A Brief Report
on

Assessment on Removal of Water hyacinth to Water Birds and Fishes' in Rupa and Begnas Lakes of Pokhara Valley, Nepal

(Based on an objective of A Second RSG Project granted to Mr. Mohan Raj Kafle)

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1. Introduction

As per the objective of the project to assess the effect of removal of Water hyacinth to the Water birds' and fishes' diversity and number in the lakes, water bird and fish survey was carried out in Begnas and Rupa Lakes. The information is gathered with the help of the questionnaire survey as well as the direct field survey and compared the result with the secondary information regarding the water birds and fishes in the lakes.

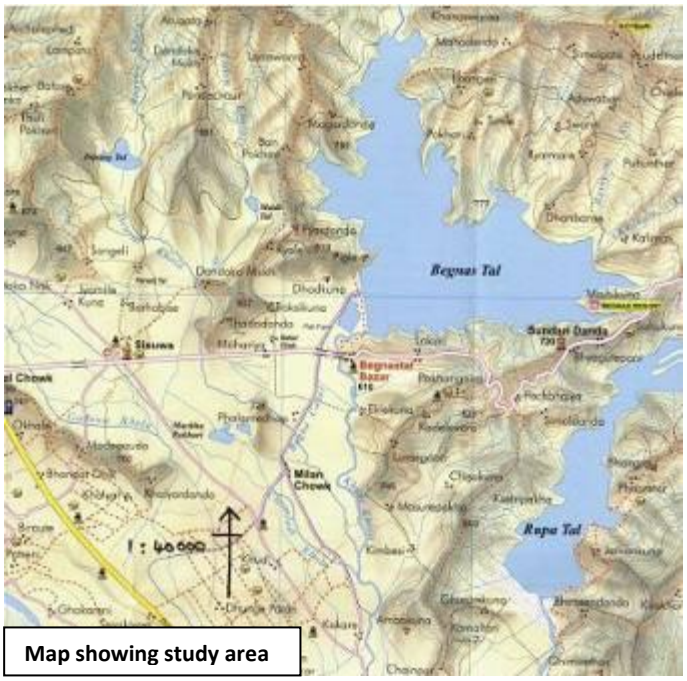
Both water birds and fishes are the major components of the wetland biodiversity, that acts as the indicator of the status of the lake environment. These lakes provide habitat for the endemic and the seasonal migrant birds, different species of fishes and other many more wetland flora and fauna. As lakes are the major habitat for waterbirds and fishes, any kind of disturbance to the lakes such as water pollution, siltation, poisioning, invasion of weeds, etc will directly affect their population.

In Begnas and Rupa lakes, local bote communities (fishermen communities) are dependent on lakes for fishing the native/local fish species. Now a days, cage culture is also growing in these lakes where native as well as the exotic species are also introduced for commercial purpose.

Out of the total bird species found in Nepal, 194 (22.5 percent) (IUCN Nepal, 2004) are known to be dependent on wetlands. Pokhara valley lakes, mainly the Begnas, Rupa and Phewa, are good habitat for some major water bird species found in Nepal. These lakes are threatened with drainage, diversion, obstruction, siltation, encroachment, infrastructure development, land use changes, pollution and poison to kill fish resulting in a marked reduction in bird numbers and species diversity since the 1970s (Karki et al., 1997; Karki and Thapa, 1999; Subedi, 2003; Gautam and Kafle, 2007).

In the contrary, the lakes are under heavy pressure from both natural and human factors. So, the wetland biodiversity of these lakes are under threat from several factors such as drainage, diversion, obstruction, siltation, encroachment, infrastructure development, land use changes, pollution and poison to kill fish resulting in a marked reduction in bird numbers and species diversity. Invasion of large portions of these lakes from water hyacinth is creating problem in fishing and fish culture to the fishermen. They spend large sum of money and effort to remove this invasive plant from the invaded portions of lakes every year. Water hyacinth invasion not only make difficulty in fishing but also affecting the movement and fbreeding of native fish species in the lakes. The study also shows that there is decline of some waterbird species too due to the invasion of the lakes.

2. Materials and Methods



Map showing study area

Current status of the waterbirds and fishes in the lakes are find out by: a) Project team's observation between 2006 and 2008 and b) Presence/absence survey was carried out using questionnaire survey to the local people residing lakeside areas. The water birds that can be identified were recorded in a data record form. Birds were identified following Grimmett et al. (2000) and nomenculature follows BCN (2006). Similarly, the threats to waterbirds were identified through direct observation, interview with local informants and secondary sources. The secondary data for waterbirds, as baseline for this study, is taken from a) Asian Waterbird Census in Pokhara between 2005 and 2008 coordinated by Tiger Mountain Pokhara Lodge, b) LI-BIRD's previous project outputs between 2005 and 2008. Likewise the secondary informatin regarding the status of the fishes in the lakes was gathered from different published and unpublished literatures.

3. Results

3.1 Assessement of effect to water birds

The baseline data for comparision to the current status is taken from the records based on several surveys carried out during December to February (winter months) between 2005 and 2008 by different surveyors of Tiger Mountain Pokhara Lodge, Institute of Forestry, Bird Conservation Nepal Pokhara Branch, Wetland Friends of Nepal, and Local Initiatives for Biodiversity, Research and Development are taken in to consideration. A total of 36 waterbird species were recorded in the lake.

3.1.1 Preliminary Checklist of Waterbirds in Rupa Lake

Preliminary checklist of waterbirds of Rupa Lake from previous surveys is as follows:

1. Bronze-winged Jacana (Metopidius indicus)
2. Cattle Egret (Bubulcus ibis)
3. Citrine Wagtail (Motacilla citreola)
4. Common Coot (Fulica atra)
5. Common Kingfisher (Alcedo atthis)
6. Common Moorhen (Gallinula chloropus)

7. Common Pochard (Aythya ferina)
8. Common Teal (Anas crecca)
9. Eurasian Wigeon (Anas penelope)
10. Ferruginous Pochard (Aythya nyroca)
11. Gadwall (Anas strepera)
12. Great Cormorant (Phalacrocorax carbo)
13. Great Crested Grebe (Podiceps cristatus)
14. Great Egret (Casmerodius albus)
15. Grey Heron (Ardea cinerea)
16. Grey Wagtail (Motacilla cinerea)
17. Indian Pond Heron (Ardeola grayii)
18. Intermediate Egret (Mesophoyx intermedia)
19. Lesser Whistling Duck/Teal (Dendrocygna javanica)
20. Little Egret (Egretta garzetta)
21. Little Grebe (Tachybaptus ruficollis)
22. Little Heron (Butorides striatus)
23. Mallard (Anas platyrhynchos)
24. Northern Pintail (Anas acuta)
25. Northern Shoveler (Anas clypeata)
26. Pheasant-tailed Jacana (Hydrophasianus chirurgus)
27. Pied Kingfisher (Ceryle rudis)
28. Plumbeous Water Redstart (Rhyacornis fuliginosus)
29. Purple Swamphen (Porphyrio porphyrio)
30. Red-crested Pochard (Rhodonessa rufina)
31. Red-wattled Lapwing (Vanellus indicus)
32. White Wagtail (Motacilla alba)
33. White-breasted Waterhen (Amaurornis phoenicurus)
34. White-browed Wagtail (Motacilla maderaspatensis)
35. White-throated Kingfisher (Halcyon smyrnensis)
36. Woolly-necked Stork (Ciconia episcopus)

Bird species found in current survey:

1. Bronze-winged Jacana (Metopidius indicus)
2. Cattle Egret (Bubulcus ibis)
3. Common Coot (Fulica atra)
4. Common Moorhen (Gallinula chloropus)
5. Common Pochard (Aythya ferina)
6. Common Teal (Anas crecca)
7. Eurasian Wigeon (Anas penelope)
8. Ferruginous Pochard (Aythya nyroca)
9. Gadwall (Anas strepera)
10. Great Cormorant (Phalacrocorax carbo)
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23. Purple Swamphen (Porphyrio porphyrio)
24. Red-crested Pochard (Rhodonessa rufina)
25. Red-wattled Lapwing (Vanellus indicus)
26. White-breasted Waterhen (Amaurornis phoenicurus)
27. Woolly-necked Stork (Ciconia episcopus)

Birds not recorded in Rupa Lake area in this study:

1. Citrine Wagtail (Motacilla citreola)
2. Common Kingfisher (Alcedo atthis)
3. Grey Wagtail (Motacilla cinerea)
4. Northern Pintail (Anas acuta)
5. Pied Kingfisher (Ceryle rudis)
6. Plumbeous Water Redstart (Rhyacornis fuliginosus)
7. White Wagtail (Motacilla alba)
8. White-browed Wagtail (Motacilla maderaspatensis)
9. White-throated Kingfisher (Halcyon smyrnensis)

3.1.2 Preliminary Checklist of Waterbirds in Begnas Lake

A total of 20 waterbird species have been identified in the previous survey in Begnas Lake.

1. Black-backed Forktail (Enicurus immaculatus)
2. Bronze-winged Jacana (Metopidius indicus)
3. Cattle Egret (Bubulcus ibis)
4. Common Coot (Fulica atra)
5. Common Redshank (Tringa totanus)
6. Common Sandpiper (Actitis hypoleucos)
7. Ferruginous Duck (Aythya nyroca)
8. Great Cormorant (Phalacrocorax carbo)
9. Great Crested Grebe (Podiceps cristatus)
10. Green Sandpiper (Tringa ochropus)
11. Indian Pond Heron (Ardeola grayii)
12. Intermediate Egret (Egretta intermedia)
13. Little Cormorant (Phalacrocorax niger)
14. Little Egret (Egretta garzetta)
15. Little Grebe (Tachybaptus ruficollis)
16. Mallard (A. platyrhynchos)
17. Plumbeous Water Redstart (Rhyacornis fuliginosus)
18. Red-crested Pochard (Rhodonessa rufina)
19. White-breasted Waterhen (Amaurornis phoenicurus)
20. Wooly-necked Stork (Ciconia episcopus)

Birds recorded in Begnas Lake in current survey:

1. Black-backed Forktail (Enicurus immaculatus)
2. Bronze-winged Jacana (Metopidius indicus)
3. Cattle Egret (Bubulcus ibis)
4. Common Coot (Fulica atra)
5. Common Redshank (Tringa totanus)
6. Ferruginous Duck (Aythya nyroca)
7. Great Cormorant (Phalacrocorax carbo)
8. Great Crested Grebe (Podiceps cristatus)
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16. Red-crested Pochard (Rhodonessa rufina)
17. White-breasted Waterhen (Amaurornis phoenicurus)
18. Wooly-necked Stork (Ciconia episcopus)

Birds not recorded in Begnas Lake in this study

1. Common Sandpiper (Actitis hypoleucos)
2. Plumbeous Water Redstart (Rhyacornis fuliginosus)

The waterbirds were not counted in this study - only presence/absence survey was carried out. The survey did not cover all the seasons in a year.

Though invasion of the Water-hyacinth to the whole lake area has the harmful effect to most of the water birds, some bird species also use the plant as the nesting and roosting habitat. The survey shows that there is no significant effect of the removal of water-hyacinth to the birds.

3.2 Assessment of effect to fish

3.2.1 Fish Survey in Begnas and Rupa Lakes

A round of interviews was made asking with fishermen. Interviews tried to include all podhe caste fishermen in Begnas and Rupa lakes. Information was obtained on the fish species found, the status of the fishes in the lakes during a decade period and the effect of the Water hyacinth removal to the fishes.

About a dozen of fish species are recorded in this fish survey in Begnas and Rupa lakes. They vary in size. Sahar and Katle grow the largest and probably live the longest. Besides the species recorded in table 1, other species are sometimes found, such as Bam (Mastooembalus sp.) and Buduna (Labed sp.).

Fish species recorded in Begnas and Rupa lakes in previous studies.

Literatures show that around 21 species of fishes have been recorded in Rupa and Begnas lakes but ony 11 identified species and their names could be available in the literature survey. Those are tabulated below:

Scientific Name	Local Name
1. Barbus tor	Sahar
2. Barbus hexagonolepsis	Katle
3. Barbus sarana	Kade
4. Barbus chaginio	Rewa
5. Mystus bleekeri	Junge
6. Labezo augra	Gardi
7. Barbus ticto	Bitta
8. Barilius barna	Bagephageta
9. Barilius varga	Lamuphageta
10. Xenentodon caucila	Tutsebam
11. Oreinus richardsoni	Asla

Fish species recorded in Begnas and Rupa Lakes in this study

Scientific Name	Local Name
1. Barbus tor	Sahar
2. Barbus hexagonolepsis	Katle
3. Barbus sarana	Kade
4. Barilius barna	Bagephageta
5. Barilius varga	Lamuphageta
6. Xenentodon caucila	Tutsebam
7. Oreinus richardsoni	Asla
8. Mastooembalus species	Bam
9. Labed species	Buduna
Additional last 2 species (no.8 & 9) are recorded in this study.	

Findings regarding the effects to the fishes:

- Silver carp are intolerant of stress; sudden environmental changes can cause heavy mortality.
- Grass carp, which can be fed grass in cages, are suitable when water bodies are poor in plankton.
- Common carp, being a bottom feeder, can move freely and depends on the bottom feeds.
- Rohu, a bottom and water column feeder which eats plant matters including decaying vegetation, can feed with Water hyacinth.

Sahar (Tor tor) and Katle (Acrossocheilus hexagonolepis) are under high pressure of fishing in the areas less or no covered with Water hyacinth. As the breeding seasons of the fish are very spread out, regulations of the Water-hyacinth to protect breeding fish do not seem feasible.

The indigenous fish species do not seem under any threat of extinction by removal of Water hyacinth, although some stocks might be diminished. Decomposed Water hyacinth introduces organic material to the lake and thus eutrophicates the lake. This would mean increased primary production and higher natural fish production. But due to too high eutrophication, the basic danger is fish kills through low dissolved oxygen values which should be taken into consideration.

4. Conclusion

Though recent water quality data is not available, cause and effect analysis have shown that the quality of the lake water is being gradually degraded due to increasing use of chemical fertilizers and pesticides in the upstream areas. Domestic sewage has enormously contributed to lake pollution. The deposited lake shore in the inlet portion is being encroached by local people for agricultural conversion.

The movement of the fish in the surface and sub-surface level of the lakes is disturbed by the invasion of the Water hyacinth. In one hand this has created the probem in the feeding and reproduction of the fishes and in the others the fishermen has affected because of the obstruction in net fishing and reduced number and diversity of the fishes.

Fish farming in the lake using nets through Rupa Lake Rehabilitation and Fisheries Cooperative causes enormous disturbance to the birds even though fishery has enormously supported the livelihoods of local people.

Water Hyacinth (Eichhornia crassipes) – called Jalakumbhi has rapidly covered the water surface of the shore and outlet portion of the lake reducing the feeding areas for ducks and other waterbirds. The extracted Water Hyacinth has been deposited at the banks of the lakes and it again flows back to the waterbody in the rainy season.

The better option can be the demarcation of the protected area for the fishes and the water birds in some portion of the lakes and remaining portion of the areas can be the open area for fishing, boating and other purposes. The Water-hyacinth from these open use areas should be removed regularly and Water hyacinth in the protected areas of the lakes should be kept untouched in natural condition for the healthy and natural aquatic bio-diversity purpose.