

Habitat Destruction of *Hilsa ilisha* due to the Environmental Changes in the Ayeyarwady River (Pyay Sector)

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Abstract

Habitat destruction is the process in which natural habitat is functionally unable support the species present. In this process, the organisms that previously used the site are displaced or destroyed, reducing biodiversity. Habitat destruction by human activity is mainly for the purpose of harvesting natural resources for human houses production and urbanization. Clearing habitats for agriculture is also the principal cause of habitat destruction. Other causes of habitat destruction include mining, logging, trawling and urban sprawl. Habitat destruction is currently ranked as primary cause of species extinction worldwide. It is a process of natural environmental change that may be caused by habitat fragmentation, water pollution, and climate change or by human impacts such as the introduction of passive species, ecosystem nutrient depletion and other human activities. The research lasted from May 2015 to May 2016. The outcomes of the research work are to give the guideline for the public by informing the human impacts and to give the ways that conserve the habitat losses.

Keywords: Habitat destruction, environmental changes, Ayeyarwady river (Pyay Sector)

INTRODUCTION

The Ayeyarwady River flows from north to south through Myanmar. It is the country's largest river and most important commercial waterway. A considerable amount of passenger and goods, traffic moves are transported by the river (Wikipedia, 2009).

Every living thing needs somewhere to live, find food and reproduce. This is known as its habitat. In order for a species to be viable its habitat must have sufficient territory, necessary food and water and a range of necessary physical features. These features can include tree cover, rocky hill or deep pools, as well as the organisms and ecosystems that are needed to complete the life cycle (Michael Evans, 2011)

A habitat is the environment in which an individual, population, community, or species lives. Habitat destruction is the most important danger to wildlife. Habitat loss is harmful, not only to a single kind of animal or plant, but to entire ecological communities. There are few parts of the world that have not been altered, damaged, or destroyed by the destruction of natural habitats (Wikipedia, 2009).

Natural habitats are often destroyed through human activity for the purpose of harvesting natural resources for industry production and urbanization. Clearing habitats for agriculture, for example, is the principal cause of habitat destruction. Other important causes of habitat destruction include mining, logging, and urban sprawl. Habitat destruction is currently ranked as the primary cause of species extinction worldwide (Primack, 2006).

Habitat degradation is primarily due to human activities but is increasingly impacted by climate changes as well. Some species have been vastly depleted and others have migrated to new habitats, e.g. moving to areas with cooler temperatures. Such changes are also observed for freshwater fish species. Fish distribution and population is very limited due to lack of scientific research and expeditions over the past several years (Fifth Nation Report, 2014).

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Habitat loss is a process of environmental change in which natural or unnatural, and may be caused by habitat fragmentation, geological processes, climate change, or human activities such as the introduction of invasive species or ecosystem nutrient depletion. In the process of habitat destruction, the organisms that previously used the site are displaced or destroyed, reducing biodiversity (Boundless, 2015).

The loss of biodiversity may not directly affect humans, but the indirect effects of losing many species as well as the diversity of ecosystems in general are enormous. The environment and all its inhabitants rely on biodiversity to recover from extreme environmental conditions. Loss of biodiversity also means that humans are losing animals that could have served as biological control agents (Sahney *et.al.*, 2010).

Freshwater wildlife are most impacted by pollution. Pollutants such as untreated sewage, mining waste, acid rain, fertilizers and pesticides concentrate in rivers, lakes and wetlands and eventually end up in estuaries and the food web (Stein *et.al.*, 2000).

Water pollution by the discharge of waste water from commercial and industrial waste into surface waters and chemical contaminants, such as chlorine, from treated sewage and agricultural runoff, which may contain chemical fertilizers and pesticides; waste disposal and leaching into groundwater; eutrophication and littering (Wikipedia, 2009).

Plastic pollution involves the accumulation of plastic products in the environment that adversely affects wildlife habitat, or humans. Plastics that act as pollutants are categorized into micro-, meso-, or macrodebric, based on size. The prominence of plastic pollution is correlated with plastics being inexpensive and durable, which lends to high levels of plastics used by humans. However, it is slow to degrade. Plastic pollution can unfavourably affect lands, waterways and oceans. Living organisms, particularly marine animals, can also be affected through entanglement, direct ingestion of plastic waste, or through exposure to chemicals within plastics that cause interruptions in biological functions (Encyclopaedia, 2013).

Domestic or municipal wastewater consists of more than 99% water and is characterized by volume or rate of flow, physical condition, chemical and toxic constituents, and its bacteriologic status. It consists mostly of greywater (from sinks, tubs, showers, dishwashers, clothes washers), blackwater (the water used to flush toilets, combined with the human waste that it flushes away); soaps and detergents, and toilet paper. Whether it also contains surface runoff depends on the design of sewer system (Wikipedia, 2009).

Soil pollution as part of land degradation is caused by the presence of xenobiotic chemicals or other alteration in the natural soil environment. It is typically caused by industrial activity, agricultural chemicals, or improper disposal of waste. The most common chemicals involved are petroleum hydrocarbons, polynuclear aromatic hydrocarbons, solvents, pesticides, lead, and other heavy metals. Contamination is correlated with the degree of industrialization and intensity of chemical usage (Olawoyin *et.al.*, 2012).

Therefore, this study was done to partially contribute to researchers who study the conservation of natural habitats.

The present work was conducted with the following objectives.

- * to consider the many irreplaceable ecosystem services provided by natural habitats,
- * to educate the public about the importance of natural habitat and biodiversity and
- * to preserve habitat corridors to minimize prior damage from fragmented habitats.

MATERIALS AND METHODS

Study area

According to the survey, the study site was conducted in Pyay: Part of Ayeyarwady River of Pyay sector (N18°50'37.51" and E95°12'19.18").

Study time

Field survey was carried out from May 2015 to May 2016.

Study design

Field survey was carried out from 7:30 a.m. to 12:00 a.m. per monthly. The survey was conducted at three sites along the Ayeyarwady River by the ferry boat because all the study sites are situated along the river side (Fig.1). The range of field survey was measured by GPS instrument. Under took the GPS based on the data collection in the three sites of parts of the Ayeyarwady River (Pyay Sector) during the study period. Questionnaire surveys with fishermen, fish sellers, local people and direct observations were monthly conducted. Data were collected from different sources. Wildlife mammals, collected species and habitat destruction were recorded. Photographic records of collected species, water pollution and sewage were also taken during study periods.

Identification

Identification of the fish species is followed by Jayaram (1981) and Talwar and Jhingran (1991).

Size and sex ratio

The range was (17-30 cm). Smaller sizes were immature and the larger sizes (above 30 cm) of *Hilsa* indicates maturity for breeding.

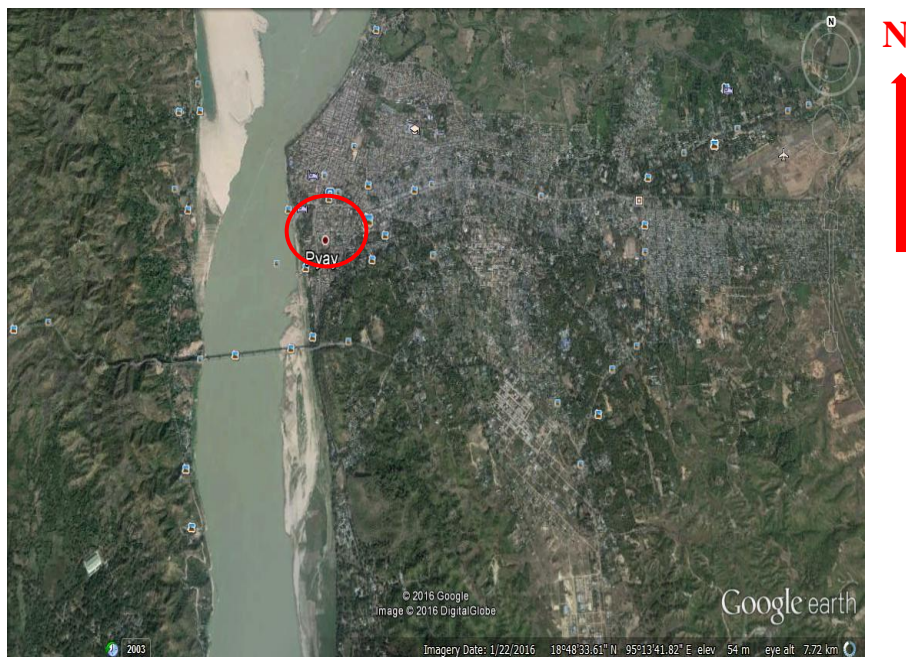


Figure (1). Sites of field survey map. (Sources from Google earth, 2016)

RESULTS

In the Ayeyarwady River, there is a decrease of *Hilsa* fish, habitat destruction including water, soil and forest. It is in relation with species population and habitat destruction. These are described in the following section.

Change in Aquatic Species

In the Ayeyarwady River, aquatic fauna and flora are being affected by habitat degradation, especially in habitat destruction, habitat loss, water pollution, plastic pollution and sewage. This degradation is primarily due to human activities but is increasingly impacted by climate changes as well. Some species have been vastly depleted and others have migrated to new habitats, e.g. moving to areas cooler with cooler temperatures. Systematic data on fish distribution and population is very limited due to lack of scientific research and expeditions over the past several years. Such changes are also observed for freshwater fish species.

Recorded *Hilsa* fish from Pyay environs

One species-focused has successfully demonstrated that conservation can be achieved. *Tenualosa ilisha* with 1294 individuals (0.47 metric tons) were recorded from Pyay fish trading dealers and 763 individuals (0.132 metric tons) from Ayeyarwady River (Pyay Sector).

Monthly collected rate of *Hilsa* at the landing sites from Pyay markets

From June 2015 to May 2016, a total of 1294 individuals (0.47 metric ton) were recorded from local fish-dealers of Pyay larger size of fish (260 individuals, 0.26 metric tons), and smaller size (1034 individuals, 0.21 metric ton) were found respectively during field survey. Among collecting larger size, the high number (45 individuals) were found on December 2015, not found on both months of June and July 2015 (Table.1 & Fig.2).

Hilsa catches at the Ayeyarwady River (Pyay sector)

According to field survey (2015-2016), most of *Hilsa* fishers villages are located along the Ayeyarwady River sides (Pyay sector) :Aung-chantha village, Ywa-thit village, Sit-win village, Sinte village, That-thit -kyun village and Htan-lone-kyaung village. Most of the fishers are professional fishermen and depend essentially on fishing or as labour fishermen.

A total of 122 fisher men of six different villages of Ayeyarwady River depend on the outcome of fishing ground for their families. The fishermen's choice of nets for operation in different areas and different seasons depends on the velocity of the current, the nature of the catch, and to a large extent, on their financial condition. Among the fishermen, 65 fishermen as high number at Tat-thit-kyun village and 5 fishermen in Sit-win villages as lowest.

Altogether 763 individuals of *Hilsa* (0.132 metric tons) were caught from November 2015 to February 2016. The high value of *Hilsa* (221 individuals) on January 2016 and low number (160 individuals) on December 2015 were founded in the Ayeyarwady River. According to the record, two sizes of *Hilsa* were found. A larger size (208 individuals) and smaller sizes (555 individuals) recorded during four month of field survey in the Ayeyarwady River. According to interview survey, catch rate of *Hilsa* became decreasing year by year. It may be weather condition and some ecological aspects of fishing ground (Table.2).

Table (1). Monthly *Hilsa* collected from fish-trading centre in Pyay (2015-16).

No.	Months	Smaller size		Larger size	
		Count	Ton(metric)	Count	Ton(metric)
1	June	56	0.0112	0	0
2	July	97	0.0194	0	0
3	August	39	0.0078	5	0.005
4	September	90	0.018	21	0.021
5	October	106	0.0212	37	0.037
6	November	80	0.016	41	0.041
7	December	150	0.03	45	0.045
8	January	0	0	34	0.034
9	February	98	0.0196	22	0.022
10	March	100	0.02	23	0.023
11	April	98	0.0196	20	0.02
12	May	120	0.024	12	0.012
Total		1034	0.2068	260	0.26
Grand total		1294 individuals		0.4668 ton(metric)	

Table (2). Individuals of collected *Hilsa* from Ayeyarwady River sides. (Pyay Sector, 2015-16).

No.	Villages	November		December		January		February	
		Smaller sizes	Larger sizes	Smaller sizes	Larger sizes	Smaller sizes	Larger sizes	Smaller sizes	Larger sizes
1	Aung-chantha	6		12	3	4	10	10	12
2	Ywa-thit	5		10	2	16	3	11	4
3	Sit-win	7		4	1	11	3	9	4
4	Sinte	15	4	16	10	18	13	22	17
5	That-thit –kyun	95	12	67	18	70	28	55	31
6	Htan-lone-kyauung	22	3	12	5	35	10	23	15
Total		150	19	121	39	154	67	130	83
Grand total		763 individuals							

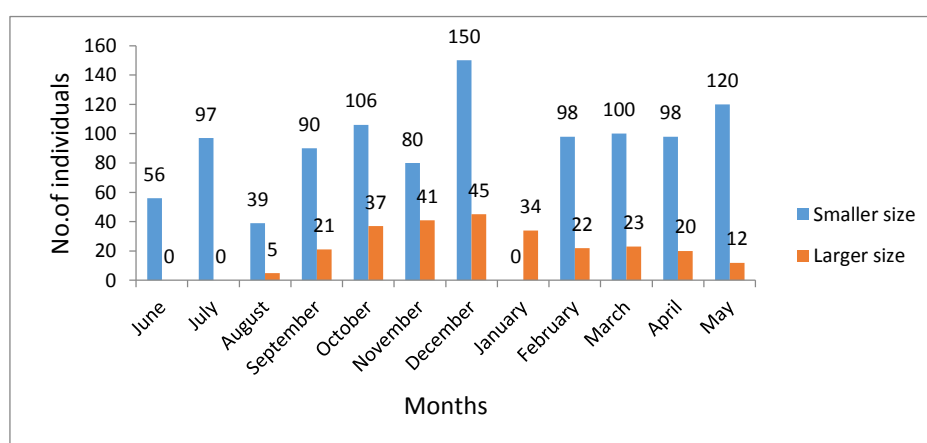


Figure (2). Monthly collected *Hilsa* from fish-trading centre in Pyay (2015-16).



Figure (3). Field survey in local markets and Ayeyarwady River.

Habitat destruction and loss

Habitat destruction by human activity is mainly for the purpose of harvesting natural resources for human houses production and urbanization. People live along the river, so the river are discharged by toilet, sewage, usage substances and other domestic items. The people of Myanmar are supportive of conservation objectives, rural people living in close proximately to protected areas may not be supportive of conservation efforts and protected area management (Fig.4).



Figure (4). Habitat destruction and loss in Ayeyarwady River(Pyay Sector)

Pollution

Water pollution is the contamination of water bodies and this form of environmental degradation occurs when pollutants are directly or indirectly discharged into water bodies without adequate treatment to remove harmful compounds.

Plastic can be found the coast of the rivers because of currents carrying the debris. Both mega- and macro- plastics are found in packaging, footwear and other domestic items.

Sewage is a water-carried waste, in solution or suspension, that is intended to be removed from a community. Wastewater consists of showers, dishwashers, clothes washers, flush toilets, soaps, detergents and toilet paper (Fig.5).



Figure (5). Pollution by humans along the Ayeyarwady River (Pyay Sector).

Soil contamination

Contaminated or polluted soil directly affects human health through direct contact with soil or via inhalation of soil contaminants. The distribution of plastic debris is highly variable as a result of certain factors such as wind and ocean currents, coastline geography, urban areas, and trade routes. Human population in certain areas also plays a large role in this. Plastic are more likely to be found in enclosed regions (Fig.6).



Figure (6). Soil contamination in strand road by human (Pyay Sector).

DISCUSSION

In the present study, aquatic fauna and flora are founded in Ayeyarwady river which being affected by habitat degradation, especially in habitat destruction, habitat loss, water pollution, plastic pollution and sewage.

Wikipedia (2009) recorded that the Ayeyarwaddy river is a large diversity of animal. Population numbers have decreased because of a combination of commercial skin hunting, habitat loss, drowning in fishing nets and over- collection of living animals. The river is still as vital today, amount of (export) goods and traffic moves by river. The finding of this research work is similar with the above statement (Wikipedia, 2009).

Larger *Hilsa* exported while more smaller feed in local. A larger size (2.0 kilogram to 2.5 kilogram, cost for 20000 kyats to 30000 kyat. Some smaller *Hilsa* were salted for local markets.

Boblme (2010) reported that it is time coincided with spawning time for mature fish (larger size) and occurred in coastal areas and in the northern Bay of Bengal. Wikipedia (2007) recorded that Nga Tha Lauk (*Hilsa ilisha*) is an important commercial species and provides a significant income source for coastal communities. In the present study, our findings were similar to them.

Habitat destruction is the process in which natural habitat is rendered functionally unable to support the species present. In this process, the organisms that previously used the side are displaced or destroyed, reducing biodiversity.

Cincotta and Engelman (2000) stated that habitat destruction is the single most important danger to wildlife. Habitat loss is harmful, not only to a single kind of animal or plant, but to entire ecological communities. Living things (2011) recorded that habitat destruction was also a contributing factor in the extinction of at least 73% of freshwater fish in North America and the leading threat to fish species considered threatened, endangered or of special concern. In the present statements were agreement with them.

The people of Myanmar are supportive of conservation objectives, rural people living in close proximity to protected areas may not be supportive of conservation efforts and protected area management.

Boundless (2015) recorded that long-lived and healthy wetlands and forests are examples of sustainable biological systems. For humans, sustainability is the potential for long-term maintenance of well-being, which has ecological, economic, political, and cultural dimensions. Sustainability requires the reconciliation of environmental, social and economic demands. In the present finding was agreed with above finding.

Michael Hogan (2010) stated that high concentration of water pollution naturally occurring substances can have negative impacts on aquatic flora and fauna. Oxygen-depleting substances may be natural materials such as plant matter as well as man-made chemicals. Other natural and anthropogenic substances may cause turbidity which blocks light and disrupts plant growth, and clogs the gills of some fish species. Michael Evans (2011) reported dredging ship channels will stir up accumulated sediments and pollutants and the removed material is often dumped on salt marshes, destroying the habitats of the creatures that live there.

In the present study, pollution in water include a wide spectrum of chemicals, pathogens, and physical changes. Pollution from toxic substances such as industrial chemicals, pesticides and motor oil are also areal problem. The finding of present study was similar to their findings.

Karleskint, *et.al* (2009) reported plastic pollution has the potential to poison animals, which can then adversely affect human food supplies. Plastic pollution has been described as being highly detrimental to large marine mammals. Wikipedia (2009) recorded that plastic can be found the coast of some rivers. Sewage is a water-carried waste. Plastic pollution can unfavourably affect lands, waterways and oceans. Living organisms, particularly marine animals, can also be affected through entanglement, direct ingestion of plastic waste, or through exposure to chemicals within plastics that cause interruptions in biological functions. In the present study, plastic can be found off the coast of some islands because of currents carrying the debris. These statements were agreement with them.

Contaminated or polluted soil directly affects human health. Wikipedia (2009) recorded that health consequences from exposure to soil contamination vary greatly depending on pollutant type, pathway of attack and vulnerability of the exposed population. Industrial or man-made concentrations of naturally occurring substances, such as nitrate and ammonia associated with livestock manure from agricultural operations, have also been identified as health hazards in soil and groundwater. The finding was agreed with above finding.

Thus, the present study will undoubtedly provide basic knowledge on the some aspects of the enhancement of conservation strategy. Now, doing research about the biodiversity of the species in these areas are getting record the lists of the rare and endangered species. These finding will support conservation.

Now, doing research a process of natural environmental change that may be caused by habitat fragmentation, water pollution, climate change or human impacts such as the introduction of passive species, ecosystem nutrient depletion and other human activities.

Thus, according to the results, Myanmar people must conserve the environment.

CONCLUSION

According to the result, habitat destruction is the process in which natural habitat is rendered functionally unable support the species present. In this process, the organisms that previously used the site are displaced or destroyed, reducing biodiversity. In Ayeyarwady River, aquatic fauna and flora are being affected by habitat degradation, especially in habitat destruction, habitat loss, water pollution, plastic pollution and sewage. The outcomes of research work are to give the guideline the public by knowing the human impacts and to give the ways that conserve the habitat losses. The present baseline data obtained thus provide valuable information for conservationists and also provide researchers in enhancement of further researches.

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