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Ghodaghodi Lake Area: Resources, Opportunities and Conservation

Gandhiv Kafle¹, Mohan Krishna Balla², Hem Sagar Baral³ and Ishana Thapa⁴

Status: Ramsar Site, Important Bird Area, not declared as Protected Area

Ramsar Designation Date: 13-08-2003

Location: Kailali District of Seti Zone, Nepal, 28°41'03" N, 80°56'43"E.

Altitude: 205 m

1. Background

Ghodaghodi Lake Area covers 2,563 ha with forests and 14 lakes and ponds. It is bordered by Sandepani VDC (E and N), Ram Shikhar Jhala VDC (W) and East-West Highway in Darakh VDC (S). The area is remarkable for its rich biodiversity and connectivity between the Terai plains and the Siwalik. The lake is large but shallow with finger-like projections. The area is characterized with various types of wetlands including a number of rivers and their floodplains, ox-bow lakes, swamps, marshes, reservoirs, ponds, water storage areas and paddy fields. It includes three types of tropical deciduous forests

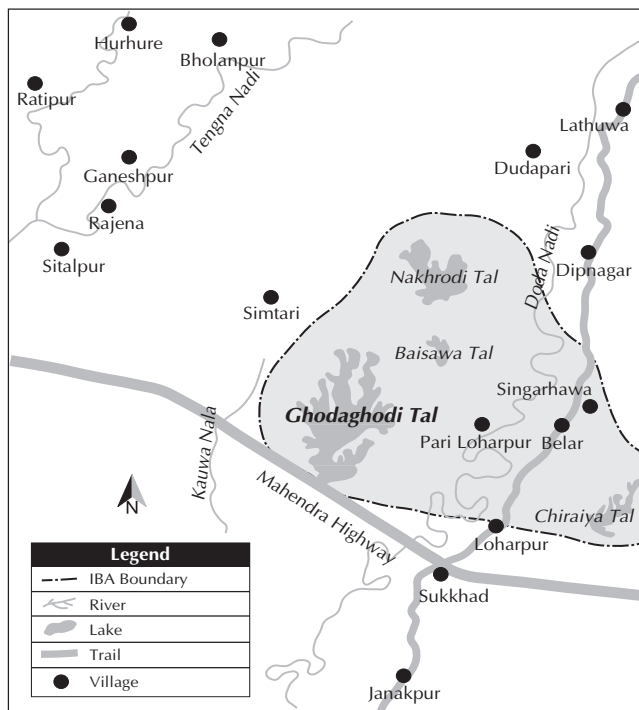
namely Sal (*Shorea robusta*) Forest, Asna/Saj (*Terminalia tomentosa*) Forest and Mixed Deciduous Riverine Forest.

2. Faunal Resources

More than 30 mammal species have been recorded in the area including threatened species: Tiger *Panthera tigris*, Hispid Hare *Caprolagus hispidus*, Smooth-Coated Otter *Lutrogale perspicillata*, Common Otter *Lutra lutra*, Dhole *Cuon alpinus*, Swamp Deer *Cervus duvaucelli*, Clouded Leopard *Neofelis nebulosa* and Sloth Bear *Melursus ursinus*. Other important species include Rhesus Macaque *Macaca mulatta*, Hanuman Langur *Semnopithecus entellus*, Bengal Fox *Vulpes bengalensis*, Leopard *Panthera pardus*, Golden Jackal *Canis chaus*, Wild Boar *Sus scrofa*, Jungle Cat *Felis chaus*, Fishing Cat *Prionailurus viverrinus*, Mongoose *Herpestes edwardsii*, Spotted Deer *Axis axis*, Hog Deer *Axis percinus* and Barking Deer *Muntiacus muntjak* (WWF Nepal and DNPWC 2006, IUCN Nepal 2004b, Baral and Inskipp 2005).

140 bird species recorded in the Ghodaghodi Lake and Nakhrodi Lake include the threatened species: White-rumped Vulture *Gyps bengalensis*, Slender-billed Vulture *Gyps tenuirostris*, Lesser Adjutant *Leptoptilos javanicus*, Ferruginous Pochard *Aythya nyroca*, Oriental Darter *Anhinga melanogaster* and Indian Spotted Eagle *Aquila hastata* (Baral 1992, Baral and Inskipp 2005).

10 reptile species recorded include threatened species: Red-Crowned Roofed Turtle *Kachuga kachuga*, Three-Striped Roof Turtle *Kachuga dhongka* and Marsh Crocodile *Crocodylus palustris* (IUCN Nepal 2004b). Three reptile species: Indian Roofed Turtle *Kachuga tecta*, Golden Monitor Lizard *Varanus flavescens* and Asiatic Rock Python *Python molurus* recorded have been listed in CITES Appendix.



Map: Ghodaghodi Lake Area



More than 25 fish species found in the lake include Threatened: Saydhari/Pothiya *Puntius chola*; and the Endemics: *Notopterus notopterus* and Darahi *Oxygaster bacaila* (WWF Nepal and DNPWC 2006, IUCN Nepal 2004b).

More than 30 species of butterflies have been recorded in the area (WWF Nepal and DNPWC 2006, IUCN Nepal 2004b).

There is possibility of occurrence of other reptile, fish and butterfly species not yet recorded in the area. The status of amphibians is still unknown in the area.

3. Floral Resources

More than 470 plant species (WWF Nepal and DNPWC 2006, IUCN Nepal 2004b) recorded include Globally Vulnerable: Satisal *Dalbergia latifolia* and Nationally Threatened: Vijaysal *Pterocarpus marsupium*, *Operculina turpethum*, Tatelo *Oroxylum indicum*, Kurilo *Asparagus racemosus*, Palaas *Butea monosperma*, Musli *Curculigo orchioides*, Pipla *Piper longum* and Mango *Mangifera indica*. Four species: Khair *Acacia catechu*, Simal *Bombax ceiba*, Vijaysal *Pterocarpus marsupium* and Sal *Shorea robusta* are protected under Forest Act 1993 (HMGN 1993) of Nepal. The lake area is an excellent source of wild genetic material for cultivated species: Wild Mango *Mangifera indica*, Wild Rice *Oryza rufipogon* and Wild Perilla *Perilla frutescens*.

Terrestrial Flora: Sal *Shorea robusta* and Asna *Terminalia alata* are the most dominant tree species in Ghodaghodi Lake Area. Other species include Jamun *Syzygium cumini*, Amala *Phyllanthus emblica*, Kyamun *Cleistocalyx operculata*, Bel *Aegle marmelos*, Kusum *Schleichera trijuga*, Sindhure *Mallotus philippensis*, Karma *Adina cordifolia*, Khair *Acacia catechu*, Simal *Bombax ceiba*, Satisal *Dalbergia latifolia*, Bains or Willows *Salix tetrasperma*, Barro *Terminalia bellirica*, Chhatiwan *Alstonia scholaris*, Kalikath *Aporosa octandra*, Bot Dhainyaro *Lagerstroemia parviflora*, Sandan *Ougenia dalbergioides*, Andi Ko Bot *Ricinus communis*, Tanki *Bauhinia purpurea*, Piyar *Buchanania latifolia*, Mango *Mangifera indica*, Vellar or Gutel *Trewia nudiflora* etc. The undergrowth vegetation is dominated by Bhui Dhayaro *Woodfordia fruticosa*, Bhogate *Maesa macrophylla*, Saruwa *Jatropha curcas*, Mitho Neem or Asare *Murraya koenigii*, Thakal *Phoenix acaulis*, Vaith *Clerodendron viscosum*, Bayer *Ziziphus mauritiana*, Ban Tarul *Dioscorea bulbifera*, Ank *Calotropis gigantea* and Bhorla *Bauhinia vahili* (Kafle 2005).

The adjacent terrestrial grassland vegetation is equally rich comprising *Cyperus distans*, *Phragmites karka*, *Cyperus esculentus*, *C. imbricatus*, *Alpinia nigra*, *Cassia tora*, *Chrysopogon aciculatus*, *Desmodium triflorum*, *Dichanthium annulatum*, *Evolvulus nummularius*, *Alternanthera sessilis*, *Digitaria sp.*, *Phyllanthus urinaria*, *Cynodon dactylon*, *Centella asiatica*, *Justicia simplex* and *Imperata cylindrica*. *Imperata cylindrica* is abundant in open and heavily grazed areas. In

less-grazed areas, species like Dubo *Cynodon dactylon* and *Centella asiatica* are also found dominantly (IUCN Nepal 2004b).

Aquatic Flora: Aquatic plants namely Water Primose *Ludwigia adscendens*, Water Velvet *Azolla imbricata*, Water Cabbage *Pistia stratiotes*, Watermeal *Wolffia globosa*, Duckweed *Lemna sp.*, Water Nymph *Najas minor*, Hydrilla *Hydrilla verticillata*, Hornwort *Ceratophyllum demersum*, Smartweed *Polygonum lapathifolia*, Willow *Salix tetrasperma*, *Spirodela polyrhiza*, *Hygrorhiza aristata*, Lotus *Nelumbo nucifera*, *Cyperus sp.* (sedges), Karaute grass *Mariscus sp.*, Common Reed *Phragmites karka*, Water Lily *Nymphaea sp.*, Water Chestnut *Trapa bispinosa* and Bladder Wort *Utricularia sp.* are frequently found in the lake (IUCN Nepal 2004b).

4. Local Communities and Resource Use

The Ghodaghodi Lake Area supports more than 400 households who are extensively dependent on plant and animal resources of the area (Gurung 2003). Of the total population, 51.3% comprises indigenous Tharus, 47% hill- migrants and 1.7 % people of other Terai origin (IUCN Nepal 1998). Since the site is in the plain area, which is covered with forest and friable agricultural land, people from other parts of the country came to settle here en-masse (Taylor et al. 2005). The lake area is widely used by local communities for fishing, grazing animals, harvesting lotus and collecting fuelwood, fodder and timber. In addition, it is an area used for recreation and watering domestic animals (Bhandari 1998a).

Tharus have low income and limited livelihood opportunities and are mostly involved in fishing and agriculture (Taylor et al. 2005). Tharu women are involved in collecting snails, fish and other wetland resources. They also, possess remarkable skills of clay pottery, clay and wood artefacts, baskets and mats weaving, etc. based entirely on locally available resources (Gurung 2003). The households with deficit food production to meet the annual demand are involved in wage labour, sharecropping, fishing, and collection and sale of Non-Timber Forest Products. Dependence of people on the wetland and forest for meeting their daily needs of food, fodder, fuelwood, small timber and other resources is ever increasing.

Sah and Heinen (2001) reported that more than 80% Tharu households fished and collected snails, whereas less than 5% of high caste and 15 to 20% of other mountain settlers fished, and none of them collected snails. Lotus (*Nelumbo nucifera*) leaves are used as plates in weddings and other occasions. Only 15-20% of mountain settlers used lotus leaves in comparison to 70% of Tharu households, who also collected lotus nuts and rhizomes for food.

The economic value and local medicinal use of commonly found 29 tree species in Ghodaghodi Lake Area is presented in Table 1:



Table 1: Economic Use of Selected Tree Species in Ghodaghodi Lake Area

Local / Scientific Name	Economic Value	Medicinal Use
Amala <i>Phyllanthus emblica</i>	Medicinal (fruits)	Dried fruit powder - common cold Root infusion – diarrhea and dysentery
Asna <i>Terminalia tomentosa</i>	Timber, furniture, fodder	Bark juice – cuts and wounds
Bar <i>Ficus bengalensis</i>	Fodder, religious, aesthetic	
Barro <i>Terminalia bellirica</i>	Fodder, firewood, medicinal	Fruit powder – cough and cold, digestive tonic
Bel <i>Aegle marmelos</i>	Religious, medicinal	Fruit paste – stomache and diarrhea Leaf juice (on forehead) – headache
Bhalayo <i>Semecarpus anacardium</i>	Firewood, medicinal	Fruit juice – to treat severe chapped feet
Dumri <i>Ficus racemosa</i>	Fodder, fruits	Plant sap – stomache and intestinal spasm
Gutel <i>Trewia nudiflora</i>	Firewood, fodder	
Harro <i>Terminalia chebula</i>	Medicinal, fodder	Fruit powder – cough, cold and bronchitis Fruit pulp – diarrhea and dysentery
Jamun <i>Syzygium cumini</i>	Timber, fruits edible, fodder	Fruit syrup – dysentery and diarrhea
Kalikath <i>Aporosa octandra</i>		Fruit pulp – pimples Bark juice - wounds
Karma <i>Adina cordifolia</i>	Timber, furniture	Bark juice – cuts and wounds
Khair <i>Acacia catechu</i>	Timber, kathha	Red thick syrup from boiled wood – body pain Wood powder – throat infection and cough
Koiralo <i>Bauhinia variegata</i>	Fodder, flowers edible	Flower- pickle, good for health
Kusum <i>Schleichera oleosa</i>	Timber, firewood, fruits edible	Fruits and bark edible - good for health
Neem <i>Azadirachta indica</i>	Medicinal	Leafe juice for cold and cough
Pipal <i>Ficus religiosa</i>	Religious, aesthetic	
Rajbriksha <i>Cassia fistula</i>	Medicinal, firewood	Fruit pulp – diarrhea and stool
Ritha <i>Sapindus mukorossi</i>	Firewood, soap (fruits)	
Sal <i>Shorea robusta</i>	Timber	Leaf juice – dysentery
Sandan <i>Eugenia dalbergioides</i>	Fodder, timber, fruits	
Satisal <i>Dalbergia latifolia</i>	Timber, furniture	
Simal <i>Bombax Ceiba</i>	Timber, matchstick, floss, flowers edible	Gum paste – wounds Resin syrup – diarrhea and dysentery
Sindhure <i>Mallotus philippensis</i>	Fodder, firewood	Bark juice and fruit powder – stomach disorder (diarrhea, worms)
Sisau <i>Dalbergia sissoo</i>	Timber, Fodder	Syrup of bark boiling – fever Seed – dysentery
Tanki <i>Bauhinia purpurea</i>	Fodder	Flowers - pickle, good for health
Tantari <i>Dillenia pentagyna</i>	Fodder, veneer	Fruits – pickle, good for health
Tejpat <i>Cinnamomum tamala</i>	Medicinal, spices	Bark powder – intestinal disorder
Tuni <i>Toona ciliata</i>	Timber	Stem bark powder - tootache

Source: WFN/IOF Field survey (2007)



Photo: Gandhiv Kalle
Ghodaghodi Lake

5. Conservation

5.1 Importance and Opportunities

- It was designated a Ramsar Site on August 13, 2003 considering its rich diversity and diverse ecosystems and an Important Bird Area by Bird Conservation Nepal and BirdLife International due to its rich avifaunal diversity.
- A total of 140 species of birds representing over 16% of the national avifaunal species has been recorded in the area (Baral 1992, Baral and Inskipp 2005). Other bird species can be expected from the remaining 12 lakes and ponds, and surrounding deciduous forest. Likewise, many species of mammals, reptiles, molluscs, fish, terrestrial plants and aquatic macrophytes have been recorded.
- It supports one percent of the Asian population of Cotton Pygmy-goose *Nettapus coromandelianus* (HMGN/MFSC 2002); six threatened bird species including Critically Endangered: White-rumped Vulture and Slender-billed Vulture, Vulnerable: Lesser Adjutant, and Near-Threatened: Ferruginous Pochard, Oriental Darter and Indian Spotted Eagle; and substantial populations of migratory waterbirds in the winter months (Baral and Inskipp 2005).
- The forest and wetlands serve as the wildlife corridor between the Terai plains and the Siwalik. The lake is an important transit site for migratory species that migrate between Dudwa National Park (India), Suklaphanta Wildlife Reserve and Bardia National Park (Nepal).
- Due to its strategic location between Bardia National Park and Suklaphanta Wildlife Reserve, it provides tremendous opportunities for developing ecotourism in the area, thereby generating income for local communities. Since the area is close to the East-West Highway, it is easily accessible. The area could be an excellent location for establishing small wetland information centre and Tharu cultural centre.
- The lake is an important religious site with a shrine dedicated to Ghodaghodi deity. Tharu people celebrate a traditional festival called *Agan Panchami* in December by worshipping, offering animals and taking holy bath in the lake.
- The area is an excellent location to enjoy the culture of both indigenous and migrant communities from the adjoining hills.

- It is the largest natural lake system in the Terai zone and is characterised with various types of wetlands: a number of rivers and their floodplains, ox-bow lakes, swamps, marshes, reservoirs, ponds and paddy fields.

5.2 Issues

Ghodaghodi Lake Area is vulnerable and is exposed to tremendous anthropogenic pressure (Bhandari 1998a). It is plagued with a multitude of environmental problems due to growing human and livestock population, migration from adjoining hills and easy accessibility (Gurung 2003, IUCN Nepal 1998).

The lake area is inhabited by dense population with around 6,700 people of which about 50% are migrants from adjoining hilly areas. These people intensively use the lake resources for traditional fishing and agriculture. There is a high dependency of local people on forest and wetland resources. Hill migrants use forests for fodder collection more than Tharus do, but the opposite is true in the case of many non-timber forest products (Sah and Heinen 2001). The factors putting pressure on the site's ecology include highway traffic at the southern edge, construction of unplanned new temples, overgrazing, poaching and hunting as well as illegal tree felling and smuggling of Sal and Khair timber, natural eutrophication accelerated by human religious and agricultural activities (Ramsar Convention Secretariat 2004). The conversion of forests and wetlands to agriculture poses serious threats to conservation in the area (Sah and Heinen 2001).

The lake is severally affected by natural eutrophication, although agricultural run-off is also affecting Nakhrodi Lake. Extensive proliferation of macrophytes causes a shift in balance of bird species, favouring egrets, storks and jacanas at the expense of those migratory waterfowl that require some open water for feeding. Ultimately these plants die and contribute to the organic material raising the lake bottom and accelerating seral succession towards dry land. In Nakhrodi Lake, the succession is rapid due to shallow, eutrophic, macrophyte-rich water, and the lake is changing into marshland where *Ipomoea carnea fistulosa* and *Salix* species are prominent (IUCN Nepal 2004a). Over 12,600 cattle regularly graze the shoreline forests at Ghodaghodi, where the composition of wetland vegetation is gradually changing into terrestrial communities as a result of over-grazing. Intensive year-round grazing in forests disrupts the regeneration of trees and impoverishes the ground flora (IUCN Nepal 2004b). Haphazard recreational development initiated by the local government could cause a significant threat to bird and other wildlife in the area (Baral and Inskipp 2005).

Rapid deforestation, overgrazing and other human disturbances have increased soil erosion and siltation in the lake system, which have gradually led to the subsidence of lake's bottom. *Ipomoea carnea fistulosa* is the major invasive alien species in the area. Water hyacinth *Eichhornia crassipes* has been introduced in small lakes and marshes. Use of poisons either indiscriminately or introduced into bait is widespread in



Ghodaghodi for fishing. Reduction in fish population by mass killing affects the food chain of the ecosystem and causes pollution of water bodies. Exotic fish farming is also prevalent in Ghodaghodi. The main interest of landowners downstream is to secure water for irrigation (IUCN Nepal 2004a, Kafle 2005).

Local people are not well aware of the resources existing in the area and are not able to use for the benefit of the community. Low level of awareness on environmental issues (Gurung 2003) and shortage of trained wetland educators (Bhandari 1998b) at local level have further fuelled up the loss of wetland and degradation in the area.

The major factors putting pressure on the natural resources of Ghodaghodi are listed below:

- High dependency of local people on forest and wetland resources
- Increasing human encroachment along the lake shores and adjoining forests for settlements and agricultural expansion
- Low literacy rate of indigenous Tharu people
- Insufficiency of environmental education and awareness among local communities on biodiversity value of Ghodaghodi Lake Area
- Proliferation of invasive alien species
- Natural eutrophication accelerated by religious and agricultural activities
- Erosion in upstream areas and lake sedimentation
- Diversion of lake water for irrigation
- Highway traffic at the southern edge
- Unplanned infrastructure development on the lake shores
- Use of pesticides, herbicides and inorganic fertilisers in agricultural land and poisons for fishing in wetland areas
- Overgrazing in adjacent forest
- Poaching and hunting and fishing in lakes
- Smuggling of Sal and Khair timber

Thus continuous, unplanned and irrational human interventions occurring in the area could invite a conservation crisis in the area if we fail to intervene on time. Integrated conservation and development programmes that benefit the community and help to maintain the biological diversity of the lake are necessary.

5.3 Efforts

Department of Forest is the management authority of the lake area. Though Kailali District Forest Office manages the area, conflict in ownership and management regime of the different parts of the lake area is still debatable. Local communities and Community Based Organizations are involved in the conservation process through community forestry and local institutional development programmes such as eco-clubs and women groups. IUCN Nepal and WWF Nepal are facilitating these groups for wise use and sustainable management of wetland resources. A participatory community-centred

management plan has been prepared for the conservation of the Lake Area in 1998. Eco-clubs, women groups and community based anti poaching groups have also been formed. Ghodaghodi Lake Area Conservation and Awareness Forum – a local organization, has been active in conservation of the lake ecosystem.

6. Suggestions

Scientific research and monitoring of biodiversity and wetland ecology in the lake area is highly suggested. The Ghodaghodi lake area should be declared as 'Conservation Area' with provision of its buffer zone so that its significance for biodiversity conservation and community development will further be explored. The details of positive and negative influences of interaction between people and lake ecosystem needs to be studied. It is crucial to win the support and stewardship of the local people in wetland conservation by implementing conservation programmes along with community development activities aimed at improving their socio-economic conditions. Integrated conservation and development programmes that benefit the local people and help to maintain the biological diversity of the lake through their active involvement at all levels are necessary.

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^{1, 2}Institute of Forestry, Pokhara Campus, Pokhara.

Email: gkafle@iof.edu.np, mkballa@iof.edu.np.

^{3, 4}Bird Conservation Nepal, Lazimpat, Kathmandu.

Email: hem@birdlifeneal.org, ishana@birdlifeneal.org.

A Preliminary Survey of Waterbirds in Phewa Lake, Kaski

Ramji Gautam¹ and Gandhiv Kafle²

Introduction

Nepal is famous for its avifauna and it is the second richest for water resources in the world (Bhandari, 1998). Wetlands are the most productive among ecosystems in the world. It also has a high value for economic development of the country because it provides recreation, transportation, nutritious food, electricity, irrigation etc. Wetlands are considered as reservoir of biodiversity. Wetlands serve important habitats for birds in Nepal. A total of 193 bird species are dependant on wetlands in Nepal (Bhandari, 1998). Among them, 98 are migratory, 59 are resident and 30 are vagrants or rare visitors to Terai wetlands. A total of 34 bird species have been recognized as globally threatened birds of Nepal (IUCN, 2007) but at a national level, 133 breeding and wintering species are considered as threatened birds (Baral and Inskipp, 2004). Wetlands are fast disappearing ecosystems of Nepal. The wetland habitats in Nepal face various problems from siltation, eutrophication, vegetation succession, encroachment, agricultural conversion, urbanization, pollution, fish poisoning and infrastructure development. These problems are creating threats to waterbirds of Nepal. Study on wetland birds from 1989 to 1999 has shown to decline some wetland bird such as Lesser Whistling Duck *Dendrocygna javanica*, Oriental Darter *Anhinga melanogaster* Ruddy Shelduck *Tadorna ferruginea*, Great Cormorant *Phalacrocorax carbo* and Storks (Baral, 1999).

Phewa Lake is one of the largest lakes of Nepal. The Lake is one of the main sources of recreation, natural beauty, drinking water, hydro-electricity, fisheries and irrigation in Pokhara Valley. Wetlands in the Pokhara valley which are unprotected are even more at risk: from drainage, diversion, obstruction,

siltation, encroachment, infrastructure development, land use changes, pollution and poison to kill fish (Karki et al. 1997, Karki and Thapa 1999, Subedi 2003) resulting in a marked reduction in bird numbers and species diversity since the 1970s (pers obs.). A status survey of water birds was carried out in Phewa Lake during 2003 and 2004 with an aim to produce checklist of waterbirds of Phewa Lake and to identify threats.

Study Area

Phewa Lake is located at the western edge of Pokhara Valley near Baidam at an altitude of 915 m. The total area of the Phewa watershed is 123 sq. km. and of Phewa Lake (water body) is 4.43 sq. km. The average and maximum water depth is 8.6m and 19m respectively. The minimum and maximum width of the lake is 100m and 2km respectively. The average length of the lake is 4.5km. The maximum water capacity of the lake is 46 million cubic meters. The main inflows into this lake are two perennial spring - fed streams, Harpan Khola (Khola=stream) and Seti Khola. Phewa Lake is very young in geological terms as tree trunks are still standing in water down to 6m depth. There are two versions about the formation of this lake. According to Hagen (1969), there was a "Paleo-Pokhara Lake" filling whole Pokhara basin and the existing lakes are the remains of the former huge lake. But Gurung (1970) and several other workers agree with the view that this lake was formed by damming of tributaries by sediments of Seti River.

Methods

The survey was carried out in the morning between 06h00-11h00 and in the afternoon between 15h00-18h00 with NIKON 7x35 and 8x35 binoculars for the best chance of

