanmar, birds play an important role in this context. Degradation of wetlands could occur at Moeyungyi Wetland WS through water diversions, irrigation and changed land use towards agricultural lands. It is also proven that wetlands are important sites of high biodiversity, conservation and other values. As wetland degradation will more or less have detrimental effects on bird population, it is advisable to maintain shallow seasonal wetlands where habitat ranges from open water of varying depths., to mudflats which can support greater bird diversity owing to a greater diversity of microhabitats.

One of the threats of birds in Moeyungyi is the bird hunting made by local communities for their living. To make the matter worse some tried to trap wildbirds with the use of nets which have serious impacts on the bird population.

According to the ‘Protection of Wildlife and Protected Areas Law’ enacted in 26 October, 1994, the following are the status of protection of birds in Myanmar: The Director General of Forest Department, Ministry of Forestry and Environmental Conservation notify the following endangered bird species as protected bird species by categories:

- Totally Protected Species (50 species)
- Protected Species (43 species), and
- Seasonally Protected Species (13)

A Park Warden from Nature and Wildlife Conservation Department (NWCD) is responsible to look after the Moeyungyi Wetland Wildlife Sanctuary and enforced the Wildlife Protection Law. However, due to insufficient staff and funds the enforcement is not quite effective.

Recommendations

- Bird hunting should not be allowed in the Moeyungyi Wetland Wildlife Sanctuary
- Bird survey should be done annually in winter season (open season) to collect up-to-date in order to understand the changing habitat for resident as well as migratory birds.
- Publish data on annual counts and regular surveys should be released to all interested persons.
- For capacity building trainings should be organized for NWCD staff as well as all stakeholders pertaining to wildlife conservation matters.
- Workshops should be conducted for local communities concerning environmental education programs.

10.3 Trading of Turtles and Snakes

Ranking: Very High

South Asia has a very rich biodiversity including a high diversity of amphibian and reptilian fauna including several unique and endemic species (Shah and Tiwari 2004). It appears that only about 50% of the biodiversity of amphibians in South Asia has been discovered. Myanmar being a country of South Asia has high herpetofauna diversity richness in the world. Herpetofauna plays an important role in the fauna of a country. But, herpetology is poorly known in Myanmar. Herpetofauna includes amphibians and reptiles. Amphibians include frogs, caecilians and salamanders. And reptiles include lizards, geckos, skinks, snakes, crocodiles, water monitors, turtles and tortoises. Reptiles and amphibians occupy a diverse range of habitats and microhabitats, i.e they are found from deserts to grasslands from forests to oceans and from hills to own houses.

Herpetofauna (i.e. amphibians and reptiles) are considered an integral but undervalued part of natural ecosystems (Gibbons et al. 2000, Meyers and Pike 2006). Gibbons et al.

(2000) reflect that declines of herpetofauna species diversity and population size can be attributed in part to several causes including: anthropogenic factors, habitat loss, and presence of invasive and introduced species, pollution, and disease. Site-specific lists of species presence are important in the development of baseline information for a site, especially when directing conservation or management efforts (Tuberville et al. 2005); this information can also provide indicators of the health of a site. Amphibians and reptiles are recognized as key bioindicators of environmental health.

A total of 24 herpetofauna species were observed during the survey period. The results recorded from the field survey were 6 frogs, 1 turtle, 8 lizards and 9 species of snakes. Live, *Ptyas korros* was not encountered but many molted skins were observed here and there, indicating the presence of this species in the area. Among all the species found, one turtle is regarded as Vulnerable (VU) and three species of frog and five species of snake as Least Concern (LC). They were namely, the turtle species, *Morenia ocellata*, three frog species namely, *Kaloula pulchra*, *Occidozyga lima* and *Hylorana macrodactyla* and five snakes namely, *Bungarus fasciatus*, *Naja kaouthia*, *Enhydris enhydris*, *Homalopsis buccata* and *Xenopeltis unicolor*. *Bungarus fasciatus* and *Naja kaouthia* that are venomous snakes.

As the IUCN vulnerable turtle species *Morenia ocellata* is traded to China which is also endemic to Myanmar, it is urgently need for the protection of this species, which can become critically endangered (CR) at any time. This turtle species was also listed as Appendix I in CITES (2013)

The main threats of herpetofauna in Moeyungyi Wetland Wildlife Sanctuary are illegal trade of turtle and snake. Particular concern is that these turtles and snakes are export to China by broakers in Waw Township which may lead to extinction of these species in the very near future.

Recommendations

- The herpetofauna species depend on season as some species are active only during the rainy season. Hence, the survey work should be carried out throughout the whole year.
- Enough time should be allotted to carry out for the herpetofauna survey.

10.4 Land encroachment (paddy field)

Priority: Very High

Agriculture can affect wetlands areas in many ways. Historically, agriculture's greatest impacts have arisen from draining, filling, and/or clearing of wetlands for agricultural production. Although wetlands provide valuable environmental benefits, they have been widely converted to other uses particularly for agriculture purposes. The functions of wetland areas located near agricultural areas can be threatened by:

Hydrologic modification

- Ground water withdrawals for irrigation;
- Diversions that reduce the flow of water into a wetland;
- Flooding that raises water levels, converting a wetland to a lake or pond

Erosion and sedimentation

- Excessive sediment from soil erosion that clogs wetland vegetation and impairs water holding capacity; and
- Diverting or withholding of sediment that prevents the regeneration of wetlands in natural areas

Alteration of vegetation

- Clearing vegetation by burning, applying herbicides or other means for extensive cultivation due to population growth.

Land encroachment for cultivation is one of the serious threats for the sustenance of the Moeyungyi Wetland Wildlife Sanctuary. The encroachment of farms usually takes place during the summer time, planting summer paddy. According to the previous survey carried out by NWCD in 2010-2011 it was found out that there were 1687 acres encroached by 491 farmers at an average of about 3.4 acres.

Township	Village	Farmers (number)	Encroachment (acres)
Bago	Phayargalay	133	400
	Wanbein	45	156
	Ywarthit	62	172
	Pyinbongyi	106	458
	Total	346	1186
Waw	Kabin	3	10
	Ninetisu	9	20
	Indaingsu	50	200
	Pyunchaung	10	50
	Ayekarit	70	200
	Htienbin	3	20
	Total	145	500
	Grand Total	491	1686

As shown in Annex 4, the areas encroached during over the survey area in 2004 are 20 acres by Hpalauk village, 10 acres by Kapin Village, 100 acres by Pyunchaung Village, 89 acres by Phalauktan Village, 10 acres by Thoneeinsu Village, totaling 229 acres. During the current survey it was stated that an area of about 1080 acres has been encroached for growing summer paddy inside the Moeyungyi Wetland WS, about 21% in extent which is quite a serious threat.

Recommendations

- As 30 hh out of 120 hh included in the study are engaged in farm work representing 25% of the household under study no further cultivation encroachment should be allowed in the Moeyungyi Wetland WS.
- Chemical fertilizers should be substituted with organic fertilizer if situations are favorable
- Educate local communities not to use pesticides and its negative impacts on the environment.
- As the water spread of the Moeyungyi Wetland WS is getting smaller, agricultural land should not be extended further horizontally: instead, the farmers should concentrate vertically on the increase of the yield per unit area.

10.5 Water Use

Priority: High

Wetland ecosystems provide a diversity of services vital for human well-being and poverty alleviation. It is well established that provisioning services from wetlands, such as food (notably fish) and fiber are essential for human well-being. Among supporting and regulating services such as nutrient cycling, sustaining vital ecosystem functions that deliver many benefits to people, the delivery of fresh water is a particularly important service both directly and indirectly.

Around the world wetland are being lost and degraded, resulting from increasing pressure to drain and reclaim land for agriculture, and others uses. In such situation, a complete study on wetlands is necessary to increase the awareness for protecting and preserving the wetland.

Traditional water and watershed management is an approach that integrates ecosystem management with traditional water and watershed management goals and techniques. It manages water resources, wetlands and related ecosystems. The watershed management in wetland is very important because it has several benefits to the whole community. These benefits include (a) improved achievement of traditional watershed management goals, (b) improved protection and restoration of wetlands and related ecosystems, (c) improved ability to allocate lands throughout a community to their most appropriate uses and protect the overall “quality of life.

Apart from that whenever there are bodies of water which varies seasonally in an area like Moeyungyi Wetland WS, there is always going to be a conflict between the activities of fishing and agriculture. Areas of land when inundated will be used for fishing and when dry will be used for agriculture.

One of the main functions of Moeyungyi Wetland WS is the supply of water for human use. The villages in the vicinity of Moeyungyi Wetland WS depends their water supply mainly on the wetland.

In the present study, Moeyungyi Wetland WS is associated with agro-irrigation, where huge water withdrawal is necessary, particularly during the summer time where summer paddy is growing.

During the present study it was realized that the use of chemical fertilizers and pesticides will be a serious threat for the water quality not only for the aquatic life but also for those depending on the water from the wetlands.

Besides, water use is the basic necessities for local people existence. It is more important in the study area because it was found out that nobody use purified drinking water: 35% rely on tube well, 13% on lake and the rest 52% on wetland for portable water.

As the vast majority of people in the study area depend on wetland water for drinking, cooking and bathing and other domestic purposes, they should be well educated on how to conserve the clean water without being polluted due to their day to day activities.

Recommendations

- Encourage to use fly-proof latrines for all villages in the environs of Moeyungyi Wetland WS so as not pollute the water sources
- Contact with concerned authorities for regulating the water volume particularly during the summer where the water level is low.
- If Moeyungyi Wetland WS is to be used as portable water, it should be either boiled or use of water purifiers for safe portable water.
- To assess the current status of water quality in Moeyungyi Wetland WS for finding out whether it is within the threshold values.

10.6 Raising of Livestock

Priority: High

Grazing livestock in the Moeyungyi Wetlands WS can lead to both positive benefits and potentially significant negative outcomes. Positive benefits of good grazing practices include:

- sustainable plant growth
- high plant species diversity; •
- limited development of plant monocultures; and
- economic benefits

Negative outcomes of poor grazing practices can include:

- increased populations of exotic plants
- loss of desirable grazing species
- reduction in plant species diversity
- loss of bird breeding habitat
- soil structural problems
- increased water turbidity
- removal of groundcover

- damage to aquatic habitats; and
- damage to long-term economic outcomes

It was also found out that the raising of livestock is also a problem for the deterioration of the water quality of the wetland by the faeces of these animals. At the moment there are 135 cattle, 568 buffaloes, 25 goats, 77 pigs, 1955 poultry and 8260 ducks are being reared in the villages which will increase the level of water pollution in the Moeyungyi Wetland WS.

At the present moment there is no proper grazing regime in the Moeyungyi Wetland WS. In some countries graziers operate set stock grazing regimes with stock moved after periods of more than 6 months. Movement is dictated by vegetation condition rather than time. Most graziers appear to have adopted rotational grazing based on pasture condition. Some apply strategic grazing systems based mainly on pasture condition or time based strategic grazing.

Recommendations

- A research study should be organized to find out the grazing regime of the animals that has least impact on the vegetation of Moeyungyi Wetland WS.
- Proper waste disposal techniques should be adopted
- Local communities should be educated on proper waste disposal techniques by the staff of Moeyungyi Wetland WS.

10.7 Population Growth

Priority: High

Rural population growth is bound to have adverse effects on the environment, if it is not accompanied by proper planning. Population growth will be understood as an increase in the number of people residing in a square kilometer. In the context of Moeyungyi Wetland WS, increase in population could be attributed to rural migration as well as an increase in the number of people born. In fact the social survey report carried out in 2011 provided some information on population of 13 villages in the Bago and Waw townships. During the current survey of 8 villages, there were only 3 villages overlapped with the previous coverage. The exact figures of population data from 17 villages in Bago and WaW townships will be obtained from the National Census data recently conducted in 2014 from March 29 to April 10. The data is still in the process and will be released in August 2014. It is expected that population of 17 villages in the vicinity will be in the increasing trend based on the fact that there were 21% of the Moeyungyi Wetland WS being encroached for paddy cultivation.

Population growth is also a serious threat for the existence and sustenance of the Moeyungyi Wetland WS. Most of the study villages are situated quite close to the Moeyungyi WS. Moreover seasonal migration for jobs outside the Moeyungyi Wetland WS is found to be only 7% which is quite low to have impact on the population pressure of the adjoining villages towards Moeyungyi Wetland WS. With the growth in population, it is envisioned that there will be a growth of unplanned informal housing and challenges related to solid waste accumulation, wetland encroachment for cultivation, livestock raising and water pollution.

Recommendations

- Wait for the population census data to have the actual population data for the villages in the environs of Moeyungyi Wetland WS.
- Socio-economic data should be collected at 5 year interval to find out the changes in socio-economic status of the villages

10.8 Indiscriminate dumping of solid and liquid waste

Priority: Moderate

The dumping of refuse from villages, discharge of domestic sewerage, as well as agricultural runoff containing fertilizer and pesticides into wetlands, increases the organic loading of the wetlands waters. This increases the biochemical oxygen demand (BOD) of the water body, leading to inadequate oxygen supply to support plant and animal life. The discharge of the various forms of wastes into the water bodies creates two major environmental health problems. First, they create a fertile environment for microbiological and biological agents to flourish and allow the spread of disease pathogens. Secondly, the chemical constituents in the waste create various health problems for humans and aquatic organisms. The indiscriminate dumping of solid and liquid waste into the wetland degrades the quality of the wetland water and natural beauty of the wetland.

Water pollution is generally classified into two categories, namely, point source (PS) and nonpoint source (NPS). NPS pollution generally consists of sediment, nutrients, organic and toxic pollutants, and originates from more diffuse pollution sources such as agriculture, storm water runoff or other land-uses. Furthermore, NPS pollution impacts at a larger scale but generally at lower concentrations, making pollution sources difficult to identify. In addition, more people contribute to the problem and are usually affected, increasing the difficulty of management. This is a serious threat for villages at the vicinity of Moeyungyi Wetland WS as only 28% of the villages have fly-proof latrines while the rest 72% of the villages have no fly-proof latrines.

This kind of pollution puts rural inhabitants at great risk-directly by affecting human health and indirectly by degrading the resource base on which many people depend. This kind of poor sanitation affects not only rural dwellers but others at the downstream as well. This kind of lack of basic sanitation services can cause pathogens to spread more quickly and reach greater numbers of people in the Moeyungyi Wetland WS that have become degraded over time.

Due to agricultural activities Moeyungyi Wetland WS water resources can become enriched by fertilizer and animal waste in runoff from croplands and also leaching of pesticides and toxic substances.

This kind of threat can also be aggravated by the presence of a Resort Hotel facility in the Moeyungyi Wetland WS. It is not only a source of income, employment, transport and recreation, but should pose restrictions that the wetland should not be used as a dumping ground for various types of waste. If not, the ecological health of the once clear, life-filled Moeyungyi Wetland WS can become murky and smelly due to the pollution.

Recommendations

- Prior should be taken to organize more fly-proof latrines for villages in the vicinity of Moeyungyi Wetland WS.
- Chemical fertilizer application should be phased out step by step to use organic fertilizer instead.
- Also, chemical pesticides should be replaced gradually by using organic type natural pesticides.
- Waste management system should be developed at Moeyungyi Wetland Resort Hotel.

10.9 Flooding during rainy season

Priority: Moderate

The effectiveness of wetlands for flood abatement may vary, depending on the size of the area, type and condition of vegetation, slope and location of the wetland in the flood path and the saturation of wetland soils before flooding.

Different types of wetlands play important flood control roles in different situations. In the upper reaches of Moeyungyi Wetland WS, vegetation cover and grassland can act like sponges, by absorbing rainfall and allowing it to percolate more slowly into the soil, thereby reducing the speed and volume of runoff entering water courses. This means that water levels rise more slowly and human lives and livelihoods are less likely to be affected by destructive flash flooding.

However, destruction of ground vegetation in the upper reaches for Moeyungyi Wetland WS for fuel wood collection has led to soil erosion and as a result siltation has reduced the area of the flood plain causing flooding during the rainy season. This has serious threat to properties and lives of those residing in the vicinity of Moeyungyi Wetland WS.

The cost of replacing the flood control function of the wetlands by engineering means will more or less offset the costs when compared to the potential lost due to flooding. However, the most effective way for preventing floods is to preserving wetlands in the first place and restoring some of those that have been drained could help reduce future flood losses.

Moeyungyi Wetland WS experienced flooding every year during the rainy season which can cause damage more or less to the planted crops and property belonging to the inhabitants.

Recommendations

- Removal of vegetation cover should be controlled at the environ of Moeyungyi Wetland WS.
- Develop first growing fire wood plantations for the community living at the vicinity of Moeyungyi Wetland WS.
- Firewood-saving stoves should be promoted for the villages in the vicinity of Moeyungyi Wetland WS.

10.10 Fuel wood Collection

Priority: Moderate

Majority of the villagers in the environs of Moeyungyi Wetland WS are poor, mainly relying on fishing and farming for subsistence livelihoods. In addition to that, various factors such as population growth, loss of access to land can lead to unsustainable levels of natural resource use, leading to degradation and loss of natural habitats. As stated earlier the majority of the inhabitants rely mainly on wood fuel for their day to day needs of cooking. Reeds and, raw grasses and other plants that thrive in the wetland provide fuel to the inhabitants around the wetland.

If the local communities have extracted excessive firewood from the Moeyungyi Wetland WS, the remaining wetland may become degraded due to the influence of human activities. The loss and degradation of wetlands has negatively affected water birds, which depends on wetland habitats. How to provide high quality habitats for water birds through effective management is a critical issue in water bird conservation for a Ramsar site like Moeyungyi Wetland WS.

The energy use of villages around Moeyungyi Wetland WS is from 4 sources, namely, electricity (8%), charcoal (10%), wood (76%) and others (6%). Sources of wood are from reeds, raw grasses and other plants that thrive in the wetland. Wetland plants are susceptible to degradation if subject to excessive extraction for fuel wood and also grazing by domestic animals.

Recommendations

1. As fuelwood will still be the energy source for the villages, it is necessary to establish fast growing tree plantations with a very short rotation.
2. Educate local communities on the use of energy efficient cook-stoves for saving fire wood for cooking.

10.11 Trapping Small Mammals

Priority: Low

Small mammals are a generic grouping biologists generally use to refer to shrews, moles, mice, bats and ground squirrels etc. Bountiful food resources of wetlands allow small mammals to thrive in and along wetlands. And small mammals help wetlands flourish as they disperse seeds, provide predators with food, aerate soils with burrows and help control insect populations.

Particularly this kind of small mammal surveys can help biologists better understand distributions, habitat associations and population status for various species of small mammals at Moeyungyi Wetland WS.

Many species of mammals depend on wetland habitats for survival. Some mammals are herbivores, while others are omnivores or carnivores that rely on varying combinations of aquatic invertebrates, amphibians, fish, and other prey. Many wetland mammals consume large numbers of insects, cultivate the soil, or modify habitat used by waterfowl and other wildlife.

The decrease in mammal species which appear to be at low densities was attributed mainly due to vegetation cover degradation due to fuel wood collection and encroachment for agricultural purposes. All wildlife populations have declined steadily over the past few decades, as a result of both legal and illegal hunting. Mist nets to catch some edible insects especially Giant Water Bug (Vernacular Name, Belar) set by local people are threats to the survival of bats.

All animals including small mammals depend on the plants or forests for food, shelter, and hidden places for the enemies or predators. There is interactive relationship between forest and mammals. Most of the diverse mammal populations live in wetland areas. Bountiful food resources allow small mammals to thrive in and along wetlands. Two main causes of population decline of small mammals are food and shelter. Scarcity of food and decreasing vegetation cover are the main causes of population decrease of animals. Their presence indicates about habitat quality and the success of conservation and management. Many species of mammals depend on wetland habitats for survival. Some mammals are herbivores, while others are omnivores or carnivores that rely on varying combinations of aquatic invertebrates, amphibians, fish, and other prey. Many wetland mammals consume large numbers of insects, cultivate the soil, or modify habitat used by waterfowl and other wildlife.

As stated earlier small Asian mongoose, 3 species of Bandicoot rat and also Norway rat are hunted for food by the local inhabitants. Although these rodents are considered as pests, over-exploitation may lead to the scarcity of natural food source for some animals such as some birds and small carnivores.

Recommendations

- Suitable trees need to be supported for some small mammals as food source.
- It is necessary to enforce the wildlife law in and around the Moeyungyi WS so as to prevent from illegal activities being done.
- Also, local people should be educated for the effective protection of the WS through environmental education and extension programs.

10.12 Infrastructure Development

Priority: Low

It is stated by Myanmar Investment Commission (MIC) that all developers will need to allocate Corporate Social Responsibility (CSR) program every year for any kind of development projects. This program is in line with the idea on how the tourism company operates in relation to protected areas and contributions willingly make to the management and conservation of protected areas. This will help develop the increased cooperation between Protected Area Managers and the Tourism Industry with the goal of preserving biodiversity through “Responsible Tourism”.



Moeyungyi Wetland Resort

Moeyungyi Wetland WS can benefit from tourism program in several ways:

- Additional funds for conservation can be generated from tourism through CSR program; this is important, as many protected areas face serious financial constraints in Myanmar.
- By raising awareness amongst visitors and raising the profile of the protected area at the local and national level, tourism can help promote conservation of the site, especially for the “Ramsar Site” like Moeyungyi Wetland Wildlife Sanctuary.
- By organizing environmental education programs for people living in and around the protected area, funds provided by tourism (CSR) may help reduce unsustainable exploitation of natural resources, habitat degradation by cultivation encroachment and particularly bird hunting and illegal fishing using electrode fishing gear which are serious threats to the aquatic resources of Moeyungyi Wetland WS.

In March 2014, the Shwe Pyi Aye Tour Co., Ltd. submitted application to the Myanmar Investment Commission (MIC) to get approval for its investment proposal to run the Resort at Moeyungyi Wildlife Sanctuary, Bago Region, by renting 145.69 ha (360 ac.) of forest land for 30 years from the Ministry of Environmental Conservation and Forestry (MOECAF). The Moeyungyi resort will employ 60 local staff for providing good services to the tourists, both local and foreign. The company will allocate some funds for its Corporate Social Responsibility (CSR) program. In order to protect the Moeyungyi Wetland Wildlife Sanctuary the following measures should be undertaken:

- To use the sewage disposal system that has least impact on the environment
- To adopt proper wastewater treatment system
- To use natural lighting system to save electrical power

Waste from the resort such as liquid waste and used oils should not be disposed of directly into the streams and rivers: the wastes should be treated such that it is in line with the ‘Ministry of Industry Effluent Standards’ before disposed of at natural water courses and proper waste management plans to be developed.

To reduce the waste derived from the resort, waste reduction methods 3 Rs, such as ‘Reduce, Reuse and Recycle’ should be adopted and draw up a plan and implement that will reduce the daily waste production.

A management plan has to be developed to have least impact on the environment by the operations of the resort.

It was stated by the Nature and Wildlife Conservation Department (NWCD) that Moeyungyi Wetland Wildlife Sanctuary receives about 150 foreigners (mostly from

USA and Europe) and about 7,500 domestic tourists each year (NWCD, 2014). Foreign tourist mostly visit for bird watching between September and March and stay for 2-3 days. Domestic tourists generally pay visit for a day trip. Visitors are allowed to wander around the lake using boats provided by the resort. They are not allowed to enter the core zone of the wetland as well as prohibited to enter ecological sensitive areas like breeding sites for waterfowls. They are allowed to watch birds from a bird-watching tower with nominal fees. Moreover, visitors are not allowed to catch fish from the Wetland WS. Therefore, negative impacts on biodiversity in general are very improbable due to the visitors.

Recommendations:

- Environmental Management Plan should be developed for Moeyungyi Resort Hotel
- Corporate Social Responsibility program shall be adopted to establish closer links with the tourism staff, staff of NWCD and the community
- Create income generation for local communities by train them to become bird-watching guides with the full participation of travellers, locals and entrepreneurs in a triple-win situation
- Promote capacity building of NWCD staff awareness and education programs on the coexistence of tourism and conservation.

10.13 Institutional Arrangement

The Moeyungyi Wetland WS is managed by NWCD according to an annual plan of operations that includes patrolling activities, maintenance of roads and buildings and zoning programme. No human access is allowed in the core zone. The organization of NWCD staff as it stands on 2007 is as follows: (Myint Aung, 2007).

If you compare the staff level at 2007 and 2014 for Moeyungyi Wetland WS the permanent staff position in 2014 is increased by 1 additional staff. During 2007 the daily staff accounted for 14 whereas in 2014 it does not mentioned about the number of daily wages staff which depends on the budget allocation of the site.

According to the studies made by Myint Aung (2007) concerning the limiting factors for effective management of Protected Areas in Myanmar are:

- Lack of education and training of PA staff
- Short period for staff for posting at a site (4 years)
- Inadequate staff for effective law enforcement and patrolling
- Lack of training for wardens and rangers
- Funding for community relations
- Insufficient services for environmental education and outreach activities

Table 4 Staffing levels of protected areas in Myanmar -2007(paper parks are those with an absence of staff, law enforcement, infrastructure, and boundary markers)

Protected Area	Total Area	Permanent Staff	Daily Staff	Total Staff	Staff (km ²)	Comment
Alaungdaw Kathapa NP	1581	99	30	129	0.08	
Chatthin WS	268	60	12	72	0.26	
Hkakabo Razi NP	3812	4	12	16	0.00	
Hlawga Park	6	138	54	192	30.14	Overstaffed
Htamanthi WS	2151	26	15	41	0.02	
Indawgyi Wetland BS	775	5	0	5	0.01	Understaffed
Inlay Wetland BS	642	13	8	21	0.03	
Kahilu WS	161	0	0	0	0.00	Paper Park
Kelatha WS	24	0	0	0	0.00	Paper Park
Kyaikhtiyoe WS	156	8	0	8	0.03	Understaffed
Lampi Island Marine Park	205	0	0	0	0.00	Paper Park
Lawkanadar WS	0.5	20	45	65	130	Overstaffed
Loimwe WS	43	0	0	0	0.00	Paper Park
Meinmahla Kyun WS	137	16	5	21	0.15	
Minsontaung WS	23	7	7	14	0.61	
Minwuntaung WS	206	0	0	0	0.00	Paper Park
Moscós Islands Marine Park	49	0	0	0	0.00	Paper Park
Moyingyi BS	104	10	14	24	0.23	
Mulayit WS	139	0	0	0	0.00	Paper Park
Natmataung NP	723	38	15	53	0.07	
Panlaung-Pyadalin Cave WS	334	3	0	3	0.01	Understaffed
Parsar WS	78	0	0	0	0.00	Paper Park
Pidaung WS	698	8	8	16	0.02	
Popa Mountain WS	129	159	13	172	1.33	Overstaffed
Pyin Oo Lwin WS	127	0	0	0	0.00	Paper Park
Rakhine Yoma WS	1756	10	11	21	0.01	Understaffed
Shwe U Daung WS	326	8	9	17	0.05	Understaffed
Shwesettaw WS	553	61	7	68	0.12	
Taungyi WS	16	0	0	0	0.00	Paper Park

Protected Area	Total Area	Permanent Staff	Daily Staff	Total Staff	Staff (km ²)	Comment
Thamihla Kyun WS	1	0	0	0	0.00	Paper Park
Wetthikan WS	5	0	0	0	0.00	Paper Park

Table 5The existing staff at Moeyungyi Wetland WS as of 2014 is as follows:

Sr.	Position	Approved	Existing	Shortage	Surplus	Remarks
1	Staff Officer	-	1	-	1	
2	Auditor	-	1	-	1	
3	Range Officer	1	-	1	-	
4	Ranger	1	1	-	-	
5	Senior Clerk	-	2	-	2	
6	Junior Clerk	1	-	1	-	
7	Forester	2	3	-	1	
8	Security-4	1	-	1	-	
9	Sale-4	1	-	1	-	
10	Forest Guard (Nursery)	1	1	-	-	
11	Security-5	1	-	1	-	
12	Driver/Mechanic	1	-	1	-	
13	Wildlife Conservation Staff	2	2	-	-	
14	Carpenter-5	-	1	-	1	
15	Helper	1	-	1	-	
	Total	13	12	7	6	

Recommendations:

- At least budget allotment for Moeyungyi Wetland WS should be provided to cover the appointment of daily staff level of 2007.
- Training should be arranged for Park Warden and Staff for management level and operational level trainings respectively by organization like WCS occasionally when they conduct surveys at Moeyungyi Wetland WS.
- Particularly for effective patrolling to monitor and control threats and wildlife which is the most important operation for Moeyungyi Wetland WS, the SMART (Spatial Monitoring and Reporting Tool) patrolling system should be introduced with the assistance of WCS.

SMART includes:

- Map reading, GPS & compass using to point out patrol route and tracking position
- Digital cameras using to collect evidence of threats and wildlife encountered during patrol
- Radio transceiver communication
- Data form using for wildlife, threats and other data collection
- Wildlife tracks & signs identification
- Crime scene investigation
- Physical strength practice
- Encounter & confront skill
- First aids

SMART have 2 levels of Training, basic level training for junior staff and advanced level training for senior staff.

- Funding for community relations should be organized from CSR program from Moeyungyi Wetland Resort Hotel.
- Sufficient funds should be acquired for environmental education and outreach activities through CSR programs and interested donors.
- Instead of working on annual work plan, a proper ‘Moeyungyi Wetland WS Management Plan’ should be developed at least on a 4 year-plan which should be implemented, updated on a regular basis and evaluated at the end of the plan period. Prior action should be given on research, surveys, extension programs for the local communities and effective patrolling activities.

Table for Monthly Operations of Moeyungyi Wetland Sanctuary in Fiscal Year 2013-2014

Sr	Operation	April	May	June	July	August	September	October	November	December	January	February	March	Remark
1	Conservation of animals and plants													
	(i) Study of Fish species				↔				↔				↔	
	(ii) Study of Migratory Birds								↔				↔	
	(iii) Study of Aquatic Plants				↔				↔				↔	
	(iv) Monitoring of Bird Flu								↔				↔	
2	Extension for Biodiversity Conservation								↔					
3	Patrolling													
	(i) Regular Inspection	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	
	(ii) Surprise Check	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	
4	Fire Protection	↔		↔							↔		↔	
5	Construction and Renovations													
	(i) Improvement of Information Centre								↔	↔				
	(ii) Construction of camps for conservation								↔	↔				
	(iii) Construction of Park Warden Residence								↔	↔				
	(iv) Renovation of Staff Quarters								↔	↔				
	(v) Renovation of Signboards													
	(a) Warning Signboards			↔	↔	↔								
	(b) Educational Signboards			↔	↔	↔								
	(vi) Zone Demarcation			↔	↔									

11.0 CONCLUSION

In Myanmar wetlands are important natural resources. Moeyungyi Wetland WS is a famous wetland as well as Important Bird Areas (IBA) in Myanmar. Moeyungyi Wetland WS is situated along flying routes which is essential for the migratory water birds as they need a chain of protected feeding and resting areas to enable them to travel from the northern breeding ground to the south non-breeding areas.

A desk study was made in 2013 December for previous surveys and the current survey by BANCA on the status of biological survey data to reflect the changes that take place during the different time periods. It was found out that the following institutions were involved in the studies in stated periods as mentioned in the following table:

Source	Avifauna	Mammal	Herptofauna (Amphibians + Reptiles)		Flora	Fishery	Entomology (Butterfly + Insects)	
WCS	128 (2007) 139 (2008) 119 (2009) 133 (2011)							
Yangon University	87 (2007)					33 (2004 – 2005)		
Bago University	52 (2008 – 2009)	9 (2008 – 2009)	12 (2008)	20 (2008)		36 (2008 – 2009)	37 (2009)	16 (2008)
NWCD, Moeyungyi	126 (2008 – 2013)		8 (2003)	20 (2003)		36 (2003)	33 (2003)	
BANCA (2014)	133	12	24		74	37	41	14

It can be observed from the above table that previous surveys are concentrated on avifauna surveys as Moeyungyi Wetland WS is quite famous for the presence of migratory waterbirds and habitats which also constitute the main attraction for tourists.

Wildlife Conservation Society (WCS) is also interested in avifauna survey. The two Universities, namely, Yangon and Bago are also interested in conducting surveys more comprehensively. Bago University takes opportunity to conduct surveys quite extensively by taking advantage of being situated quite close to Moeyungyi Wetland WS, compared to Yangon University. Even then, surveys were carried out in 2008-2009 only. However, the period of surveys are found to be not well planned and carried out on an ad hoc basis.

As stated earlier the objectives of conducting current surveys conducted by BANCA when compared to previous surveys are quite comprehensive. It covers avifauna, fish, entomology, harpetology, mammals and also socioeconomic aspects. However, this kind of assessment is like a rapid assessment as the survey period is 7-8 days only. This will provide some information on the current situation of the biodiversity of the Moeyungyi Wetland WS at a glance and the social context for 'wise use' of wetlands. Based on the surveys data it is quite

certain that the status of biodiversity resources in Moeyungyi Wetland WS is quite stable during the time period between 2007 and 2014.

Based on the above mentioned surveys Moeyungyi Wetland WS as a RAMSAR site is still significant for conservation of birds and aquatic life. The socioeconomic survey indicated that about 77% of the populations are dependent of Moeyungyi Wetland WS for their livelihood. By occupation 49% engaged in fishery while 25% are engaged in agriculture with the rest for services and others. With the increase in population in the near future more and more people will depend on the wetland for their livelihood.

People living in the vicinity of Moeyungyi Wetland WS depend for their livehood because wetlands are major sources of water for drinking, cooking, transportation, fishing and cultivation of crops.

Concerning income and expenditure of the inhabitants, it was realized that 58% of the household income was between K 3000-6000 while for expenditure it was between K 2000-4000 for 64% of household. Hence, the socio-economic condition of the villages under study can be considered as moderate situation.

It is also realized from the study that water pollution is also a serious threat in the Moeyungyi wetland. Likewise, illegal means of fishing like electric-shock fishing will lead to the depletion of fish resources in the very near future.

It is thus necessary to study the analysis of the socio-economic life of the inhabitants living in the environs of Moeyungyi Wetland WS from the geographic perspective. Also, a detailed study of the fishery resources as well as wetland agriculture so as to have least impact on the water resources as the wetland water is being used for day to day needs by the inhabitants. Hence, water pollution studies and monitoring at Moeyungyi Wetland WS should be given high priority.

Forest Department is a 'Ramsar Focal Point' for Myanmar and is responsible to manage closely in collaboration relevant Ministries. According to the current studies communities living in close proximity to Moeyungyi Wetland may not be supportive of conservation efforts and protected area management. Most probable reasons for this may include low awareness about the objectives or value mechanism of Moeyungyi Wetland WS for local communities concerning benefits accrued from protected areas that in turn limit opportunities for grassroots participation in conservation activities.

The socio-economic studies carried out in this study indicated that the livelihood of poor communities living near the wetlands should be given due consideration so that their dependence on wetland resource can be made sustainable. This can be accomplished through education programs for the effective protection of the WS through environmental education and extension programs.

Also, it is necessary to develop the Management Plan for a long-term duration (at least 4 years period) for Moeyungyi Wetland WS, rather than annual program currently in practice.

As human activities are responsible for such kind of negative impacts mentioned already, NWCD should coordinate with relevant stakeholders such as local administrators, academia, NGOs, local communities and donors, particularly national and international (such as CSR, GEF) to effectively manage the one and only listed 'Ramsar site' of Myanmar.

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APPENDICES

CRITERIA FOR THE DESIGNATION OF WETLANDS OF INTERNATIONAL IMPORTANCE (RAMSAR CRITERIA)

Criterion 1: A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.

Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

Criterion 3: A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.

Criterion 4: A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.

Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.

Criterion 6: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.

Criterion 7: A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.

Criterion 8: A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.

Criterion 9: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of wetland-dependent non-avian animal species.

Source: A Wetland inventory of Myanmar (MOEJ, 2004)

**DESK STUIES OF BIODIVERSITY AND SOCIOECONOMIC DATA FOR
MOEYUNGYI WETLAND WILDLIFE SANCTUARY**

Appendix 2.1**List of Avifauna in Moeyungyi Wetland Wildlife Sanctuary**

Sr.no	Reference	Author	Period	Total Species
1	Wildlife Conservation Society	Naing Lin	Jun 2007	128
2	Wildlife Conservation Society	Naing Lin	2008 to 2009	139
3	Wildlife Conservation Society	Naing Lin	Jan 2009	119
4	Wildlife Conservation Society	Naing Lin	Jan 2011	133
4	Bago University	Group	2008 to 2009	52
5	Moeyingyi Bird Sanctuary	NWCD*	2008 to 2013	126
6	Yangon University	Naw Tar Ma Lar Htoo	2007	87

Nature Wildlife Conservation Department*

Compiled Bird List of the Moeyingyi Bird Sanctuary (2007 to 2013)

Sr. no	Family	Common name	Scientific name	Water Birds	Terrestrial Birds	Range and Status
1	ANATIDAE	Lesser Whistling-duck	<i>Dendrocygna javanica</i>	+		R
2		Comb Duck	<i>Sarkidiornis melanotos</i>	+		R
3		Ruddy Shelduck	<i>Tadorna ferruginea</i>	+		M
4		Cotton Pygmy-goose	<i>Nettapus coromandelianus</i>	+		R
5		Gadwall	<i>Anas strepera</i>	+		M
6		Indian Spot-billed Duck	<i>Anas poecilorhyncha</i>	+		R
7		Northern Shoveler	<i>Anas clypeata</i>	+		M
8		Northern Pintail	<i>Anas acuta</i>	+		M
9		Garganey	<i>Anas querquedula</i>	+		M
10		Eurasian Teal	<i>Anas crecca</i>	+		M
11		Baer's Pochard	<i>Aythya baeri</i>	+		M
12		Tufted Duck	<i>Aythya fuligula</i>	+		M
13	PODICIPEDIDAE	Little Grebe	<i>Tachybaptus ruficollis</i>	+		R
14	CICONIIDAE	Painted Stork	<i>Mycteria leucocephala</i>	+		M
15		Asian Openbill	<i>Anastomus oscitans</i>	+		M
16		Woolly-necked Stork	<i>Ciconia episcopus</i>	+		R
17	THRESKIORNITHIDAE	Black-headed Ibis	<i>Threskiornis melanocephalus</i>	+		M
18		Red-naped Ibis	<i>Pseuidbis papillosa</i>	+		R
19		Glossy Ibis	<i>Plegadis falcinellus</i>	+		R
20		Eurasian Spoonbill	<i>Platalea leucorodia (Only one sighted)</i>	+		M
21	ARDEIDAE	Great Bittern	<i>Botaurus stellaris</i>	+		M
22		Yellow Bittern	<i>Ixobrychus sinensis</i>	+		R
23		Cwetlandamon Bittern	<i>Ixobrychus cwetlandamomeus</i>	+		R
24		Black-crowned Night-heron	<i>Nycticorax nycticorax</i>	+		R

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Sr. no	Family	Common name	Scientific name	Water Birds	Terrestrial Birds	Range and Status
25		Indian Pond-heron	<i>Ardeola grayii</i>	+		R
26		Chinese Pond-heron	<i>Ardeola bacchus</i>	+		R
27		Eastern Cattle Egret	<i>Bubulcus coromandus</i>	+		R
28		Grey Heron	<i>Ardea cinerea</i>	+		R
29		Purple Heron	<i>Ardea purpurea</i>	+		R
30		Great Egret	<i>Ardea alba</i>	+		R
31		Intermediate Egret	<i>Mesophoyx intermedia</i>	+		R
32		Little Egret	<i>Egretta garzetta</i>	+		R
33	PELECANIDAE	Great White Pelican	<i>Pelecanus onocrotalus</i>	+		M
34		Spot-billed Pelican	<i>Pelecanus philippensis</i>	+		M
35	PHALACROCORACIDAE	Little Cormorant	<i>Phalacrocorax niger</i>	+		R
36		Great Cormorant	<i>Phalacrocorax carbo</i>	+		M
37	ANHINGIDAE	Oriental Darter	<i>Anhinga melanogaster</i>	+		R
38	FALCONIDAE	Ospery	<i>Pandion haliaetus</i>		+	M
39		Black-shouldered Kite	<i>Elanus caeruleus</i>		+	M
40		Black Kite	<i>Milvus migrans</i>		+	R
41		Black-eared Kite	<i>Milvus lineatus</i>		+	M
42		Western Marsh-harrier	<i>Circus aeruginosus</i>		+	M
43		Eastern Marsh-harrier	<i>Circus spilonotus</i>		+	M
44		Hen Harrier	<i>Circus cyaneus</i>		+	M
45		Pied Harrier	<i>Circus melanoleucos</i>		+	R
46		Shikra	<i>Accipiter badius</i>		+	R
47		Greater Spotted Eagle	<i>Aquila clanga</i>		+	M
48		Tawny Eagle	<i>Aquila rapax</i>		+	M
49	RALLIDAE	Slaty-breasted Rail	<i>Gallirallus striatus</i>	+		R
50		Water Rail	<i>Rallus indicus</i>	+		M
51		Ruddy-breasted Crane	<i>Porzana fusca</i>	+		R

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Sr. no	Family	Common name	Scientific name	Water Birds	Terrestrial Birds	Range and Status
52		White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	+		R
53		Grey-headed Swamphen	<i>Porphyrio poliocephalus</i>	+		R
54		Watercock	<i>Gallicrex cinerea</i>	+		R
55		Common Moorhen	<i>Gallinula chloropus</i>	+		R
56		Common Coot	<i>Fulica atra</i>	+		R
57	GRUIDAE	Sarus Crane	<i>Grus antigone</i>	+		R
58	PLUVIALIDAE	Pacific Golden Plover	<i>Pluvialis fulva</i>	+		M
59	RECURVIROSTRIDAE	Black-winged Stilt	<i>Himantopus himantopus</i>	+		R
60	VANELLIDAE	Grey-headed Lapwing	<i>Vanellus cinereus</i>	+		M
61		Red-wattled Lapwing	<i>Vanellus indicus</i>	+		R
62	CHARADRIIDAE	Little Ringed Plover	<i>Charadrius dubius</i>	+		M
63		Kentish Plover	<i>Charadrius alexandrinus</i>	+		M
64		Greater Sand-plover	<i>Charadrius leschenaultii</i>	+		M
65	JACANIDAE	Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</i>	+		R
66		Bronze-winged Jacana	<i>Metopidius indicus</i>	+		R
67	SCOLOPACIDAE	Jack Snipe	<i>Lymnocyptes minimus</i>	+		M
68		Pintail Snipe	<i>Gallinago stenura</i>	+		M
69		Common Snipe	<i>Gallinago gallinago</i>	+		M
70		Black-tailed Godwit	<i>Limosa limosa</i>	+		M
71		Common Sandpiper	<i>Actitis hypoleucos</i>	+		M
72		Spotted Redshank	<i>Tringa erythropus</i>	+		M
73		Common Greenshank	<i>Tringa nebularia</i>	+		M
74		Green Sandpiper	<i>Tringa ochropus</i>	+		M
75		Marsh Sandpiper	<i>Tringa stagnatilis</i>	+		M
76		Wood Sandpiper	<i>Tringa glareola</i>	+		M
77		Temminck's Stint	<i>Calidris temminckii</i>	+		M

Biodiversity And Nature Conservation Association

Sr. no	Family	Common name	Scientific name	Water Birds	Terrestrial Birds	Range and Status
78		Long-toed Stint	<i>Calidris subminuta</i>	+		M
79	GLAREOLIDAE	Oriental Pratincole	<i>Glareola maldivarum</i>	+		M
80	STERNIDAE	White-winged Tern	<i>Chlidonias leucopterus</i>	+		M
81		Little Tern	<i>Sternula albifrons</i>	+		R
82		Whiskered Tern	<i>Chlidonias hybridus</i>	+		M
83		Black-bellied Tern	<i>Sterna acuticauda</i>	+		R
84	LARIDAE	Brown-headed Gull	<i>Chroicocephalus brunnicephalus</i>	+		M
85	COLUMBIDAE	Rock Pigeon	<i>Columba livia</i>		+	R
86		Spotted Dove	<i>Streptopelia chinensis</i>		+	R
87	CUCULIDAE	Plaintive Cuckoo	<i>Cacomantis merulinus</i>		+	R
88		Asian Koel	<i>Cacomantis merulinus</i>		+	R
89		Greater Coucal	<i>Centropus sinensis</i>		+	R
90		Lesser Coucal	<i>Centropus bengalensis</i>		+	R
91	TYTONIDAE	Common Barn-owl	<i>Tyto alba</i>		+	R
92	APODIDAE	Asian Palm-swift	<i>Cypsiurus balasiensis</i>		+	R
93	ALCEDINIDAE	White-throated Kingfisher	<i>Halcyon smyrnensis</i>		+	R
94		Black-capped Kingfisher	<i>Halcyon pileata</i>		+	M
95		Blue-eared Kingfisher	<i>Alcedo meninting</i>		+	R
96		Common Kingfisher	<i>Alcedo atthis</i>		+	R
97	MEROPIIDAE	Little Green Bee-eater	<i>Merops orientalis</i>		+	R
98		Blue-tailed Bee-eater	<i>Merops philippinus</i>		+	M
99		Chestnut-headed Bee-eater	<i>Merops lechenaulti</i>		+	R
100	UPUPIDAE	Common Hoopoe	<i>Upupa epops</i>		+	M
101	RAMPHASTIDAE	Coppersmith Barbet	<i>Megalaima haemaccephala</i>		+	R
102	ORIOIDAE	Black-naped Oriole	<i>Oriolus chinensis</i>		+	R
103	AEGITHINIDAE	Common Iora	<i>Aegithina tiphia</i>		+	R
104	DICRURIDAE	Black Drongo	<i>Dicrurus macrocercus</i>		+	R

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Sr. no	Family	Common name	Scientific name	Water Birds	Terrestrial Birds	Range and Status
105	CORVIDAE	House Crow	<i>Corvus splendens</i>		+	R
106		Large-billed Crow	<i>Corvus japonensis</i>		+	R
107		Eastern Jungle Crow	<i>Corvus leuillanti</i>		+	R
108	LANIIDAE	Tiger Shrike	<i>Lanius tigrinus</i>		+	M
109		Brown Shrike	<i>Lanius cristatus</i>		+	M
110		Long-tailed Shrike	<i>Lanius schach</i>		+	M
111	PLOCEIDAE	Streaked Weaver	<i>Ploceus manyar</i>		+	R
112		Baya Weaver	<i>Ploceus philippinus</i>		+	R
113		Asian Golden Weaver	<i>Ploceus hypoxanthus</i>		+	R
114	ESTRILDIDAE	Scaly-breasted Munia	<i>Lonchura punctulata</i>		+	R
115	PASSERIDAE	House Sparrow	<i>Passer domesticus</i>		+	R
116		Eurasian Tree-sparrow	<i>Passer montanus</i>		+	R
117	MOTACILLIDAE	Red-throated Pipit	<i>Anthus cervinus</i>		+	M
118		Paddy Field Pipit	<i>Anthus rufulus</i>		+	R
119		White Wagtail	<i>Motacilla alba</i>		+	M
120		Grey Wagtail	<i>Motacilla cinerea</i>		+	M
121		Western Yellow Wagtail	<i>Motacilla flava</i>		+	M
122		Eastern Yellow Wagtail	<i>Motacilla tschutschensis</i>		+	M
123		Citrine Wagtail	<i>Motacilla citreola</i>		+	M
124	STURNIDAE	White-vented Myna	<i>Acridotheres grandis</i>		+	R
125		Jungle Myna	<i>Acridotheres fuscus</i>		+	R
126		Common Myna	<i>Acridotheres tristis</i>		+	R
127		Chestnut-tailed Starling	<i>Sturnus malabaricus</i>		+	R
128	MUSCICAPIDAE	Bluethroat	<i>Luscinia svecica</i>		+	M
129		Grey Bushchat	<i>Saxicola ferreus</i>		+	R
130		Eastern Stonechat	<i>Saxicola maurus</i>		+	R
131		Pied Bushchat	<i>Saxicola caprata</i>		+	R

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Sr. no	Family	Common name	Scientific name	Water Birds	Terrestrial Birds	Range and Status
132		Taiga Flycatcher	<i>Ficedula albicilla</i>		+	M
133		Oriental Magpie-robin	<i>Copsychus saularis</i>		+	R
134	ALAUDIDAE	Oriental Skylark	<i>Alauda gulgula</i>		+	R
135	PYCNONOTIDAE	Streak-eared Bulbul	<i>Pycnonotus blanfordi</i>		+	R
136		Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>		+	R
137		Brown-breasted Bulbul	<i>Pycnonotus xanthorrhous</i>		+	R
138		Red-vented Bulbul	<i>Pycnonotus cafer</i>		+	R
139	HIRUNDINIDAE	Asian House Martin	<i>Delichon dasypus</i>		+	R
140		Common Sand-martin	<i>Riparia riparia</i>		+	R
141		Barn Swallow	<i>Hirundo rustica</i>		+	M
142		House Swallow	<i>Hirundo tahitica</i>		+	R
143		Red-rumped Swallow	<i>Cecropis daurica</i>		+	M
144		Striated Swallow	<i>Cecropis striolata</i>		+	R
145	PHYLLOSCOPIIDAE	Dusky Warbler	<i>Phylloscopus fuscatus</i>		+	R
146	TAMALIDAE	White-throated Babbler	<i>Turdoides gularis</i>		+	R
147	ACROCEPHALIDAE	Black-browed Reed-warbler	<i>Acrocephalus bistrigiceps</i>		+	R
148		Blunt-winged Warbler	<i>Acrocephalus concinens</i>		+	M
149		Oriental Reed-warbler	<i>Acrocephalus orientalis</i>		+	M
150		Green Reed Warbler	<i>Acrocephalus arundinaceus*</i>		+	M
151	MEGALURIDAE	Striated Grassbird	<i>Megalurus palustris</i>		+	R
152	CISTICOLIDAE	Zitting Cisticola	<i>Cisticola juncidis</i>		+	R
153		Common Tailorbird	<i>Orthotomus sutorius</i>		+	R
154		Yellow-bellied Prinia	<i>Prinia flaviventris</i>		+	R
155		Plain Prinia	<i>Prinia inornata</i>		+	R

Key

+ Water Bird and Terrestrial
R Resident , M Migratory

List of Fish Species in Moyungyi Area, Yangon University (2004-2005)

No.	Family	Scientific Name	FAO Name	Vernacular Name
1	Ambassidae	<i>Parambassis ranga</i>	Indian glassy fish	Nga-zin-zat
2	Anabantidae	<i>Anabas testudineus</i>	Climbing perch	Nga-byay-ma
3	Badidae	<i>Badis ruber</i>	Red badis	Nga-mee-loung
4	Bagridae	<i>Mystus bleekeri</i>	Dwarf catfish	Nga-zin-yine
5		<i>Mystus cavasius</i>	Dwarf catfish	Nga-zin-yine
6		<i>Mystus pulcher</i>	Dwarf catfish	Nga-zin-yine
7	Belonidae	<i>Xenentodon cancila</i>	Freshwater garfish	Nga-phaung-yoe
8	Belontiidae	<i>Colisa labiosus</i>	Thicklipped gourami	Nga-pyin-tha-let
9		<i>Trichogaster pectoralis</i>	Snakeskin gourami	Gorami
10	Channidae	<i>Channa orientalis</i>	Brown snake head	Nga-yant-khaung-to
11		<i>Channa panaw</i>	Panaw snake head	Nga-pa-naw
12		<i>Channa striata</i>	Striped snke head	Nga-yant
13	Clariidae	<i>Clarias batrachus</i>	Walking catfish	Nga-khu
14	Cobitidae	<i>Lepidocephalichthys berdmorei</i>	Loach	Nga-tha-lae-doh
No.	Family	Scientific Name	FAO Name	Vernacular Name
15		<i>Lepidocephalichthys hasselti</i>	Loach	Nga-yight-cut
16	Cyprinidae	<i>Amblypharygodon mola</i>	Carplet	Nga-beh-phyu
17		<i>Esomus danricus</i>	Flying barb	Nga-maw-tawt
18		<i>Osteobrama belangeri</i>	Carplet	Nga-phane-ma

No.	Family	Scientific Name	FAO Name	Vernacular Name
19		<i>Osteobrama cunma</i>	Carplet	Nga-byat(Nga phane ma)
20		<i>Puntius chola</i>	Barb	Nga-khone ma
21		<i>Puntius sophore</i>	Barb	Nga-khone ma
22		<i>Rasbora daniconius</i>	Common Rasbora	Nga-daung-zin
23	Gobiidae	<i>Glossogobius giuris</i>	Bar-eyed goby	Ka-tha-boh
24	Heteropneustidae	<i>Heteropneustes fossilis</i>	Stinging catfish	Nga-gyee
25	Mastacembelidae	<i>Macrogathus aculeatus</i>	Lesser spiny eel	Nga-mway-doe-pyaungchaw
26		<i>Macrogathus zebrinus</i>	Zebrus eel	Nga-mway-doe-kyar
27		<i>Mastacembelus armatus</i>	spiny eel	Nga-mway-nagar
28	Notopteridae	<i>Notopterus notopterus</i>	Featherbard	Nga- lar
29	Schilbeidae	<i>Pseudeutropius auctirostris</i>	Butter catfish	Nga-than-gyeik
30	Siluridae	<i>Ompok bimaculatus</i>	Butter catfish	Nga-nu-than
31		<i>Wallago attu</i>	Freshwater shark	Nga-butt
32	Synbranchidae	<i>Monopterus albus</i>	Swamp eel	Nga-shint-mwe
33		<i>Symbranchus bengalense</i>	Pigmy eel	Nga-shint-ni

Compile list of total fish species from three Department in Moeyingyi Area

No.	Family	Scientific Name	Common Name	Myanmar Name	IUCN
1	Ambassidae	<i>Parambasis ranga</i>	Indian glassy fish	Nga-zin-zat	LC (2012)
2	Anabantidae	<i>Anabas testudineus</i>	Climbing perch	Nga-byay-ma	DD (2010)
3	Anguillidae	<i>Anguilla bicolor</i>	Level finned eel	Nga-lin -ban	LC (2009)
4		<i>Anguilla bicolor pacifica</i>	True eel (Conger)	Nga-lin-ban	Not Evaluated

No.	Family	Scientific Name	Common Name	Myanmar Name	IUCN
5	Badidae	<i>Badis ruber</i>	Red badis	Nga-mee-loung	LC (2012)
6	Bagridae	<i>Aorichthys aor</i>	Long-whiskered catfish	Nga-kyauung	LC (2010)
7		<i>Mystus bleekeri</i>	Dwarf catfish	Nga-zin-yine	LC (2010)
8		<i>Mystus cavasius</i>	River catfish	Nga-zin-yaing	LC (2010)
9		<i>Mystus menoda</i>	Fresh water catfish	Nga-eike	LC (2012)
10		<i>Mystus microphthalmus</i>	Long whisker catfish	Nga-eike	LC (2010)
11		<i>Mystus pulcher</i>	Dwarf catfish	Nga-zin-yine	LC (2010)
12		<i>Mystus vittatus</i>	Striped dwarf catfish	Nga-zin-yaing	LC (2010)
13	Belontiidae	<i>Colisa lobiosus</i>	Thick-lipped goromy	Nga-pyin-tha-lat	LC (2010)
14		<i>Osphronemus goramy</i>	Gourami	Nga-phin-tha-lat	LC (2010)
15		<i>Trichogaster pectoralis</i>	Snakeskin gourami	Gorami	LC (2012)
16	Belonidae	<i>Xenentodon cancila</i>	Garfish	Nga-phaung-yoe	LC (2010)
17	Chandidae	<i>Cahanda nama</i>	Glass fish	Nga-zin-zap	LC (2010)
No.	Family	Scientific Name	Common Name	Myanmar Name	IUCN
18	Channidae	<i>Channa guchua</i>	Brown snake head	Nga-gaung-do	LC (2010)
19		<i>Channa lucius</i>	Green-snake-head	Nga-pa-naw	LC (2012)
20		<i>Channa orientalis</i>	Brown snake head	Nga-yant-khaung-to	Not Evaluated
21		<i>Channa panaw</i>	Panaw snake head	Nga-pa-naw	Not Evaluated
22		<i>Channa striata</i>	Stripped-snakehead	Nga-yant	LC (2010)
23	Cichlidae	<i>Tilapia mossambica</i>	Tilapia	Telarbeyar (Telipia)	NT (2007)
24	Clariidae	<i>Clarias batrachas</i>	Walking catfish	Nga-khoo	LC (2011)
25	Cobitidae	<i>Lepidocephalichthys</i>	Loach	Nga-tha-lae-doh	LC (2010)

No.	Family	Scientific Name	Common Name	Myanmar Name	IUCN
		<i>berdmorei</i>			
26		<i>Lepidocephalichthys guntea</i>	Loach	Nga-thale-doe	LC (2012)
27		<i>Lepidocephalichthys hasselti</i>	Loach	Nga-thale-doe	Not Evaluated
28	Cynoglossidae	<i>Cynoglossus lingua</i>	Long tongue fish	Nga-kway-shar	Not Evaluated
29		<i>Cynoglossus microlepis</i>	Tongue fish (Sole)	Nga-con-shat	LC (2012)
30	Cyprinidae	<i>Amblyharynagodon mola</i>	Carplet	Nga-be-phyu	LC (2010)
31		<i>Cirrhina mrigala</i>	Carp	Nga-gyin	LC (2010)
32		<i>Esomus danricus</i>	Flying barb	Nga-mot-top	LC (2009)
33		<i>Labeo nandina</i>	Carp	Nga-ohn-ton	NT (2010)
34		<i>Osteobrama belangeri</i>	Carplet	Nga-phane-ma	NT (2010)
35		<i>Osteobrama cunma</i>	Carplet	Nga-byat	LC (2010)
36		<i>Osteochilus melanopleura</i>	Black banded systmus	Nga-own-toan	LC (2012)
No.	Family	Scientific Name	Common Name	Myanmar Name	IUCN
37		<i>Puntius chola</i>	Barb	Nga-khone-ma	LC (2010)
38		<i>Puntius sophore</i>	Barb	Nga-khone ma	LC (2010)
39		<i>Rasbora daniconius</i>	Common radbora	Nga-daung-zin	LC (2011)
40		<i>Rasbora rasbora</i>	Common rasbora	Nga-daung-zin	LC (2010)
41	Gobiidae	<i>Glossogobius giuris</i>	Bar-eyed goby	Ka-tha-boe	LC (2012)
42	Heteropneusitidae	<i>Heteropnustes fossilis</i>	Stinging catfish	Nha-kyee	LC (2010)
43	Latidae	<i>Lates calcarifer</i>	Giant sea perch	Kat-ka-tic	Not Evaluated
44	Mastacembelidae	<i>Macrognathus aculeatus</i>	Lesser spiny eel	Nga-mway-doe-pyaungchaw	Not Evaluated

No.	Family	Scientific Name	Common Name	Myanmar Name	IUCN
45		<i>Macrognathus zebrinus</i>	Ophidian	Nga-mway-doh	LC (2010)
46		<i>Mastacembelus armatus</i>	Spiny eel	Nga-mway-doh	LC (2010)
47	Nandidae	<i>Nandus nandus</i>	Spotted field perch	Nga-wat-ma	LC (2010)
48	Notopteridae	<i>Notopterus notopterus</i>	Feather bard	Nga-phe	LC (2010)
49	Schilbeidae	<i>Eutropiichthys vacha</i>	Dwarf carp	Nga-than-chate	LC (2012)
50		<i>Pseudotropius auctirostris</i>	Butter catfish	Nga-than-chate	Not Evaluated
51	Sciaenidae	<i>Oryzias minutilus</i>	Fish larva	Nga-chee-khar	LC (2009)
52		<i>Sciaena coitor</i>	Coitor croaker	Nga-byet	LC (2009)
53	Siluridae	<i>Ompok pabo</i>	Butter catfish	Nga-nu-than	NT (2010)
54		<i>Ompok bimaculatus</i>	Butter catfish	Nga-nu-than	NT (2010)
55		<i>Wallago attu</i>	Sheat fish	Nga-bat	NT (2010)
56	Synbranchidae	<i>Monopterus albas</i>	Mud eel	Nga-shint	LC (2010)
No.	Family	Scientific Name	Common Name	Myanmar Name	IUCN
57		<i>Ophisternon bengalense</i>	Pigmy eel	Nga-shint-ni	LC (2010)
58	Tetraodontidae	<i>Monotrete leiurus</i>	Globe fish	Nga-pu-tin	LC (2012)
59		<i>Tetrodon cutcutia</i>	Globe fish/puffer	Nga-pu-tin	LC (2010)

Comparison of Fish Spp. Data in Moeyingyi Area

No.	Family	Scientific Name	Forest Dep;	Bago Uni;	Yangon Uni;
1	Ambassidae	<i>Parambassis ranga</i>	+		+
2	Anabantidae	<i>Anabas testudineus</i>	+		+
3	Anguillidae	<i>Anguilla bicolor</i>		+	
4		<i>Anguilla bicolor pacifica</i>	+		
5	Badidae	<i>Badis ruber</i>			+
6	Bagridae	<i>Aorichthys aor</i>	+		
7		<i>Mystus bleekeri</i>			+
8		<i>Mystus cavasius</i>		+	+
9		<i>Mystus menoda</i>	+		
10		<i>Mystus microphthalmus</i>		+	
11		<i>Mystus pulcher</i>	+		+
12		<i>Mystus vittatus</i>	+	+	
13	Belontiidae	<i>Colisa lobiosus</i>		+	+
14		<i>Osphronemus goramy</i>	+		
15		<i>Trichogaster pectoralis</i>	+		+
16	Belonidae	<i>Xenentodon cancila</i>	+	+	+
17	Chandidae	<i>Chanda nama</i>		+	
18	Channidae	<i>Channa guchua</i>	+	+	
19		<i>Channa lucius</i>	+	+	
20		<i>Channa orientalis</i>			+
21		<i>Channa panaw</i>			+
22		<i>Channa striata</i>	+	+	+
23	Cichlidae	<i>Tilapia mossambica</i>		+	
24	Clariidae	<i>Clarias batrachas</i>	+	+	+
25	Cobitidae	<i>Lepidocephalichthys berdmorei</i>			+
26		<i>Lepidocephalichthys guntea</i>		+	
27		<i>Lepidocephalichthys hasselti</i>	+		+
28	Cynoglossidae	<i>Cynoglossus lingua</i>		+	
29		<i>Cynoglossus microlepis</i>	+		
30	Cyprinidae	<i>Amblyharyngodon mola</i>	+	+	+
No.	Family	Scientific Name	Forest Dep;	Bago Uni;	Yangon Uni;
31		<i>Cirrhina mrigala</i>		+	
32		<i>Esomus danricus</i>	+	+	+
33		<i>Labeo nandina</i>		+	
34		<i>Osteobrama belangeri</i>	+		+
35		<i>Osteobrama cunma</i>			+
36		<i>Osteochilus melanopleura</i>	+		

No.	Family	Scientific Name	Forest Dep;	Bago Uni;	Yangon Uni;
37		<i>Puntius chola</i>	+	+	+
38		<i>Puntius sophore</i>	+	+	+
39		<i>Rasbora daniconius</i>			+
40		<i>Rasbora rasbora</i>		+	
41	Gobiidae	<i>Glossogobius giuris</i>	+	+	+
42	Heteropneusitidae	<i>Heteropnustes fossilis</i>	+	+	+
43	Latidae	<i>Lates calcarifer</i>	+		
44	Mastacembelidae	<i>Macrognathus aculeatus</i>			+
45		<i>Macrognathus zebrinus</i>	+		+
46		<i>Mastacembelus armatus</i>	+	+	+
47	Nandidae	<i>Nandus nandus</i>	+	+	
48	Notopteridae	<i>Notopterus notopterus</i>	+	+	+
49	Schilbeidae	<i>Eutropiichthys vacha</i>	+		
50		<i>Pseudotropius auctirostris</i>		+	+
51	Sciaenidae	<i>Oryzias minutilus</i>	+	+	
52		<i>Sciaena coitor</i>		+	
53	Siluridae	<i>Ompok pabo</i>	+	+	
54		<i>Ompok bimaculatus</i>			+
55		<i>Wallago attu</i>	+	+	+
56	Synbranchidae	<i>Monopterus albas</i>	+	+	+
57		<i>Ophisternon bengalense</i>	+	+	+
58	Tetraodontidae	<i>Monotrete leiurus</i>	+		
59		<i>Tetodon cutcutia</i>		+	

Appendix 2.3

1. List of Butterflies from Moeyingyi Wildlife Sanctuary (NWCD)

No	Family name	Scientific name	Common name
1.	Papilionidae	<i>Papilio demoleus</i>	Lime Butterfly
2.	Papilionidae	<i>Papilio polytes</i>	Common Mermon
3.	Pieridae	<i>Catopsilia pomona</i>	Lemon Emigrant
4.	Pieridae	<i>Catopsilia <u>pomona</u> crocale</i>	The Lemon Emigrant
5.	Pieridae	<i>Catopsilia scylla</i>	Orange Emigrant

No	Family name	Scientific name	Common name
6.	Pieridae	<i>Appias libythea</i>	Striped Albatross
7.	Pieridae	<i>Appias lynxida</i>	Chocolate Albatross
8.	Pieridae	<i>Eurema hecabe</i>	Not Known
9.	Pieridae	<i>Delias descombi</i>	Common Yellow jezebal
10.	Danaidae	<i>Danaus genutia</i>	Common Tiger
11.	Danaidae	<i>Danaus limniace</i>	The Blue Tiger
12.	Danaidae	<i>Euploea core</i>	Violet Tipped Crow
13.	Danaidae	<i>Euploea klugii</i>	King Crow
14.	Satyridae	<i>Melanitis phedima bela</i>	Not Known
15.	Satyridae	<i>Melanitis zitenius</i>	Not Known
16.	Satyridae	<i>Mycalesis mineus</i>	Not Known
17.	Nymphalidae	<i>Precis almana</i>	Peacock Pansy
18.	Nymphalidae	<i>Precis altites</i>	Gray Pansy
19.	Nymphalidae	<i>Athyma perius</i>	Common Sergeant
20.	Nymphalidae	<i>Cethosia cyane</i>	Leopard Lacewing
21.	Nymphalidae	<i>Pantoporia hordonia</i>	Common Lascar
22.	Nymphalidae	<i>Athyma asura</i>	Studded Serum
23.	Nymphalidae	<i>Euthalia phermius</i>	White edge Blue Barom
24.	Amathusiidae	<i>Descophora timora(male)</i>	Not Known
25.	Amathusiidae	<i>Descophora timora (female)</i>	Not Known
26.	Riodinidae	<i>Zemerus flegyas</i>	Not Known
27.	Lycaenidae	<i>Logania regina</i>	Not Known
28.	Lycaenidae	<i>Jamides alecto</i>	Cerulean
29.	Lycaenidae	<i>Jamides alecto alocina</i>	Cerulean
30.	Hesperiidae	<i>Parnara naso bada</i>	Not Known
31.	Hesperiidae	<i>Halpe insignis</i>	Not Known
32.	Hesperiidae	<i>Gerosis bhagava</i>	Not Known
33.	Hesperiidae	<i>Pithauria marsena</i>	Not Known

(Source – FD of Moeyungyi) 2003

2. List of butterflies from Moeyingyi Wildlife Sanctuary (Bago University)

No	Family name	Scientific name	Common name
1.	Pieridae	<i>Pieris</i> sp.	Butterfly
2.	Pieridae	<i>Catopsilia pomona</i>	Lemon Emigrant
3.	Pieridae	<i>Catopsilia scylla</i>	Orange Emigrant
4.	Pieridae	<i>Appias libythea</i>	Striped Albatross
5.	Pieridae	<i>Appias lynicda</i>	Chocolate Albatross
6.	Pieridae	<i>Delias descombi</i>	Common Yellow Jezebel
7.	Nymphalidae	<i>Precis atlites</i>	Gray Pansy
8.	Nymphalidae	<i>Precis almana</i>	Peacock Pansy
9.	Nymphalidae	<i>Athyma perius</i>	Common Sergeant
10.	Nymphalidae	<i>Euthalia phemius</i>	White edged Blue Barom
11.	Nymphalidae	<i>Cethosia cyane</i>	Leopard Lacewing
12.	Nymphalidae	<i>Pantoporia hordonia</i>	Common Lascar
13.	Nymphalidae	<i>Athyma asura asura</i>	The Studded Sergeant
14.	Papilionidae	<i>Papilio demoleus</i>	Lime Butterfly
15.	Papilionidae	<i>Papilio polytes</i>	Common Mermon
16.	Danaidae	<i>Danaus limniace</i>	Blue Tiger
17.	Danaidae	<i>Danaus genutia</i>	Common Tiger
18.	Danaidae	<i>Euploea core</i>	Violet Tipped Crow
19.	Danaidae	<i>Euploea klugii</i>	The King Crow
20.	Lycaenidae	<i>Jamides alecto</i>	The Cerulean
21.	Lycaenidae	<i>Jamides alecto alocina</i>	The Creulean

(Source – Zoology Department of Bago University) (2008)

List of Insects from Moeyingyi Wildlife Sanctuary (Bago University)

No	Family name	Scientific name	Common name
1.	Petaluridae	<i>Tanypteryx hageni</i>	Dragonflies
2.	Petaluridae	<i>Tachopterynx thoreyi</i>	Dragonflies
3.	Acrididae	<i>Melanopus</i> sp.	Grasshopper

No	Family name	Scientific name	Common name
4.	Blattidae	<i>Periplaneta americana</i>	Cockroach
5.	Apidae	<i>Apis</i> sp.	Honey bee
6.	Muscidae	<i>Musca nebulosa</i>	Housefly
7.	Gryllidae	<i>Gryllus campestris</i>	House cricket
8.	Vespidae	<i>Vespa orientalis</i>	Wasp
9.	Pompilidae	<i>Araneus</i> sp.	Garden spider
10.	Culicidae	<i>Culex, Anopheles, Aedes</i>	Mosquitoes
11.	Elateridae	<i>Julus</i> sp.	Wireworm
12.	Buprestidae	<i>Chrysochora vittata</i>	Metallic wood borers
13.	Termitidae	<i>Macrotermes</i> sp.	Termites
14.	Calopterygidae	<i>Calopteryx maculate</i>	Broad-winged Damselflies
15.	Lestidae	<i>Lestes</i> sp.	Spread-winged Damselflies
16.	Coenagrionidae	<i>Argia fumipennis</i>	Narrow-winged Damselflies

(Source – Zoology Department of Bago University)

Appendix 2.4

List of Aquatic Plants from Moeyingyi Wetland Wildlife Sanctuary

NO	မြန်မာအမည် (Common Name)	ရုက္ခဗေဒအမည် (Scientific Name)
1/	ညံ	<i>Sesbania Javnia</i>
2/	ကျွဲခေါင်း	<i>Trapa bispinosa</i>
3/	ကြာပြာ	<i>Nymphaea stellata</i>
4/	ကြာလင်ဝန်း	-
5/	ဝကန်ကြမ်း	<i>Hydrilla Spp:</i>
6/	ဝကန်နု	<i>Ulricularia Spp:</i>
7/	မျောက်မီး	<i>Ceratophyllum Spp:</i>
8/	ဝဒုမ္မာကြာနီ	<i>Nelumbo nucifera</i>
9/	ဝဒုမ္မာကြာအဖြူ	/
10/	ဘဲစားမြတ်	-
11/	ကညွတ်	<i>Ludwigia adscendens</i>
12/	ကျွဲလည်ချောင်း	<i>Polygonem Spp:</i>
13/	မြတ်ချို	Family Gramineae
14/	မြတ်ခါး	/
15/	နတ်စပါး	/
16/	မြတ်ကလုံး	/
17/	မြတ်ယား	/
18/	မြတ်ခြင်းတောင်း	-
19/	မြတ်ကျွတ်	-
20/	ပိန်း	<i>Elephant grass</i>
21/	ကြက်ဖပင်	<i>Vallosneria</i>
22/	ဆစ်ပုခုံ	-
23/	မဲလေး	-
24/	မြေဇာမြတ်	Family Gramineae
25/	ငေဒါ	<i>Eichornia Crassipes</i>
26/	ဘဲခြေထောက်	-
27/	ရေကန်စွန်း	<i>Ipomaea aqua</i>

NO	မြန်မာအမည် (Common Name)	ရုက္ခဗေဒအမည် (Scientific Name)
28/	ကြာဖြူ	<i>Nymphaea alba</i>
29/	မျက်ဝမ်းပူ	-
30/	ကုလားတက်ပြား	<i>Hydrocharis</i>
31/	ကြာနီ	-
32/	မိုနတို	<i>Nymphaea Spp:</i>
33/	ပုဇွန်စာ	-
34/	ရေဆူးပုတ်	<i>Mimosa Pigna</i>
35/	ထိကရုန်း	-
36/	လယ်ပဒူ	-
37/	ကိုင်း	-
38/	ကျောက်ကညွတ်	-
39/	ကုလားမနို့သီး	-
40/	ခွားထမင်းတုတ်	-
41/	ပုဇွန်မှတ်ဆိတ်	-
42/	ရေမှော်ကြီး	<i>Pistia</i>
43/	ရေမှော်လေး	<i>Salvinia</i>
44/	မြက်ထီးဆောင်း	<i>Cyperus</i>
45/	မိချောင်းကွမ်းဘတ်	-
46/	ဆင်နှာမောင်း	-
47/	မီးစပ်ရက်	-
48/	ကြိတ်မှန်	-
49/	ဆင်ငိုမြက်	-

List of Amphibians and Reptiles from Moeyingyi Wildlife Sanctuary

No.	Family Name	pScientific Name	Common Name
1	Microhylidae	<i>Kaloula pulchra</i>	Common Bull Frog
2	Ranidae	<i>Occidozyga lima</i>	Common Floating Frog
3	Ranidae	<i>Rana erythraea</i>	Red-eared Frog
4	Ranidae	<i>Rana limnocharis</i>	Paddy Frog
5	Ranidae	<i>Rana macrodactyla</i>	Long-toed Frog
6	Ranidae	<i>Rana rugolosa</i>	Chinese Bullfrog
7	Rhacophoridae	<i>Polypedates leucomystax</i>	Common Tree Frog
8	Microhylidae	<i>Microhyla inornata</i>	Inornate Froglet
9	Trionychidae	<i>Morenia ocellata</i>	Myanmar Eyed Turtle
10	Bataguridae	<i>Lissemys scutata</i>	Myanmar Flapshell Turtle
11	Agamidae	<i>Calotes versicolor</i>	Garden Lizard
12	Agamidae	<i>Calotes mystaceus</i>	Blue Forest Lizard
13	Gekkonidae	<i>Hemidactylus frenatus</i>	House Gecko
14	Scincidae	<i>Lygosoma bowringii</i>	Bowring's Supple Skink
15	Scincidae	<i>Mabuya multifasciata</i>	Common Sun Skink
16	Natricidae	<i>Amphiesma stolata</i>	Buff-striped Keelback
17	Natricidae	<i>Xenochrophis flavipunctatus</i>	Yellow-spotted Keelback Snake
18	Natricidae	<i>Xenochrophis piscator</i>	Chequered Keelback Water Snake
19	Homalopsidae	<i>Enhydris enhydris</i>	Rainbow Water Snake
20	Homalopsidae	<i>Homalopsis buccata</i>	Puff-faced Water Snake
21	Boodontidae	<i>Psammopsis condanansis</i>	Water Snake
22	Xenopeltidae	<i>Xenopeltis unicolor</i>	Sunbeam Snake
23	Elapidae	<i>Bungarus fasciatus</i>	Yellow-banded Krait
24	Elapidae	<i>Naja kaouthia</i>	Monocellate Cobra
25	Typhlopidae	<i>Ramphotyphlops braminus</i>	Common Blind Snake
26	Typhlopidae	<i>Typhlops diardi</i>	Diard's Blind Snake
27	Viperidae	<i>Daboia russellii siamensis</i>	Russell's Viper

No.	Family Name	pScientific Name	Common Name
28	Colubridae	<i>Ptyas korros</i>	Indo-chinese Rat Snake

(Source – FD of Moeyingyi)

List of Amphibians and Reptiles from Moeyingyi Wildlife Sanctuary (Bago University)

No.	Family Name	Scientific Name	Common Name
1	Bufo	<i>Bufo melanostictus</i>	True Frog
2	Ranidae	<i>Occidozyga lima</i>	Common Floating Frog
3	Ranidae	<i>Rana erythraea</i>	Red-eared Frog
4	Ranidae	<i>Rana limnocharis greanii</i>	Paddy Frog
5	Ranidae	<i>Rana limnocharis</i>	Paddy Frog
6	Ranidae	<i>Rana macrodactyla</i>	Long-toed Frog
7	Ranidae	<i>Rana rugolosa</i>	Chinese Bullfrog
8	Ranidae	<i>Rana tigerina</i>	Khaing Land Frog
9	Polypedatidae	<i>Polypedates leucomystax</i>	Common Tree Frog
10	Rhacophoridae	<i>Rhacophorus</i> sp	Flying Frog
11	Brevicipitidae	<i>Microhyla ornata</i>	Narrow-mouth Toad
12	Brevicipitidae	<i>Kaloula pulchra</i>	Narrow-mouth Toad
13	Emydidae	<i>Morenia occellata</i>	Eyed Turtle
14	Trionychidae	<i>Lissemys scutata</i>	Flapshell Turtle
15	Agamidae	<i>Calotes versicolor</i>	Changeable Lizard
16	Agamidae	<i>Calotes mystaceus</i>	Lizard
17	Gekkonidae	<i>Hemidactylus frenatus</i>	Common House Gecko
18	Scincidae	<i>Lygosoma bowringii</i>	Christmas Island Grass Skink
19	Scincidae	<i>Mabuya multifasciata</i>	East Indian Brown Mabuya
20	Natricidae	<i>Amphiesma stolata</i>	Buff-striped Keelback
21	Natricidae	<i>Xenochrophis flavipunctatus</i>	Yellow-spotted Keelback Snake
22	Natricidae	<i>Xenochrophis piscator</i>	Chequered Keelback Water Snake
23	Homalopsidae	<i>Enhydryis enhydryis</i>	Rainbow Water Snake
24	Homalopsidae	<i>Homalopsis buccata</i>	Rainbow Mud Snake
25	Xenopeltidae	<i>Xenopeltis unicolor</i>	Sunbeam Snake

No.	Family Name	Scientific Name	Common Name
26	Elapidae	<i>Bungarus fasciatus</i>	Banded Krait
27	Elapidae	<i>Naja kaouthia</i>	Monocellate Cobra
28	Typhlopidae	<i>Ramphotyphlops braminus</i>	Brahming Blind Snake
29	Typhlopidae	<i>Typhlops diardi</i>	Diard's Blind Snake
30	Viperidae	<i>Daboia russellii siamensis</i>	Easter Russell's Viper
31	Colubridae	<i>Ptyas korros</i>	Indo-chinese Rat Snake
32	Colubridae	<i>Psammopsis condanarus</i>	Sand Snake

(Source – Zoology Department of Bago University)

List of mammal species of Moeyingyi from Zoology Department of Bago University

Sr. No	Scientific Name	Myanmar Name	Common Name	Family
1	<i>Rhizomys pruinosus</i>	Pway Kywet	Hoary Bamboo Rat	Spalacidae
2	<i>Bandicota Indica</i>	Kywet Kalar	Greater Bandicoot Rat	Muridae
3	<i>Bandicota savilei</i>	Bamar Kywet	Savile's Bandicoot Rat	Muridae
4	<i>Niviventer fulvescens</i>	Kywet Wan Phyu	White volleyed Rat	Muridae
5	<i>Mus cervicolor</i>	Kywer Pha Laung	Fawn coloured Rat	Muridae
6	<i>Bibos gaurus</i>	Nwa	Eventood Mammal	Bovidae
7	<i>Syncerus coffer</i>	Kywe	Buffalo	Bovidae
8	<i>Sus scrofa</i>	Wet	Pig	Suidae
9	<i>Nubin goat</i>	Seit	Africa Goat	Bovidae

(Source - Zoology Department of Bago University)

**BIODIVERSITY DATA AND SOCIOECONOMIC DATA
OF
MOEYUNGY WETLAND WILDLIFE SANCTUARY
(2014)**

List of Avifauna from Survey Conducted in 2014

Sr.	Family and Common Name	Scientific name	Water Birds	Terrestrial Birds	Range and Status
	ANTIDAE: DENDROCYGNINAE: Whistling-ducks				
1	Lesser Whistling-Duck	<i>Dendrocygna javanica</i>	X		R
	ANATIDAE: ANATINAE: Typical ducks and pygmy-geese				
2	Indian Spot-billed Duck	<i>Anas poecilorhyncha</i>	X		R
3	Northern Pintail	<i>Anas acuta</i>	X		M
4	Garganey	<i>Anas querquedula</i>	X		M
	PODICIPEDIDAE: Grebes				
5	Little Grebe	<i>Tachybaptus ruficollis</i>	X		R
	CICONIIDAE: Storks				
6	Painted Stork	<i>Mycteria leucocephala</i>	X		M
7	Asian Openbill	<i>Anastomus oscitans</i>	X		M
8	Black Stork	<i>Ciconia nigra</i>	X		M
	THRESKIORNITHIDAE: THRESKIOGNITHINAE: Ibises				
9	Black-headed Ibis	<i>Threskiornis melanocephalus</i>	X		R
10	Glossy Ibis	<i>Plegadis falcinellus</i>	X		R
	ARDEIDAE: BOTAURINAE: Bitterns				
11	Yellow Bittern	<i>Ixobrychus sinesis</i>	X		R
12	Cwetlandamon Bittern	<i>Ixobrychus cwetlandamomeus</i>	X		R
	ARDEIDAE: ARIDEINAE: Herons & egrets				
13	Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	X		R
14	Pond-Heron	<i>Ardeola speciosa</i>	X		R
15	Eastern Cattle Egret	<i>Bubulcus coromandus</i>	X		R
16	Grey Heron	<i>Ardea cinerea</i>	X		R
17	Purple Heron	<i>Ardea purpurea</i>	X		R

Sr.	Family and Common Name	Scientific name	Water Birds	Terrestrial Birds	Range and Status
18	Great Egret	<i>Ardea alba</i>	X		R
19	Intermediate Egret	<i>Mesophoyx intermedia</i>	X		R
20	Little Egret	<i>Egretta garzetta</i>	X		R
	PELECANIDAE: Pelicans				
21	Spot-billed Pelican	<i>Pelecanus philippensis</i>	X		M
	PHALACROCORACIDAE: Cormorants				
22	Little Cormorant	<i>Phalacrocorax niger</i>	X		R
	ANHINGIDAE: Darters				
23	Oriental Darter	<i>Anhinga melanogaster</i>	X		R
	FALCONIDAE: FALCONINAE: Falcons				
24	Common Kestrel	<i>Falco tswetlandunculus</i>		X	R
	FALCONIDAE: ACCIPITRINAE: Hawks, eagles & allies				
25	Oriental Honey-Buzzard	<i>Pernis ptilorhynchus</i>		X	R
26	Black -shouldered Kite	<i>Elanus caeruleus</i>		X	R
27	Black Kite	<i>Milvus migrans</i>		X	M
28	Black-eared Kite	<i>Milvus lineatus</i>		X	M
29	Crested Serpent-Eagle	<i>Spilornis cheela</i>		X	R
30	Eastern Marsh-Harrier	<i>Circus spilonotus</i>		X	M
31	Pied Harrier	<i>Circus melanoleuco</i>		X	M
	RALLIDAE: Rails, crakes, gallinules & coots				
32	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	X		R
33	Ruddy-breasted Crake	<i>Porzana fusca</i>	X		R
34	Watercock	<i>Gallixrex cinerea</i>	X		R
35	Grey-headed Swamphen	<i>Porphyrio poliocephalus</i>	X		R
36	Common Coot	<i>Fulica atra</i>	X		M
	GRUIDAE: GRUINAE: Typical cranes				

Sr.	Family and Common Name	Scientific name	Water Birds	Terrestrial Birds	Range and Status
37	Sarus Crane	<i>Grus antigone</i>	X		R
	PLUVIALIDAE: <i>Pluvialis</i> plovers				
38	Pacific Golden Plover	<i>Pluvialis fulva</i>	X		M
	RECURVIROSTRIDAE: Stilts & avocets				
39	Black-winged Stilt	<i>Himantopus himantopus</i>	X		R
	VANELLIDAE: Lapwings & allies				
40	Grey-headed Lapwing	<i>Vanellus cinereus</i>		X	M
41	Red-wattled Lapwing	<i>Vanellus indicus</i>		X	R
	CHARADRIIDAE: <i>Charadrius</i> plovers & allies				
42	Little Ringed Plover	<i>Charadrius dubius</i>	X		M
43	Kentish Plover	<i>Charadrius alexandrinus</i>	X		M
44	Lesser Sand-Plover	<i>Charadrius mongolus</i>	X		M
	JACANIDAE: Jacanas				
45	Pheasant-tailed Jacana	<i>Hydrophasianus chirurgus</i>	X		R
46	Bronze-winged Jacana	<i>Metopidicus indicus</i>	X		R
	SCOLOPACIDAE: GALLINAGININAE: Snipes				
47	Snipe	<i>Gallinago spp</i>	X		M
	SCOLOPACIDAE: TRINGINAE: Godwits, dowitchers, curlews, sandpipers				
48	Common Sandpiper	<i>Actitis hypoleucos</i>	X		M
49	Green Sandpiper	<i>Tringa ochropus</i>	X		M
50	Spotted Redshank	<i>Tringa erythropus</i>	X		M
51	Wood Sandpiper	<i>Tringa glareola</i>	X		M
52	Common Redshank	<i>Tringa totanus</i>	X		M
	SCOLOPACIDAE: CALIDRIDNAE: <i>Calidris</i> sandpiper & allies				
53	Temminck's Stint	<i>Calidris temminckii</i>	X		M
54	Long-toed Stint	<i>Calidris subminuta</i>	X		M

Sr.	Family and Common Name	Scientific name	Water Birds	Terrestrial Birds	Range and Status
	GLAREOLIDAE: GLAREOLINAE: Pratincoles				
55	Oriental Pratincole	<i>Glareola maldivarum</i>	X		M
	STERNIDAE: Noddies & terns				
56	White-winged Tern	<i>Chlidonias leucopterus</i>	X		M
57	Whiskered Tern	<i>Chlidonias hybrida</i>	X		M
58	Common Tern	<i>Sterna hirundo</i>	X		M
	COLUMBIDAE: COLUMBINAE: Typical pigeons & doves				
59	Rock Pigeon	<i>Columba livia</i>		X	R
60	Red Collared-Dove	<i>Streptopelia tranquebarica</i>		X	R
61	Spotted Dove	<i>Streptopelia chinensis</i>		X	R
	CUCULIDAE: CUCULINAE: Old World cucukoos				
62	Indian Cuckoo	<i>Cuculus micropterus</i>		X	R
63	Plaintive Cuckoo	<i>Cacomantis merulinus</i>		X	R
	CUCULIDAE: CENTROPODINAE: Coucals				
64	Greater Coucal	<i>Centropus sinensis</i>		X	R
65	Lesser Coucal	<i>Centropus bengalensis</i>		X	R
	TYTONIDAE: TYTONINAE: Barn -and grass-owls				
66	Eastern Grass-Owl	<i>Tyto longimembris</i>		X	R
	STRIGIDAE: Typical owls				
67	Collared Scops-Owl	<i>Otus lettia</i>		X	R
68	Asian Barred Owlet	<i>Glaucidium cuculoides</i>		X	R
69	Spotted Owlet	<i>Athene brama</i>		X	R
	APODIAE: APODINAE: Typical swifts				
70	Asian Palm-Swift	<i>Cypsiurus balas</i>		X	R
71	House Swift	<i>Apus affinis</i>		X	R
	CORACIIDAE: Rollers				

Sr.	Family and Common Name	Scientific name	Water Birds	Terrestrial Birds	Range and Status
72	Indian Roller	<i>Coracias benghalensis</i>		X	R
	ALCEDINIDAE: HELCYONINAE: Larger kingfishers				
73	White-throated Kingfisher	<i>Halcyon smyrnensis</i>		X	R
74	Black-capped Kingfisher	<i>Halcyon pileata</i>		X	M
	ALCEDINIDAE: ALCEDININAE: Smaller kingfisher				
75	Blue-eared Kingfisher	<i>Alcedo meninting</i>		X	M
76	Common Kingfisher	<i>Alcedo atthis</i>		X	R
	MEROPIDAE: Bee-eaters				
77	Little Green Bee-eater	<i>Merops orientalis</i>		X	R
78	Blue-tailed Bee-eater	<i>Mecops philippinus</i>		X	R
	RAMPHASTIDAE: MEGALAIMINAE: Asian barbets				
79	Coppersmith Barbet	<i>Megalaima haemacephala</i>		X	R
	PICIDAE: JYGNINAE: Wrynecks				
80	Eurasian Wryneck	<i>lynx torquilla</i>		X	M
	PICIDAE: PICINAE: Typical woodpeckers				
81	Fulvous-breasted Woodpecker	<i>Dendrocopos macei</i>		X	M
	ORIOIDAE: Orioles & allies				
82	Black-naped Oriole	<i>Oriolus chinensis</i>		X	M
	ARTAMIDAE: Woodswallows				
83	Ashy Woodswallow	<i>Artamus fuscus</i>		X	R
	AEGITHINIDAE: Ioras				
84	Common Iora	<i>Aegithina tiphia</i>		X	R
	DICRURIDAE: Drongos				
85	Black Drongo	<i>Dicrurus macrocercus</i>		X	M
	CORVIDAE: Crows, nutcrackers, magpies, jays, treepies & allies				
86	House Crow	<i>Corvus splendens</i>		X	R

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Sr.	Family and Common Name	Scientific name	Water Birds	Terrestrial Birds	Range and Status
	LANIIDAE: Shrikes				
87	Brown Shrike	<i>Lanius cristatus</i>		X	M
88	Long-tailed Shrike	<i>Lanius schach</i>		X	M
	NECTARINIIDAE: Sunbirds & spinderhunters				
89	Olive-backed Sunbird	<i>Cwetlandyris jugularis</i>		X	R
	PLOCEIDAE: Weavers & allies				
90	Baya Weaver	<i>Ploceus philippinus</i>		X	R
	ESTRILDIDAE: LONCHURINAE: Java Sparrow, munias,				
91	White-rumped Munia	<i>Lonchura striata</i>		X	R
92	Scaly-breasted Munia	<i>Lonchura punctulata</i>		X	R
	PASSERIDAE: Sparrows & allies				
93	House Sparrow	<i>Passer domesticus</i>		X	R
94	Plain-backed Sparrow	<i>Passer flaveolus</i>		X	R
95	Eurasian Tree-Sparrow	<i>Passer montanus</i>		X	R
	MOTACILLIDAE: Wagtails & pipits				
96	Red-throated Pipit	<i>Anthus cervinus</i>		X	M
97	Richard's Pipit	<i>Anthus richardi</i>		X	M
98	Paddyfied Pipit	<i>Anthus rufulus</i>		X	R
99	White Wagtail	<i>Motacilla alba</i>		X	M
100	Grey Wagtail	<i>Motacilla cinerea</i>		X	M
101	Eastern Yellow Wagtail	<i>Motacilla tschutschensis</i>		X	M
	EMBERIZIDAE: Buntings & allies				
102	Chestnut-eared Bunting	<i>Emberiza fucata</i>		X	M
	STURNIDAE: STURNINAE: Mynas, starlings & allies				
103	Jungle Myna	<i>Acridotheres fuscus</i>		X	R
104	Common Myna	<i>Acridotheres tristis</i>		X	R

Sr.	Family and Common Name	Scientific name	Water Birds	Terrestrial Birds	Range and Status
105	Asian Pied Starling	<i>Gracupica contra</i>		X	R
	MUSCICAPIDAE: SAXICOLINAE: Shortwings, robins, redstarts,				
106	Bluethroat	<i>Luscinia svecica</i>		X	M
107	Eastern Stonechat	<i>Saxicola maurus</i>		X	M
108	Pied Bushchat	<i>Saxicola caprata</i>		X	R
	MUSCICAPIDAE: MUSCICAPINAE: Old World flycatchers & allies				
109	Taiga Flycatcher	<i>Ficedula albicilla</i>		X	M
110	Oriental Magpie-Robin	<i>Copsychus saularis</i>		X	R
	ALAUDIDAE: Larks				
111	Oriental Skylark	<i>Alauda gulaula</i>		X	R
	PYCNONOTIDAE: Bulbuls				
112	Streak-eared Bulbul	<i>Pycnonotus blanfordi</i>		X	R
113	Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>		X	R
114	Red-vented Bulbul	<i>Pycnonotus cafer</i>		X	R
	HIRUNDINIDAE: HIRUNDININAE: Martins, swallows & allies				
115	Common Sand-Martin	<i>Riparia nipalense</i>		X	M
116	Pale Sand-Martin	<i>Riparia diluta</i>		X	M
117	Barn Swallow	<i>Hirundo rustica</i>		X	M
118	Red-rumped Swallow	<i>Cecropis daurica</i>		X	M
	PHYLLOSCOPIDAE: <i>Seicercus</i> & <i>Phylloscopus</i> warblers				
119	Greenish Warbler	<i>Phylloscopus trochiloides</i>		X	M
120	Yellow-browed Warbler	<i>Phylloscopus inornatus</i>		X	M
121	Dusky Warbler	<i>Phylloscopus fuscatus</i>		X	M
	TIMALIIDAE: Babblers				
122	Yellow-eyed Babbler	<i>Chrysomma sinense</i>		X	R
123	Oriental White-Eye	<i>Zosterops palpebrosus</i>		X	R

Sr.	Family and Common Name	Scientific name	Water Birds	Terrestrial Birds	Range and Status
	ACROCEPHALIDAE: Acrocephalus warblers & allies				
124	Black-Browed Reed-Warbler	<i>Acrocephalus bistrigiceps</i>		X	M
125	Paddyfield Warbler	<i>Acrocephalus agricola</i>		X	M
126	Oriental Reed-Warbler	<i>Acrocephalus orientalis</i>		X	M
127	Thick-billed Warbler	<i>Acrocephalus aedon</i>		X	
	MEGALURIDAE: Grasshopper warblers, <i>Bradypterus</i> bush-warbler,				
128	Striated Grassbird	<i>Megalurus palustris</i>		X	R
	CISTICOLIDAE: Cisticolas, tailorbirds, prinias & allies				
129	Zitting Cisticola	<i>Cisticola juncidis</i>		X	M
130	Bright-headed Cisticola	<i>Cisticola exilis</i>		X	R
131	Common Tailorbird	<i>Orthotomus sutorius</i>		X	R
132	Yellow-bellied Prinia	<i>Prinia flaviventris</i>		X	R
133	Plain Prinia	<i>Prinia inornata</i>		X	R

Aquatic Plant Species from Moyingyi Wetland Wildlife Sanctuary (2014)

No.	Family	Scientific name	Local name	Habit	Collection sites	
					Upland	Weland
1	Acanthaceae	<i>Hygrophila ptilomoides</i> Nees.	Migyaung-kunbat	H=32	+	+
2	Acanthaceae	<i>Rungia pectinata</i> (L.) Nees.	Nil	H	+	+
3	Acanthaceae	<i>Rungia</i> sp.	Nil	H	+	-
4	Aizoaceae	<i>Sesuvium</i> sp.	Nil	H	-	+
5	Amarantaceae	<i>Alternanthera sessilis</i> R. Br.	Pazun-sa	H	+	-
6	Apiaceae	<i>Sium latifolium</i> L.	Nil	H	-	+
7	Araceae	<i>Colocasia esculenta</i> (L.) Schott.	Pein	H	-	+
8	Araceae	<i>Homalomena truncata</i> Hk. F.	Nil	H	-	+
9	Araceae	<i>Lemna paucicostata</i> Hegelm..	Duckweed	AH=12	-	+
10	Asteraceae	<i>Acmella vliginosa</i> (Sw.) Cass.	Bizat	H	+	-
11	Asteraceae	<i>Blumea lacera</i> DC.	Kadu	H	+	+
12	Asteraceae	<i>Eclipta alba</i> (L.) Hassk.	Kyeikhman	H	+	-
13	Asteraceae	<i>Enhydra fluctuans</i> Lour.	Kanahpaw	H	-	+
14	Asteraceae	<i>Eupatorium odoratum</i> L.	Bizat	H	+	+
15	Asteraceae	<i>Laennecia coulteri</i> (A. Gray) G.L. Nesom	Nil	H	+	-
16	Asteraceae	<i>Mikania scandens</i> (L.) Willd.	Bizat-nwe	C=4	+	+
17	Asteraceae	<i>Sphaeranthus indicus</i> L.	Mon-di	H	+	-
18	Azollaceae	<i>Azolla</i> sp.	Red fern	AH	-	+
19	Boraginaceae	<i>Heliotropium ovalifolium</i> Forsk.	Sin-let-maung-gale	H	+	-
20	Caesalpiniaceae	<i>Cassia italica</i> (Mill.) Lam.	Dan-gywe	S=5	+	-
21	Cleomaceae	<i>Cleome burmani</i> W. & A.	Taw-hingala	H	+	-

No.	Family	Scientific name	Local name	Habit	Collection sites	
					Upland	Weland
22	Commelinaceae	<i>Commelina communis</i> L.	Wetkyok	H	+	+
23	Commelinaceae	<i>Commelina erecta</i> L.	Wetkyok	H	+	+
24	Convolvulaceae	<i>Ipomoea aquatica</i> Forsk.	Ye-kazun	C	+	+
25	Convolvulaceae	<i>Ipomoea alba</i> L.	Nwe-kazun-byu	C	+	+
26	Cyperaceae	<i>Cyperus</i> sp.	Nil	MP=8	-	+
27	Cyperaceae	<i>Cyperus alternifolius</i> L.	Hti-myet	MP	+	+
28	Cyperaceae	<i>Cyperus compressus</i> L.	Wetlar-myet	MP	+	+
29	Cyperaceae	<i>Kyllinga triceps</i> Rottb.	Thone-daunt-myet	MP	+	+
30	Cyperaceae	<i>Scirpus juncooides</i> Roxb.	Nil	MP	-	+
31	Cyperaceae	<i>Scirpus cespitosus</i> L.	Nil	MP	-	+
32	Fabaceae	<i>Caesalpinia</i> spp.	Hman	S	+	-
33	Fabaceae	<i>Canavalia ensiformis</i> DC.	Taw-pe	C	+	+
34	Fabaceae	<i>Crotalaria striata</i> Schrank.	Taw-pike-san	S	+	-
35	Fabaceae	<i>Sesbania cannabina</i> (Retz.) Pers.	Nyan	H	+	+
36	Hydrocharitaceae	<i>Hydrilla verticillata</i> (L. f) Royle	Ye-hnyi	AH	-	+
37	Hydrocharitaceae	<i>Ottelia ovalifolia</i> (R.Br.) Rich.	Nil	AH	-	+
38	Lamiaceae	<i>Ocimum sanctum</i> L.	Kala-pinsein	H	+	-
39	Lentibulariaceae	<i>Utricularia flexuosa</i> Vahl.	Bubaung- pin	H	-	+
40	Lentibulariaceae	<i>Utricularia</i> sp.	Bubaung- pin	H	-	+
41	Limncharitaceae	<i>Limncharis flava</i> (L.) Buchenau	Tet-pya	H	-	+
42	Malvaceae	<i>Sida rhombifolia</i> Lwetland.	Tamyet-si-pin	H	+	-
43	Malvaceae	<i>Urena rigida</i> Wall.	Katsi-ne-pin	H	+	-
44	Menyanthaceae	<i>Nymphoides indicum</i> Ktze.	Kya-linban	AH	-	+
45	Mimosaceae	<i>Mimosa asperata</i> L.	Ye-suboke	S	+	+
46	Mimosaceae	<i>Mimosa pudica</i> L.	Tikayon	H	+	-

No.	Family	Scientific name	Local name	Habit	Collection sites	
					Upland	Weland
47	Nelumbonaceae	<i>Nelumbo nucifera</i> Gaertn.	Padon-ma-kya	AH	-	+
48	Nymphaeaceae	<i>Nymphaea lotus</i> L.	Kya-phyu	AH	-	+
49	Nymphaeaceae	<i>Nymphaea rubra</i> Roxb.	Kya-ni	AH	-	+
50	Nymphaeaceae	<i>Nymphaea stellata</i> Willd.	Kya-pya	AH	-	+
51	Onagraceae	<i>Jussiaea repens</i> L.	Ye-tikayon	H	-	+
52	Onagraceae	<i>Ludwigia octovalvis</i> (Jacq.) P.H.	Nil	S	+	+
53	Oxalidaceae	<i>Oxalis corniculata</i> L.	Hmo-na-do	H	+	-
54	Poaceae	<i>Andropogon</i> sp.	Padaw-ni-myet	G=13	+	-
55	Poaceae	<i>Chloris inflata</i> Link.	Sin-ngo-myet	G	+	-
56	Poaceae	<i>Imperata cylindrica</i> (L.) Beauv.	Thekke	G	+	+
57	Poaceae	<i>Imperata</i> sp.	Nil	G	-	+
58	Poaceae	<i>Catabrosa aquatica</i> (L.) Beauv.	Nil	G	+	-
59	Poaceae	<i>Cynodon dactylon</i> (L.) Pers.	Myaesa-myet	G	+	-
60	Poaceae	<i>Eulaliasp.</i>	Thekke-gale	G	+	+
61	Poaceae	<i>Hygroryza aristata</i> Nees.	Nil	G	-	+
62	Poaceae	<i>Hymenachne myosuroides</i> R. Br.	Bawh-myet	G	+	+
63	Poaceae	<i>Leptochloa neesii</i> (Thw.) Benth.	Myet-cho	G	+	-
64	Poaceae	<i>Oryza minuta</i> J. Presl.	Nat-saba	G	-	+
65	Poaceae	<i>Panicum repens</i> L.	Myet-kha	G	+	-
66	Poaceae	<i>Saccolipsis interrupta</i> (Willd.) Stapf.	Myet-win-poo	G	-	+
67	Polygonaceae	<i>Polygonum barbatum</i> L.	Kywe-lae-chaung	H	+	+
68	Polygonaceae	<i>Rheum nobile</i> Hk.f.& T.	Kala-chinbaung	H	+	-
69	Pontederiaceae	<i>Eichhornia crassipes</i> (Mart.) Solms.	Beda-pin	AH	-	+
70	Pteridaceae	<i>Adiatum</i> sp.	Nil	MP	-	+
71	Salviniaceae	<i>Salvinia natans</i> (L.) All.	Nil	AH	-	+

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No.	Family	Scientifica name	Local name	Habit	Collection sites	
					Upland	Weland
72	Solanaceae	<i>Physalis minima</i> L.	Bauk-pin	H	+	
73	Trapaceae	<i>Trapa bispinosa</i> L.	Kywe-kaung	AH	-	+
74	Thelypteridaceae	<i>Thelypteris palustris</i> L.	Dayin-gauk-pin	MP	-	+
Total observed species from both upland and wetland areas					44	50

List of (10) plant species which occur constantly present (80-100%) from emergent macrophytes

No.	Family	Scientific name	Local name
1	Araceae	<i>Colocasia esculenta</i> (L.) Schott.	Pein
2	Commelinaceae	<i>Commelina communis</i> L.	Wetkyok
3	Cyperaceae	<i>Cyperus</i> sp.	Nil
4	Cyperaceae	<i>Cyperus alternifolius</i> L.	Hti-myet
5	Cyperaceae	<i>Cyperus compressus</i> L.	Wetlar-myet
6	Cyperaceae	<i>Scirpus juncooides</i> Roxb.	Nil
7	Cyperaceae	<i>Eleocharis</i> sp.	Nil
8	Fabaceae	<i>Sesbania cannabina</i> (Retz.) Pers.	Nyan
9	Onagraceae	<i>Ludwigia octovalvis</i> (Jacq.) P.H.	Nil
10	Poaceae	<i>Eulalia</i> spp.	Thekke-gale
11	Poaceae	<i>Hymenachne myosuroides</i> R. Br.	Bawh-myet

List of (10) plant species which occur constantly present (80-100%) from floating-leaved macrophytes

No.	Family	Scientific name	Local name
1	Cyperaceae	<i>Eleocharis</i> sp.	Nil
2	Hydrocharitaceae	<i>Hydrilla verticillata</i> (L. f) Royle	Ye-hnyi
3	Lentibulariaceae	<i>Utricularia flexuosa</i> Vahl.	Bubaung-pin
4	Menyanthaceae	<i>Nymphoides indicum</i> Ktze.	Kya-linban
5	Nelumbonaceae	<i>Nelumbo nucifera</i> Gaertn.	Padon-ma-kya
6	Nymphaeaceae	<i>Nymphaea lotus</i> L.	Kya-phyu
7	Nymphaeaceae	<i>Nymphaea stellata</i> Willd.	Kya-pya
8	Poaceae	<i>Hygroryza aristata</i> Nees.	Nil
9	Poaceae	<i>Saccolepis interrupta</i> (Willd.) Stapf.	Myet-win-pu
10	Trapaceae	<i>Trapa bispinosa</i> L.	Kywe-kaung

List of Observed Fish Species in Moyungyi Wetland Sanctuary (2014)

Sr	Scientific name	Local name	Common name	Thoneeinsu	Pyinpongyi	Wanbei wetland	Falauk	kapin	Pyun chanug	Htain pin	Targawa	lake	Total occurrence
1	<i>Amblyharyngodon mora</i> (Hamilton,1822)	Nga be phyu	Aspidoparia					▲	▲		▲		3
2	<i>Anabas testudineus</i> (Bloch,1792)	Nga bye ma	Climbing perch	▲		▲				▲	▲		4
3	<i>Anguilla bicolor</i> (M' Clelland,1844)	Nga lin ban	Level fwetlanded eel			▲							1
4	<i>Badis ruber</i> (Schreitmuller,1923)	Nga mee laung	Red badis	▲	▲								2
5	<i>Catla catla</i> (Hamilton,1822)	Nga own ton/ nga thine	Carp								▲		1
6	<i>Channa guchua</i> (Hamilton,1822)	Nga gaung toe	Dwarf snakehead		▲	▲				▲	▲		4
7	<i>Channa punctatus</i> (Bloch,1793)	Nga pa naw	Spotted-snake head	▲	▲	▲	▲	▲	▲	▲	▲		8
8	<i>Channa striata</i> (Bloch,1793)	Nga yant	Banded snakehead	▲	▲	▲	▲	▲	▲	▲	▲		8
9	<i>Clarias batrachas</i> (Lwetlandaeus,1822)	Nga khu	Philippine catfish		▲		▲	▲			▲		4
10	<i>Colisa lobiosus</i> (Day,1822)	Nga phyin tha lat	Thick-lipped gorame	▲	▲								2
11	<i>Erethistes sp.</i> (Kottelat)	Nga kyuk pha	Burmese erethistes								▲		1
12	<i>Esomus altus</i> (Blyth,1860)	Nga maw tawt	Burmese flying barb	▲									1

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Sr	Scientific name	Local name	Common name	Thoneinsu	Pyinpongyi	Wanbei wetland	Falauk	kapin	Pyun chanug	Htain pin	Targawa	lake	Total occurrence
13	<i>Glossogobius giuris</i> (Hamilton, 1822)	Ka tha boe	Tank goby	▲	▲						▲		3
14	<i>Heteropnustes fossilis</i> (Bloch, 1794)	Nga kyee	Stinging catfish	▲	▲	▲	▲	▲	▲	▲	▲		8
15	<i>Labeo rohita</i> (Hamilton, 1822)	Nga myet san ni/myit chin	Roho labeo								▲		1
16	<i>Lepidocephalichthys micropogon</i> (Blyth, 1860)	Nga yaik kat/ tha le doe	loach								▲		1
17	<i>Macrogathus aral</i> (Bloch&Schneider, 1801)	Nga mwe doe chaw	Onestripe spiny eel		▲	▲			▲	▲	▲	▲	6
18	<i>Macrogathus zebrinus</i> (Blyth, 1858)	Nga mwe doe kyan sit	Ophidian	▲	▲	▲					▲		4
19	<i>Mastacembelus armatus</i> (Lecepede, 1800)	Mwe na gar	Spiny ell		▲						▲		2
20	<i>Monopterus albas</i> (Zuiew, 1973)	Nga shint	Rice swamp eel		▲	▲				▲			3
21	<i>Mystus cavasius</i> (Hamilton, 1822)	Nga zin yine kywe	River catfish		▲								1
22	<i>Mystus microphthalmus</i> (Day, 1877)	Nga aike	Long-whisker catfish		▲						▲		2
23	<i>Mystus pulcher</i> (Chaudhuri, 1911)	Nga zin yine mee kwet	Dwarf catfish	▲	▲								2
24	<i>Nandus nandus</i> (Hamilton)	Nga wet ma	Spotted field perch		▲				▲	▲			3
25	<i>Neotropius actiostriis</i> (Day, 1870)	Nga tan jate	Butter catfish		▲						▲		2
26	<i>Notopterus notopterus</i> (Pallas, 1760)	Nga la/nga phe	Bronze/Grey feather back	▲	▲	▲	▲	▲	▲	▲	▲	▲	9
27	<i>Ompok bimaculatus</i> (Bloch, 1794)	Nga nu than	Indian butter catfish		▲	▲	▲	▲	▲	▲			6

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Sr	Scientific name	Local name	Common name	Thoneinsu	Pyinpongyi	Wanbei wetland	Falauk	kapin	Pyun chanug	Htain pin	Targawa	lake	Total occurrence
28	<i>Ophisternon bengalensis</i> (M'clelland)	Nga shint	Mud eel		▲								1
29	<i>Osteobrama belangeri</i> (Valenciennes,1844)	Nga phan ma	Manipur osteobrama		▲	▲		▲	▲	▲		▲	6
30	<i>Parambassis ranga</i> (Hamilton,1822)	Nga zin zut	Indian glass fish	▲	▲		▲	▲	▲	▲		▲	7
31	<i>Puntius chola</i> (Hamilton,1822)	Nga khone ma	Swamp barb	▲	▲		▲	▲	▲				5
32	<i>Puntius sophore</i> (Hamilton,1822)	Nga khone ma	Barb	▲	▲			▲	▲				4
33	<i>Tetrodon cutcutia</i> (Hamilton,1822)	Nga pu tin	Globe fish/puffer									▲	1
34	<i>Tilapia mossambica</i> (Peter,1852)	Nga phe ma	Mozambique tilapia					▲	▲		▲		3
35	<i>Trichogaste pectoralis</i> (Regan,1910)	Ngaphyinthalat	Snakeskin gourami	▲	▲						▲		3
36	<i>Wallago attu</i> (Bloch &Schneider,1801)	Nga but	Sheat fish	▲		▲	▲					▲	4
37	<i>Xenentodon cancila</i> (Hamilton,1822)	Nga phung yoe	Garfish		▲				▲		▲	▲	4

Near Threatened Fish Species of Moyungyi Wetland Wildlife Sanctuary.

No	Family	Scientific name	Local name	IUCN status
1	Cichlidae	<i>Tilapia mossambica</i> (Peter, 1852)	Tilapia/ Ngaphe ma	NT (2007)
2	Cyprinidae	<i>Osteobrama belangeri</i> (Valenciennes, 1844)	Nga phe aung/ phan ma	NT (2010)
3	Cyprinidae	<i>Catla catla</i> (Hamilton, 1822)	Nga own ton/ nga gaung pwa	NT (2010)
4	Siluridae	<i>Ompok bimaculatus</i> (Bloch, 1794)	Nga nu than	NT (2010)
5	Siluridae	<i>Wallago attu</i> (Bloch & Schneider, 1801)	Nga but	NT (2010)

Least Concern Fish Species of Moyungyi Wetland Wildlife Sanctuary.

No	Family	Scientific name	Local name	IUCN
1	Ambassidae	<i>Parambassis ranga</i> (Hamilton, 1822)	Nga zin zut	LC (2012)
2	Anguillidae	<i>Anguilla bicolor</i> (M' Clelland, 1844)	Nga lin ban	LC (2009)
3	Badidae	<i>Badis ruber</i>	Nga mee laung	LC (2012)
4	Bagridae	<i>Mystus cavasius</i> (Hamilton, 1822)	Nga zin yine kywe	LC (2010)
5		<i>Mystus micropthalmus</i> (Day, 1877)	Nga aike	LC (2010)
6		<i>Mystus pulcher</i> (Chaudhuri, 1911)	Nga zin yine mee kwet	LC (2010)
7	Belonidae	<i>Xenentodon cancila</i> (Hamilton, 1822)	Nga phung yoe	LC (2010)
8	Belontiidae	<i>Colisa lobiosus</i> (Day, 1822)	Nga phyin tha lat	LC (2010)
9		<i>Trichogaster pectoralis</i> (Regan, 1910)	Nga phyin tha lat/Gorami	LC (2012)
10	Chandidae	<i>Nandus nandus</i>	Nga wet ma	LC (2010)
11	Channidae	<i>Channa guchua</i> (Hamilton, 1822)	Nga gaung toe	LC (2010)
12		<i>Channa striata</i> (Bloch, 1793)	Nga yant	LC (2010)
13	Clariidae	<i>Clarias batrachas</i> (Lwetlandaeus, 1822)	Nga khu	LC (2011)
14	Cobitidae	<i>Lepidocephalichthys micropogon</i> (Blyth, 1860)	Nga yaik kat/ Nga tha le doe	LC (2010)
15	Cyprinidae	<i>Amblyharyngodon mora</i>	Nga be phyu	LC (2010)
16		<i>Esomus altus</i> (Blyth, 1860)	Nga maw tawt	LC (2009)
17		<i>Labeo rohita</i> (Hamilton, 1822)	Nga myet san ni/ myit chin	LC (2010)
18		<i>Puntius chola</i> (Hamilton, 1822)	Nga khone ma / metapauk	LC (2010)

No	Family	Scientific name	Local name	IUCN
19		<i>Puntius sophore</i> (Hamilton,1822)	Nga khone ma	LC (2010)
20	Sisoridae	<i>Erethistes</i> sp	Nga kyuk pha	LC (2010)
21	Gobiidae	<i>Glossogobius giuris</i> (Hamilton,1822)	Ka tha boe	LC (2012)
22	Heteropneusiti	<i>Heteropnustes fossilis</i> (Bloch,1794)	Nga kyee	LC (2010)
23	Mastacembelid	<i>Macrognathus zebrinus</i> (Blyth,1858)	Nga mwe doe kyan sit	LC (2010)
24		<i>Mastacembelus armatus</i> (Lecepede,1800)	Mwe na gar /nga mwe doe	LC (2010)
25	Notopteridae	<i>Notopterus notopterus</i> (Pallas,1760)	Nga la/nga phe	LC (2010)
26	Synbranchidae	<i>Monopterus albas</i> (Zuiew,1973)	Nga shint	LC (2010)
27		<i>Ophisternon bengalensis</i>	Nga shint	LC (2010)
28	Tetraodontidae	<i>Tetrodon cutcutia</i> (Hamilton,1822)	Nga pu tin	LC (2010)

Data Deficient Fish Species of Moyungyi Wetland Wildlife Sanctuary.

No	Family	Scientific name	Local name	IUCN status
1	Anabassidae	<i>Anabas testudineus</i> (Bloch,1792)	Nga bye ma	DD

Not Evaluated Species of Moyungyi Wetland Wildlife Sanctuary.

No	Family	Scientific name	Local name	IUCN status
1	Schilbeidae	<i>Neotropius actriostriis</i> (Day,1870)	Nga tan jate	Not Evaluated
2	Mastacembelidae	<i>Macrognathus aral</i> (Bloch &Schneider,1801)	Nga mwe doe chaw	Not Evaluated
3	Channidae	<i>Channa punctatus</i> (Bloch,1793)	Nga pa naw	Not evaluated

Type of Fishing gears in Moyungyi Wetland Wildlife Sanctuary Area.

Sr	Name	Measurement			Remark
		Length(m)	Depth(m)	Mesh size(cm)	
1	Push net(yin ton)	Pole- 7 Net- 3.5	2.5	2	Shrimp and small fishes
2	Set gill net(tar pike)	25 - >1000	1.5-2.0	2.5	Non target species (Small size)
3	Set gill net(tar pike)	50 - >1000	1.5- 2.0	5 – 5.5	Non target species (Medium size)
4	Set gill net(tar pike)	>60	15	10 - 11.5	Nga but (big size)
5	Longline (Nga mya tann)	400-800	Hook-(200-400)nos	Hook no-16 Hook no-22 Bait –(life) nga phyin tha lat	Nga Nu than, Nga yant, Nga gyee
6	Longline (Nga mya tann)	400-1000	Hook (150 - 200)nos	Hook no-9 Bait-Nga phyin thalat/nga bye ma (life)	Nga but
7	Beach seine(Swe pike)	100	3	Float-80, 5cm Mz Fisher- 4	Variety species (Several size)
8	Pole and line (Nga myar tan)	3-4	Hook-1-2	Hk-22/16/9 Bait-E-worm Nga phyin thalat/ nga bye ma(life)	Nga gyee Nga khu Nga nu than Nga but
9	Bamboo vaseTrap	H-0.5	0.4 m Ø	Earth worm/	Swamp eel

Sr	Name	Measurement			Remark
		Length(m)	Depth(m)	Mesh size(cm)	
	(Nga shint myone)			Small fish	
10	Trap(Myone kye)	0.7	1-1.25 m Ø		Non target fish
11	Stationary bush park (Chone cha)	10 - 30m Ø	1.5 – 2.5m		Several fish ,most big fish
12	Cast net(Kun)	3 - 7	Weigh-4.5kg	1.5-3.0 cm	Non target fish
13	Electro fishing	1.5 – 2	6" dia –iron sieve	35A battery	Non target fish

Inventory list of Amphibians and Reptiles from Moeyungyi Wildlife Sanctuary (2014)

No.	Family Name	Scientific Name	Common Name	IUCN
1	Microhylidae	<i>Kaloula pulchra</i>	Common Bull Frog	LC
2	Ranidae	<i>Occidozyga lima</i>	Common Floating Frog	LC
3	Ranidae	<i>Fejervarya limnocharis</i>	Paddy Frog	
4	Ranidae	<i>Fejervarya cf. limnocharis</i>	Paddy Frog	
5	Ranidae	<i>Hylorana macrodactyla</i>	Long-toed Frog	LC
6	Ranidae	<i>Rana rugolosa</i>	Chinese Bullfrog	
7	Emydidae	<i>Morenia ocellata</i>	Myanmar Eyed Turtle	VU
8	Agamidae	<i>Calotes mystaceus</i>	Blue Forest Lizard	
9	Agamidae	<i>Calotes versicolor</i>	Garden Fence Lizard	
10	Gekkonidae	<i>Gehyra multilata</i>	Four-clawed Gecko	
11	Gekkonidae	<i>Gekko gekko</i>	Tockay Gecko	
12	Gekkonidae	<i>Hemidactylus brookii</i>	Brooke's House Gecko	
13	Gekkonidae	<i>Hemidactylus frenatus</i>	House Gecko	
14	Scincidae	<i>Eutropis multifasciata</i>	Common Sun Skink	
15	Scincidae	<i>Lygosoma bowringii</i>	Bowring's Supple Skink	
16	Colubridae	<i>Ptyas korros</i>	Indo-chinese Rat Snake	
17	Elapidae	<i>Bungarus fasciatus</i>	Yellow-banded Krait	LC
18	Elapidae	<i>Naja kaouthia</i>	Monocellate Cobra	LC
19	Homalopsidae	<i>Enhydryis enhydryis</i>	Rainbow Water Snake	LC
20	Homalopsidae	<i>Homalopsis buccata</i>	Puff-faced Water Snake	LC
21	Natricidae	<i>Amphiesma stolata</i>	Buff-striped Keelback	
22	Natricidae	<i>Xenochrophis flavipunctatus</i>	Yellow-spotted Keelback Snake	
23	Natricidae	<i>Xenochrophis piscator</i>	Chequered Keelback Water Snake	
24	Xenopeltidae	<i>Xenopeltis unicolor</i>	Sunbeam Snake	LC

Species found only in desk survey

No.	Family Name	Scientific Name	Common Name
1	Bufo	<i>Bufo melanostictus</i>	True Frog
2	Ranidae	<i>Rana erythraea</i>	Red-eared Frog
3	Ranidae	<i>Rana tigerina</i>	Khaing Land Frog
4	Polypedatidae	<i>Polypedates leucomystax</i>	Common Tree Frog

No.	Family Name	Scientific Name	Common Name
5	Rhacophoridae	<i>Rhacophorus</i> sp	Flying Frog
6	Microhylidae	<i>Microhyla ornata</i>	Narrow-mouth Toad
7	Microhylidae	<i>Microhyla inornata</i>	Narrow-mouth Toad
8	Trionychidae	<i>Lissemys scutata</i>	Flapshell Turtle
9	Typhlopidae	<i>Ramphotyphlops braminus</i>	Brahming Blind Snake
10	Typhlopidae	<i>Typhlops diardi</i>	Diard's Blind Snake
11	Viperidae	<i>Daboia russellii</i>	Russell's Viper
12	Colubridae	<i>Psammopsis condanarus</i>	Sand Snake

Species found only in field survey

No.	Family Name	Scientific Name	Common Name
1	Gekkonidae	<i>Gehyra multilata</i>	Four-clawed Gecko
2	Gekkonidae	<i>Gekko gekko</i>	Tockay Gecko
3	Gekkonidae	<i>Hemidactylus brookii</i>	Brooke's House Gecko

List of Herpetofauna Species from Moeyungyi Wildlife Sanctuary (2014)

No.	Family Name	Scientific Name	Common Name	Desk survey	Field survey
1	Bufo	<i>Bufo melanostictus</i>	True Frog	√	
2	Ranidae	<i>Occidozyga lima</i>	Common Floating Frog	√	√
3	Ranidae	<i>Rana erythraea</i>	Red-eared Frog	√	
4	Ranidae	<i>Fejervarya limnocharis</i>	Paddy Frog	√	√
5	Ranidae	<i>Fejervarya cf. limnocharis</i>	Paddy Frog	√	√
6	Ranidae	<i>Hylorana macrodactyla</i>	Long-toed Frog	√	√
7	Ranidae	<i>Rana rugolosa</i>	Chinese Bullfrog	√	√
8	Ranidae	<i>Rana tigrina</i>	Khaing Land Frog	√	
9	Polypedatidae	<i>Polypedates leucomystax</i>	Common Tree Frog	√	
10	Rhacophoridae	<i>Rhacophorus</i> sp	Flying Frog	√	
11	Microhylidae	<i>Microhyla ornata</i>	Narrow-mouth Toad	√	
12	Microhylidae	<i>Microhyla inornata</i>	Narrow-mouth Toad	√	
13	Microhylidae	<i>Kaloula pulchra</i>	Narrow-mouth Toad	√	√

No.	Family Name	Scientific Name	Common Name	Desk survey	Field survey
14	Emydidae	* <i>Morenia ocellata</i>	Myanmar Eyed Turtle	√	√
15	Trionychidae	* <i>Lissemys scutata</i>	Myanmar Flapshell Turtle	√	
16	Agamidae	<i>Calotes versicolor</i>	Garden Fence Lizard	√	√
17	Agamidae	<i>Calotesmystaceus</i>	Lizard	√	√
18	Gekkonidae	<i>Gehyramultilata</i>	Four-clawed Gecko		√
19	Gekkonidae	<i>Gekko gekko</i>	Tockay Gecko		√
20	Gekkonidae	<i>Hemidactylus brookii</i>	Brooke's House Gecko		√
21	Gekkonidae	<i>Hemidactylus frenatus</i>	Common House Gecko	√	√
22	Scincidae	<i>Lygosoma bowringii</i>	Christmas Island Grass Skink	√	√
23	Scincidae	<i>Eutropis multifasciata</i>	East Indian Brown Mabuya	√	√
24	Natricidae	<i>Amphiesma stolata</i>	Buff-striped Keelback	√	√
25	Natricidae	<i>Xenochrophis flavipunctatus</i>	Yellow-spotted Keelback Snake	√	√
26	Natricidae	<i>Xenochrophis piscator</i>	Chequered Keelback Water Snake	√	√
27	Homalopsidae	<i>Enhydryis enhydryis</i>	Rainbow Water Snake	√	√
28	Homalopsidae	<i>Homalopsis buccata</i>	Rainbow Mud Snake	√	√
29	Xenopeltidae	<i>Xenopeltis unicolor</i>	Sunbeam Snake	√	√
30	Elapidae	<i>Bungarus fasciatus</i>	Banded Krait	√	√
31	Elapidae	<i>Naja kaouthia</i>	Monocellate Cobra	√	√
32	Typhlopidae	<i>Ramphotyphlops braminus</i>	Brahming Blind Snake	√	
33	Typhlopidae	<i>Typhlops diardi</i>	Diard's Blind Snake	√	
34	Viperidae	<i>Daboia russellii siamensis</i>	Easter Russell's Viper	√	
35	Colubridae	<i>Ptyas korros</i>	Indo-chinese Rat Snake	√	√
36	Colubridae	<i>Psammopsis condanarus</i>	Sand Snake	√	

(*) = endemic species

Inventory List of Butterfly in Moeyungyi Wildlife Sanctuary

No	Family name	Scientific name
1	Papilionidae	<i>Papilio polytes</i>
2	Papilionidae	<i>Graphium cloanthus</i>
3	Pieridae	<i>Leptosia nina</i>
4	Pieridae	<i>Delias hyparete</i>
5	Pieridae	<i>Dercas lycorias</i>
6	Pieridae	<i>Hebomoia glaucippe</i>
7	Pieridae	<i>Catopsilia pyranthe</i>
8	Pieridae	<i>Catopsilia florea</i>
9	Pieridae	<i>Catopsilia pomona</i>
10	Pieridae	<i>Pareronia valeria</i>
11	Pieridae	<i>Gandaca harina</i>
12	Pieridae	<i>Eurema ada</i>
13	Pieridae	<i>Eurema brigitia</i>
14	Pieridae	<i>Eurema hecabe</i>
15	Pieridae	<i>Eurema andersoni</i>
16	Pieridae	<i>Eurema blanda</i>
17	Pieridae	<i>Eurema sari</i>
18	Pieridae	<i>Eurema simulatrix</i>
19	Danaidae	<i>Danaus chrysippus</i>
20	Danaidae	<i>Danaus genutia</i>
21	Danaidae	<i>Danaus limniace</i>
22	Danaidae	<i>Euploea sylvester</i>
23	Danaidae	<i>Euploea klugii</i>
24	Danaidae	<i>Euploea core</i>
25	Satyridae	<i>Melanitis zitenius</i>
26	Satyridae	<i>Ypthima asterope</i>
27	Nymphalidae	<i>Phalanta phalanta</i>
28	Nymphalidae	<i>Cirrochroa sp.</i>
29	Nymphalidae	<i>Junonia lemonias</i>
30	Nymphalidae	<i>Junonia almana</i>
31	Nymphalidae	<i>Junonia atlites</i>
32	Nymphalidae	<i>Athyma perius</i>
33	Riodinidae	<i>Zemeros flegyas</i>

No	Family name	Scientific name
34	Riodinidae	<i>Abisara fylla</i>
35	Lycaenidae	<i>Loxura atymnus</i>
36	Lycaenidae	<i>Rapala refulgens</i>
37	Lycaenidae	<i>Rapala</i> sp.
38	Lycaenidae	<i>Anthene lycaenina</i>
39	Lycaenidae	<i>Catochrysops strabo</i>
40	Hesperiidae	<i>Telicota augius</i>
41	Hesperiidae	<i>Telicota bambusae</i>

Inventory List of Beetle in Moeyungyi Wetland Wildlife Sanctuary

No	Family name	Scientific name
1	Hydrophilidae	<i>Hydrophilus triangularis</i>
2	Scarabaeidae	<i>Copris magicus</i>
3	Scarabaeidae	<i>Parastasia</i> sp.
4	Scarabaeidae	<i>Heliocopris bucephalus</i>
5	Cicindelidae	<i>Calochroa cariana</i>
6	Cicindelidae	<i>Cicindela aurulenta</i>
7	Cerambycidae	<i>Xystrocera globosa</i>
8	Lucanidae	<i>Velutinodorus velutinus</i>
9	Passalidae	<i>Aceraius</i> sp.
10	Buprestidae	<i>Mastogenius taoi</i>
11	Coccinellidae	<i>Coccinella septempunctata</i>
12	Coccinellidae	<i>Hippodamia convergens</i>
13	Carabaeidae	<i>Calosoma scrutator</i>
14	Carabaeidae	<i>Carabus violaceus</i>

Inventory List of Dragon flies in Moeyungyi Wetland Wildlife Sanctuary

No	Scientific name	Common name
1	<i>Neurothemis fluctuant</i>	Obligue Banded Widow
2	<i>Neurothemis intermedia</i>	Pale Yellow Widow
3	<i>Neurothemis fulla</i>	Black Spot Widow
4	<i>Crocothemis servilla</i>	Greater Red Skimmer
5	<i>Pantala flavescens</i>	Wandering Glider

Inventory List of Other Insects in Moeyungyi Wetland Wildlife Sanctuary

No	Scientific name	Common name
1	<i>Lethocerus americanus</i>	Giant Water Bug
2	<i>Lygaeus hesperus</i>	Red Cotton Bug
3	<i>Astota plana</i>	Pale Fig Moth
4	<i>Dysphania militaris</i>	Military Dysphania
5	<i>Gryllotaipa africana</i>	Oriental More Cricket
6	<i>Argiope mangai</i>	Mangrove Argiope Spider
7	<i>Oecophylla smaragdina</i>	Red Ant

Appendix 3.6

List of Mammals Documented during 2014 Survey.

No.	Scientific name	Common name	Local Name	Type of evidence
	Insectivora (Soricidae)	Shrews		
1	<i>Suncus murinus</i>	House Shrew	KywetSote	A
	Chiroptera (Pteropodidae)	Fruit Bats		
2	<i>Rousettus leschenaultii</i>	Leschenault's Rousette	Lin Nay Kywet	Db
	Chiroptera (Emballonuridae)	Sheath-tailed and Tomb Bats		
3	<i>Taphozous longimanus</i>	Long-winged Tomb Bat	Lin Nay Kywet	Db, A
	Chiroptera (Vespertilionidae)	Common Bats		
4	<i>Myotis muricola</i>	Asian Whiskered Myotis	Lin Nay Kywet	A
5	<i>Scotophilus heathii</i>	Greater Asian House Bat	Lin Nay Kywet	Db, A
	Carnivora (Herpestidae)	Mongoose		
6	<i>Herpestes javanicus</i>	Small Asian Mongoose	Mway Bar	Db, A
	Rodentia (Muridae)	Rats and Mice		
7	<i>Rattus rattus</i>	House Rat	EainKywet	A
8	<i>Rattus norvegicus</i>	Norway Rat	LalKywetKy	A
9	<i>Bandicota indica</i>	Greater Bandicoot Rat	KywetKalar	A
10	<i>Bandicota savilei</i>	Savile's Bandicoot Rat	Kywet Wan Bu	A
11	<i>Bandicota bengalensis</i>	Lesser Bandicoot Rat	LalKywet	A
12	<i>Mus cervicolor</i>	Fawn-coloured Mouse	KywetPhaLaung	A

Abbreviations; A = alive specimen, Db = dead body

ANNEXES

Socio-economic Data of Moeyungyi Wetland Wildlife Sanctuary

Annex 1. Some Social factors of the 8 Selected Villages at the Study Area (2014)

Sr.	Name of Village	Housing Condition				Total Household	Population			Ethnicity	Religion	Remark
		Brick	Wooden	Bamboo	Total Housing		Male	Female	Total			
1	Targwa	0	2	16	18	18	20	35	55	Bamar	Buddish	Temporary Settlement
2	Phalauk	0	2	45	47	47	107	157	264	Bamar	Buddish	
3	Kabin	4	200	83	287	287	859	882	1741	Bamar	Buddish	
4	Pyunechaung	4	50	146	200	200	400	680	1080	Bamar	Buddish	
5	Pauktaw Hlayseik)	0	2	35	37	37	40	45	85	Bamar	Buddish	Temporary Settlement
6	Phalauktan	7	30	25	62	62	120	140	260	Bamar	Buddish	
7	Thoneeainsu	20	30	178	228	228	552	591	1143	Bamar	Buddish	
8	Tarsone	30	100	95	238	238	520	579	1099	Bamar	Buddish	
	Total	65	416	623	1117	1117	2618	3109	5727	Bamar	Buddish	

Source: Interview for Local Administrators & Local People of the Study Area (2014)

Annex 2. Comparison of Farming and Fishing Household in the Study Area (2014)

Sr No.	Name of Village	TotalHH	Farming	%	Fishing	%	Boat	Traditional fishing	%	Electric fishing	%	% of total	Others	%
1	Targwa	18	2	11	14	78	25	11	61	3	17	21.00	2	11
2	Phalauk	47	15	32	28	60	170	23	49	5	11	18.00	4	9
3	Kabin	287	174	61	113	39	300	73	25	35	12	31.00	0	0
4	Pyune Chaung	200	20	10	170	85	170	145	73	30	15	18.00	10	5
5	Pauk Taw (Hlay Seik)	37	2	5	32	81	35	27	73	3	5	9.00	3	8
6	Phalauk Tan	62	10	16	47	76	50	42	68	5	8	11.00	5	8
7	Thone Eain Su	228	30	13	50	22	35	46	20	4	2	8.00	148	65
8	Tar Zone	238	50	21	34	14	20	31	14	3	1	9.00	154	65
	Total	1117	303	27	488	44	805	398	36	88	8	18.00	326	29

Annex 3. The Educational Status of Some Villages at the Study Area (2014)

Sr No.	Name of Village	Primary Student			Teacher	Teacher : Student	Remark
		Male	Female	Total			
1	Targwa	0	0	0	0		No School
2	Phalauk	27	23	50	1	1:50	
3	Kabin	127	131	258	4	01:65	
4	Pyune Chaung	87	68	155	4	1:38	
5	Pauk Taw (Hlay Seik)	0	0	0	0		No School
6	Phalauk Tan	0	0	0	0		No School
7	Thone Eain Su	62	70	132	6	1:22	

Sr No.	Name of Village	Primary Student			Teacher	Teacher : Student	Remark
		Male	Female	Total			
*** 8	Tar Zone	50	65	115	5	1:23	
	Total	353	357	710	20	1:35	

Source: Interview for Local Primary Teachers from the Field Survey of the Study Area (2014)

Annex 4. Some Economic Factors of the Study Area (2014)

Sr No.	Name of Village	Land encroachment (Acres)	Main Occupation	Main Crop	Main Transportation		Livestock Breeding					
					Cycle	Boat	Cattle	Buffalo	Goat	Pig	Poultry	Duck
1	Targwa	0	Fishery	Paddy	2	25	0	11	15	3	15	50
2	Phalauk	20	Fishery	Paddy	0	170	0	30	0	6	25	500
3	Kabin	10	Fishery	Paddy	61	300	30	200	0	10	1000	500
4	Pyune Chaung	100	Fishery	Paddy	20	170	40	150	10	10	150	5000
5	Pauk Taw (Hlay Seik)	0	Fishery	Paddy	3	35	0	2	0	3	15	2000
6	Phalauk Tan	89	Fishery/other	Paddy	12	50	15	60	0	10	200	30
7	Thone Eain Su	10	Fishery/others	Paddy	25	35	20	65	0	15	250	80
8	Tar Zone	0	Fishery/others	Paddy	50	20	30	50	0	20	300	100
	Total	229	Fishery	Paddy	173	805	135	568	25	77	1955	8260

Source Interview for Local Administrators & Local People of the Study Area (2014)

Annex 5a: Status of Socioeconomic Conditions of the Study Area (2014)

Sr.	Name of Village	1.Family Life								2.Education					
		Happiness & Satisfaction				Public Safety				Literacy				Graduate condition	
		Yes	%	No	%	Yes	%	No	%	Yes	%	No	%	f	%
1	Targwa	8	80	2	20	10	100	0	0	8	80	2	20	0	0
2	Phalauk	9	90	1	10	9	90	1	10	7	70	3	30	0	0
3	Kabin	18	90	2	10	20	100	0	0	18	80	2	20	2	10%
4	Pyune Chaung	20	100	0	0	19	95	1	5	16	80	4	20	1	5%
5	Pauk Taw (Hlay Seik)	7	70	3	30	8	80	2	20	6	60	4	40	0	0
6	Phalauk Tan	10	100	0	0	10	100	0	0	8	80	2	20	1	10%
7	Thone Eain Su	19	95	1	5	20	100	0	0	17	85	3	15	2	5%
8	Tar Zone	18	90	2	10	20	100	0	0	18	90	2	10	2	10%
	Total	109	90.811	11	9.2	116	97	4	3.3	98	73	22	18	8	7%

Annex 5b: Status of Socioeconomic Conditions of the Study Area (2014)

Sr.	Name of Village	3.Health					4.Material Possession							
		Fly Proof Toilet				Medical staff: Population	Owned House				Owned Telephone			
		Yes	%	No	%	Ratio	Yes	%	No	%	Yes	%	No	%
1	Targwa	0	0	10	100	0	10	100	0	0	1	10	9	90
2	Phalauk	0	0	10	100	0	10	100	0	0	2	20	8	80
3	Kabin	0	0	20	100	1:580	19	95	1	5	3	15	17	85
4	Pyune Chaung	4	20	16	80	1:540	20	100	0	0	4	20	16	80
5	Pauk Taw (Hlay Seik)	0	0	10	100	0	10	100	0	0	0	0	10	100
6	Phalauk Tan	6	60	4	40	0	10	100	0	0	2	20	8	80
7	Thone Eain Su	14	70	6	30	0	20	100	0	0	3	15	17	85
8	Tar Zone	10	50	10	50	0	20	100	0	0	5	25	15	75
	Total	34	28	86	71.7	1:716	119	99	1	1	20	17	100	83.3

Annex 5c: Status of Socioeconomic Conditions of the Study Area (2014)

Sr..	Name of Village	5.Major Occupation											
		Depend on Wetland (Livelihood)				Main Job function							
		Yes	%	No	%	Agriculture	%	fishing	%	services	%	others	%
1	Targwa	10	100	0	0	2	20	7	70	0	0	1	10
2	Phalauk	9	90	1	10	3	30	6	60	0	0	1	10
3	Kabin	17	85	3	15	4	20	12	60	2	10	2	10
4	Pyune Chaung	18	90	2	10	5	25	13	65	0	0	2	10
5	Pauk Taw (Hlay Seik)	10	100	0	0	2	20	7	70	0	0	1	10
6	Phalauk Tan	6	60	4	40	3	30	3	30	3	30	1	10
7	Thone Eain Su	11	55	9	45	5	25	6	30	6	30	3	15
8	Tar Zone	10	50	10	50	6	30	4	20	5	25	5	25
	Total	91	75.8	29	24	30	25	58	49	16	13	16	13

Annex 6: Status of Socioeconomic Conditions of the Study Area (2014)

Sr.	Component	Indicator	Responded conditions								Expression			
			Yes(F)				%	No(F)		%				
1	Occupation Status	1	Livelihood depend on Wetland						91	76	9	24	Fairly	
		2	Main Job Function						58	49	-	-	Fairly	
2	Finance	1	Income (Per Day)		< K3000		K3000 ~ 6000		> K6000					
					hh	%	hh	%	hh	%				
				31	25	70	58	19	16			Fairly		
		2	Expense (Per Day)		< K2000		K2000 ~ 4000		> K4000					
hh	%				hh	%	hh	%						
		21	18	77	64	22	18			Fairly				
3	Human Activity	1	Positive Impact (ELF)						111		93	9	7	Strong
		2	Negative Impact (UCF & PHH)						23		72	7	23	Fairly

Note:

ELF: Effectiveness Livelihood of Household fishing

UCF & PHH - Utility of chemical fertilizer & pesticides of farming household

Annex 7: Income and Expenditure in the Study Area (2014)

Sr.	Name of Village	Finance											
		Income						Expense					
		Quantity (per day)			Percentage			Quantity (per day)			Percentage		
		< K3000	K 3001 ~ 6000	>K 6001	%	%	%	< K2000	K 2001 ~ 4000	> K 4001	%	%	%
1	Targwa	1	9	0	10	90	0	1	8	1	10	80	10
2	Phalauk	1	9	0	10	90	0	0	10	0	0	100	0
3	Kabin	5	12	3	25	60	15	4	14	2	20	70	10
4	Pyune Chaung	5	11	4	25	55	20	3	13	4	15	65	20
5	Pauk Taw (Hlay Seik)	5	4	1	50	40	10	3	4	3	15	70	15
6	Phalauk Tan	3	5	2	30	50	20	2	5	3	20	50	30
7	Thone Eain Su	5	11	4	25	55	20	4	13	3	20	65	15
8	Tar Zone	6	9	5	30	45	25	4	10	6	20	50	30
	Total	31	70	19	26	58	16	21	77	22	18	64	18

Annex 7a: Energy Source of the Study Area (2014)

Sr.	Name of Village	Energy Utility							
		for Cooking							
		Electricity		Charcol		Wood		Others	
		F	%	F	%	F	%	F	%
1	Targwa	0	0	1	10	9	90	0	0
2	Phalauk	0	0	0	0	10	100	0	0
3	Kabin	0	0	2	10	18	90	0	0
4	Pyune Chaung	0	0	1	5	19	95	0	0
5	Pauk Taw (Hlay Seik)	0	0	0	0	10	100	0	0
6	Phalauk Tan	2	20	2	20	4	40	2	20
7	Thone Eain Su	4	20	3	15	10	50	3	15
8	Tar Zone	3	15	3	15	12	60	2	10
	Total	9	8	12	10	92	76	7	6

Annex 8: Water Consumption in the Study Area (2014)

Sr.	Name of Village	Utility of Water							
		Purified	Tube	Lake	Wetland	%	%	%	%
1	Targwa	0	0	0	10	0	0	0	100
2	Phalauk	0	0	3	7	0	0	30	70
3	Kabin	0	0	2	18	0	0	10	90
4	Pyune Chaung	0	0	3	17	0	0	15	85
5	Pauk Taw(Hlay Seik)	0	0	0	10	0	0	0	100
6	Phalauk Tan	0	10	0	0	0	100	0	0
7	Thone Eain Su	0	16	4	0	0	80	20	0
8	Tar Zone	0	17	3	0	0	85	15	0
	Total	0	43	15	62	0	35	13	52

Annex 8a. Some Socioeconomic Conditions of the Study Area (2014)

Sr.	Name of Village	Seasonal Migration for Job				Human Positive Impact Effectiveness Fishery for the natives			
		Yes	%	No	%	Yes	%	No	%
		1	Targwa	0	0	10	100	10	100
2	Phalauk	0	0	10	100	8	80	2	20
3	Kabin	2	10	18	90	19	95	1	5
4	Pyune Chaung	2	10	18	90	17	85	3	15
5	Pauk Taw(Hlay Seik)	0	0	10	100	10	100	0	0
6	Phalauk Tan	1	10	9	90	10	100	0	0
7	Thone Eain Su	1	5	19	95	20	100	0	0
8	Tar Zone	2	10	18	90	17	85	3	15
	Total	8	7	112	93	111	93	9	8

Annex 9. The Agricultural Conditions of Some Villages at the Study Area (2014)

Sr.	Name of Village	Paddy Cultivation				Type of Paddy						Cultivated Acreage					
		Y	N	%	%	L	M	S	%	%	%	< 5	5 to 10	> 10	%	%	%
1	Targwa	2	0	7	0	0	1	1	0	50	50	1	0	1	50	0	50
2	Phalauk	3	0	10	0	0	2	1	0	67	33	1	1	1	33	33	34
3	Kabin	5	0	17	0	0	2	3	0	40	60	0	3	2	0	60	40
4	Pyune Chaung	5	0	17	0	0	1	4	0	20	80	0	2	3	0	40	60
5	Pauk Taw(Hlay Seik)	2	0	7	0	0	1	1	0	50	50	1	1	0	50	50	0
6	Phalauk Tan	3	0	10	0	0	2	1	0	67	33	0	1	2	0	33	67
7	Thone Eain Su	5	0	16	0	0	3	2	0	60	40	0	1	4	0	20	80
8	Tar Zone	5	0	16	0	0	2	3	0	40	60	0	3	2	0	60	40
	Total	30	0	25	0	0	14	16	0	47	53	3	12	15	10	40	50

Annex 9a. The Agricultural Conditions of Some Villages at the Study Area (2014)

Sr.	Name of Village	Output (Basket)						Cultivated Experiences (Years)					
		<25	25 to 50	> 50	%	%	%	< 5	5 to 10	> 10	%	%	%
1	Targwa	0	1	1	0	50	50	0	0	2	0	0	100
2	Phalauk	0	1	2	0	33	67	0	1	2	0	33	67
3	Kabin	0	2	3	0	40	60	0	2	3	0	40	60
4	Pyune Chaung	0	3	2	0	60	40	0	1	4	0	20	80
5	Pauk Taw(Hlay Seik)	0	1	1	0	50	50	0	1	1	0	50	50
6	Phalauk Tan	0	1	2	0	33	67	0	1	2	0	33	67
7	Thone Eain Su	0	0	5	0	0		0	1	4	0	20	80
8	Tar Zone	0	1	4	0	20	80	0	0	5	0	0	100
	Total	0	10	20	0	33	67	0	7	23	0	23	77

Annex 10. General Conditions of Some Villages at the Study Area (2014)

Sr.	Name of Village	Effectiveness Livelihood for natives				Local natives interest for Environmental conservation				Other distinguished Industries or Services	Local People's Main Suggestions
		Yes	%	No	%	Yes	%	No	%		
1	Targwa	10	100	0	0	7	70	3	30	Ngapi industry	need to smooth transportation
2	Phalauk	9	90	1	10	6	60	4	40	Duck Livestock breeding	need to get Lighting & Smooth Transport
3	Kabin	18	90	2	10	14	70	6	30	Ngapi , dry fish & bamboo selling	need to get Lighting & Smooth Transport
4	Pyune Chaung	20	100	0	0	17	85	3	15	Horse-shoe Chief selling & Ngapi industry	need to smooth transportation
5	Pauk Taw(Hlay Seik)	8	80	2	20	4	40	6	60	Dried Pain plant Selling & Duck Livestock Breeding	need to get Lighting
6	Phalauk Tan	9	90	1	10	8	80	2	20	cherrot service	need to get Lighting
*** 7	Thone Eain Su	18	90	2	10	16	80	4	20	Rice milling & Charrot service	need to get Lighting
*** 8	Tar Zone	17	85	3	15	15	75	5	25	Sub central Fish Selling Area	need to supply water Problem
	Total	109	91	11	9	87	73	33	28		Reginal development Program

Annex 11. The Utility of Fertilizer Conditions of the Study Area (2014)

Sr.	Name of Village	Fertilizer Utility											Pesticide Condition							
		Natural Fertilizer				Chemical Fertilizer				Quantity Fertilizer (Per Bag)			Pesticide Use				Quantity of Pesticide (0.25mm Per bottle for an acre)			
		Yes	%	No	%	Yes	%	No	%	< 1	2 to 3	> 3 & above					< 1	2 to 3	> 3 & above	
													f	f	f	f				f
1	Targwa	1	50	1	50	1	50	1	50	0	1	0	2	100	0	0	2	0	0	
2	Phalauk	1	33	2	67	2	67	1	33	3	0	0	2	67	1	33	2	1	0	
3	Kabin	1	20	4	80	4	80	1	20	2	1	2	3	60	2	40	2	2	0	
4	Pyune Chaung	1	20	4	80	4	80	1	20	2	3	1	3	60	2	40	3	3	0	
5	Pauk Taw(Hlay Seik)	1	50	1	50	1	50	1	50	2	1	0	2	100	0	0	2	0	0	
6	Phalauk Tan	1	33	2	67	2	67	1	33	1	2	1	3	100	0	0	0	3	0	
7	Thone Eain Su	1	20	4	80	4	80	1	20	0	2	3	4	80	1	20	2	3	0	
8	Tar Zone	2	40	3	60	3	60	2	40	1	2	0	3	60	2	40	3	2	0	
	Total	9	30	21	70	21	70	9	30	11	12	7	22	73	8	27	16	14	0	