CHAPTER ONE

INTRODUCTION

1.1 General Background

Nepal is a small landlocked country situated in the lap of Himalaya surrounded by China in the North and India in the rest three sides. Nepal is rich in fresh water resources of snow fed rivers and lakes which are located in different terrains of the country from mountains to the Terai. The average rainfall in country is estimated to be 1.6 mm and about 80% of it occurrs during the (June – September) monsoon period (APSORC, 1994). Freshwater aquaculture & fisheries are playing a significant role in supplying cheap animal protein as well as in supporting the livelihood of people in Nepal. Production of fish is dependent on the use of inland water resources. In Nepal agriculture is the main occupation which engages about 66% population (DOFD, 2007) and also includes aquaculture and fishery which could also be of significant importance in uplifting the livelihood of the people. Significant fish production can be achieved through the development of aquaculture. Approximately 5% of the total area of country is occupied by different freshwater aquatic habitat (Bhandari, 1992) where 184 fish species are reported to thrive (Shrestha, 1995). Being a landlocked country main aquatic products are based on inland aquaculture or culture & capture fisheries from various wetlands. Culture fisheries involve all activities where complete or partial control of fish production cycle is under taken. In capture fisheries fishes are caught from natural water bodies, where little or no control measures are taken over the fish production on cycle. At present fisheries contribute about 2.25% of agricultural gross products which amounts to 0.9% of the GDP of country (country profile 2003/04).

1.2 Fresh Water Resources of Nepal

Next to land the water is major resources Nepal.It still await to be explored for the benefit of the people .On the basis of present available data the water resources of the country can be estimated vary crudely. The major sourceof water is the rainfall which comes as monsoon in the mid-June and last up to mid September. Nearly 94.4% of total precipitation occurs during three months of the monsoon period and rest 9% is in the winter season.

Precipitation varies from 250 mm in Mustang to 4000mm in Pokhara region with an average of 1700mm. The rainfall distribution varies east to west as well as from north to south. With the result some parts in the country are dry and other parts are in the flood.

Types of Water Resources

Rainfall is the main resource which varies in different parts of the country . During the monsoon period the eastern and southern Nepal gets more precipitation than the western and northern with an exception of Pokhara region where the maximum precipitation occurs. Rainfall is split into snow, surface run off i.e. river ground water, lakes and hot springs (Sharma,1978).

1.1.1 Snow:

Snow occurs in the northern Nepal and covers the peaks above 15000ft; however glacier comes as low as 3000m in the western Nepal. As topography is steep the snow is comparatively thin i.e. on the average 1m. The snow holds nearly 10% of the total precipitation and works as a balancing reservoir for the flow of water during March and April when it starts melting. It works also as heat balance. This melting feature continues up to September when the monsoon is receding and snow cover starts increasing and it gets to maximum thickness during the winter when westerly comes. The total snow cover area is as follows:

a) Mahakali- 805sq.km
b) Seti - 190 sq km.
c) Bheri- 1850 sq.km.
d) Karnali-3400sq.km.
e) Kali- 2100sq.km.
f) Marsyangdi- 2100sq.km.
g) Trishuli- 1100sq.km.
h) Sunkoshi- 650 sq.km
i) Dudhkoshi- 500sq.km.
j) Arun- 4475 sq.km.
k) Tamur- 750 sq.km.

Total snow covered area is 14795sq.km.

This snow covered area includes adjoining country also. From the nature of snow covered area Arun, Karnali, Kali, Marsyangdi are the most important rivers. This indicates that snow work is the balancing reservoir along with the ground water for the flow period.

1.1.2 Rivers:

Rivers are the major constituents of water resources in regard to coverage (Table 1). There are 6000 rivers in Nepal with a total length of 4500 km. There are three major rivers systems and each river system has seven main tribhutries. They are i) Saptakoshi in east ii) Sapta Gandaki in the mid region iii) Sapta Karnali in the west. Besides these Kankai, Kamal , Mechi, Babai, Rapti, Tinall Mahakhali Rivers are also equally important rivers. All these rivers systems constitute the 48% of the total water area of Nepal. All these rivers and their tributaries drain into Ganges system in India. The combined run off from all rivers of Nepal contribute 40% of the annual flow of Ganges river and 71% of the dry season flow (Abbas, 1982 cited in Shrestha, 1992).

The rivers of the region deposit silting in the fertile flood plains. Some of the rivers are used in irrigation. Now most of the Mahabharat rivers have been tapped such as the Kankai, the Kamala, Bagmati and Tinau (Shrestha, 1992).

There are four major river systems viz. Koshi, Gandaki, Karnali and Mahakali which drain Nepal(Sharma, 1978). Minor and medium rivers are numerous in the dendritic and trellis pattern. Notable medium size rivers are Kamala, Bagmati, Tinau, and Rapti. Shankar (1976) estimated that more or less there are 6000 rivers in Nepal out of which 1000 rivers are 11km long each and about 100 rivers are longer than 160 km each. The total length of all streams and rivulets exceed 45000km with drainage density of 0.3km per square km. Nearly 70%-72% of precipitation runs as a surface runoff. On the basis of hydrological data the estimated run off of all rivers is 6370 cumex. The individual break down of the mean discharge of the major river is as follows(Sharma, 1978) -

1. Koshi- 1200 cumex
2. Karnali- 11496 cumex
3. Narayani- 8790 cumex

Most of the snow fed rivers become small in February and swell up in the month of March. The maximum to minimum ratio of major rivers ranges from 50 to

200, whereas non-snow fed varies from 500 to 5000 & others are practically dry in the summer months. Sediment loads are heavy in the rainy season where as in the winter the rivers become partly clear with the sediments settled in the bottom. Each year river attains non equilibrium condition in the rainy season to equilibrium condition in wet seasons and the river removes the bed material. In Terai meandering and change of the course are found frequently.

1.1.3 Ground Water:

Nearly 18% of the total water percolates down and comes out as a delayed run off on the mountain to sustain the low flow of the river before the next cycle of the monsoon starts. From the investigation it is clear that most of the Terai area can be covered by tube well irrigation without depleting or mining the underground aquifers. Considering the length and breadth of Terai it can hold 190 x 10^9 m^3 at a specific time.

1.1.4 Lakes:

There are uncountable numbers of ponds and lakes. Lakes found in the country can be classified on the basis of limnology as oligotrophic, mesotrophic and eutrophic. Lakes also classified on the basis of their formation they are glacier, oxbow and tectonic, which hold nearly 2% of the total run off. Maximum numbers are found in the Terai region where in the past the river meandered and made the oxbow lakes.

There are several lakes scattered all over the country. The estimated area of lake is about 5000 ha that is 0.6% of the total existing water areas. The lakes can be categorized in to 3 types on the basis of their origin. Viz. i) Glacial, ii) Oxbow and iii) Tectonic. There are 17 major glacial lakes in the northern Himalayan region which are located above 4000 m altitude. Tectonic takes occurs in the hill region. The most of lakes of Nepal are tectonic in origin which when drained out were replaced by flat basins in the past. The Kathmandu valley, Banepa, Panchkhal, Palpa, Dang, Surkhet valleys are good examples of such basins. Oxbow lakes are mainly confined to the southern part of country.

1.1.4 Reservoirs

There are a few reservoirs with a total area of 1500 ha comprising 0.2% of the total existing water area of Nepal. These reservoirs are mainly constructed for

hydroelectric & irrigation purposes. Among the existing reservoirs, the Indrasarobr reservoir, Kulekhani is newly impounded reservoir for producing hydroelectric power by damming Kulekhani River in the midhill of Nepal. Other existing reservoirs are Trisuli(16 ha), Marsyangdi(62 ha), Panauti, Sunkoshi for irrigation & generating hydroelectric power. The estimated 78000 ha reservoirs will be added for hydropower generation & irrigation from Gandaki basin (45000 ha), Bagmai river (9000 ha) and Karnali river (24000 ha) on their completion (FAO, 1993). It is estimated that 5000000 ha of water surface will be available for fish production, out of which approximately 100000 hectares would be from lakes, reservoirs and village ponds (Pant, 1995).

1.1.5 Hot Springs:

Most of the hot springs are found in the river valley of Nepal. The river recharges the hot spring's zone. Hot springs are called "Tatopani" in Nepali. There are two zones of hot springs in Nepal: Northern and Southern zones. Northern zone lies in the zone of granitisation in the higher Himalayan range, particularly in the lines of the central Himalayan thrust. The other zone is located in the southern side in the Churiya hill particularly along the fault content.

Water resources of Nepal are exclusively inland in nature which occupy about 2.27% of the world's resources (Shresta,1990). The existing water resources of the country and their future potential reveal that there is tremendous scope for expansion & intensification of fishery activities in the country.

Table 1. Estimated water surface area of Nepal (DOFD, 2007)

S.No.	Resource Details	Estimated area (ha)	Coverage %
A	Natural Water	401500	49.14
1	Rivers	395000	48.34
2	Lakes	5000	0.61
B	Reservoirs	1500	0.18
C	Village Ponds	6500	0.80
D	Marginal /Swamps	1100	1.36
E	Irrigated Paddy field	398000	48.71
	Total	817100	100.00

1.3 Status of Fisheries and aquaculture in Nepal

Fisheries & aquaculture are small but important sectors of agriculture. Pond aquaculture as well as fish cage culture in lake & reservoirs are the main activities carried out in Nepal During 1984-1995 period aquaculture production in Nepal was increased by nearly four fold (Subasinghe, 1997). Fish is considered to be auspicious by the Nepalese people as food item and commonly acceptable to all groups of people as compared to meat. Despite it's auspicious character & significant dietary contribution consumption of fish is rather low. It is probably because the fish production in our country is restricted to inland fisheries & aquaculture because of it's land locked nature (Swar, 1998). In aquaculture, Nepal employed about 504000 people & benefited 741000(Over 3% of the population) (FAO, 2003).

Carp polyculture in ponds & enclosures of lakes/reservoirs, culture of planktivorous species in cage and integration of common carp in rice field are the major aquaculture systems adopted in Nepal. Still the per capita fish consumption is very low i.e. 1.67 kg and fish has been contributing about 10% of animal protein in people's diet. Presently by utilizing existing water resources aquaculture production has reached 25.721 tons in 2004/2005 (about 56.4%) of the total fish production (DOFD, 2005).

1.3.1 Aquaculture

Aquaculture involves all activities where complete practical control of the fish and non fish production cycle is undertaken. Modern aquaculture has a short history which started in 1950s with the introduction of common cap species(*Cyprinus carpio*). Three aquaculture systems are in practice in Nepal since 1981 with the investment of Aquaculture Development Project (ADP) with loan assistance from Asian Development Bank, United Nations Development Project (ADB/UNDP). Major aquaculture practices adopted in Nepal are carp poly-culture in ponds, lakes, enclosures in cages, paddy cum fish culture and integrated fish culture (Shrestha and Yadav, 2003)

Aquaculture has been categorized into pond fish culture and other aquaculture activities.

Pond fish culture is practiced in 5987 ha of land producing 16,000 metric ton of fish annually whereas other aquaculture activities including paddy cum fish culture are practiced in 160 ha producing 64 metric ton fish, culture in Ghoals producing 1254

metric tons in 1072 ha, enclosure fish culture producing 130 metric tons in 100 ha and 192 metric tons is produced by cage fish culture practiced in 32,000 m^3.

Aquaculture and allied activities have been providing employment to 76,000 with 52,000 of males and 24,000 of females. Total number of family involved in this sector is 29,000 benefiting 158,000 (Country Profile, 2002/03), whereas capture fisheries has different scenarios.

1.4 Aim and objectives

A number of groups of indigenous people live mainly upon the capture fisheries for their livelihood. These communities inhabit either along the banks of perennial rivers or big lakes, flood plains and other wetlands of the country and live upon the capture fisheries for their livelihood. There are a number of such fishing communities such as Majhi, Bote, Jalari etc. in the country. Majhis and Botes are found to inhabit along the banks of snow fed perennial rivers whereas Jalaris are concentrated along the bank of Phewa lake in the Pokhara valley. Jalari community in the Pokhara valley are the traditional fisher community that has been catching and selling fishes since ages and they still continue to do so in present day also. There are about 50 different Jalari households residing near the study area. The community traditionally depending on fishing activities for their livelihood led a nomadic life along the rivers and lake carrying cast net to feed their families (Wagle, 2007). Because of their livelihood dependency, these fishing communities have been maintaining intimate relationship with the aquatic resources from time immemmorial thereby accumulating a rich body of knowledge about not only their use but also about their conservation. But with the advent of modern development processes and population explosion most of the fresh water bodies are polluted thereby causing serious impact upon the fish and other aquatic resources. This in turn has affected these communities which depend upon fish and fisheries for their livelihood. In view of this present situation present work aims to study the impact of fisheries on the Jalari community of Ward No. 2 of Sarangkot VDC of Kaski District. The work also studies the ethnoichthyological knowledge of the community. Other objectives of the study are as follows:

- Study of the socioeconomic condition of the Jalari community.
- Study of the impact of cage culture on the livelihood of the Jalari community.
- Assessment of their annual income from fish and fisheries.
- Study of the inherent resource conservation measures of the community.

1.5 Limitations of the Study

Like other studies this research also not free from limitation Naturally. Underlying and acknowledged limitation of this study can be presented as follows:

- This study is only confined to the socio economic status of Jalari community residing Phewa watershed. So findings of this area may not be equally applicable in case of Jalaris of other parts of Nepal.
- This study focuses on the educational and economic activities of the community. The study however, does not cover other aspects.
- The study period of six months is too short to collect sufficient data.
- People were hesitant to give time for interview for they were busy in their daily work. So only on data limited aspects could be collected.

1.6 Justification of the study

Phewa Lake is endowed with resources of immense social, cultural and scientific values. It is rich in fish diversity including large number of indigenous fish species. Around the Phewa lake area there is an ethnic Jalari community whose livelihood mainly depends on fishes from the lake. So the socioeconomic status of the community could be raised by improving the production of the fishes of commercial value in the lake. This could be achieved by the integration of the indigenous knowledge with the modern scientific knowledge. So present work is aimed at assessing their annual income from fish and fisheries and provide base line data for further research for the development of fisheries which would raise the community's socioeconomic condition. Also, by this scientific study, the indigenous knowledge of Jalari community could be utilized for the preservation of the important indigenous fishes.

CHAPTER TWO

LITERATURE REVIEW

2.1 Physiography of Nepal

Nepal is a land locked Himalayan country extending from 26^{o} 22'N to30^{o} 27'N and from longitude 80^{o} 40' and 88^{o} 12'E. It is roughly rectangular in shape and occupies a total area of 1, 47,191. sq. km. From east to west the average length is 885 km. About 83% of it's area is occupied by high mountains & wavy hills and the remaining 17% by flat lands of the Terai. The altitude varies from some 60m above the sea level in the Terai to 8,848m Mt Everest which is the high point of the world(Sharma, 1978).

Wide altitudinal variation & diverse climate conditions within a small area make the physiography of the country unique in the world. According to Stainton (1972), Nepal can be divided into seven natural zones which occur in the following order from south to north.

a) Terai and Bhabar:

Terai belt which is flat and consist of valuable agricultural land in southern Nepal is a part of the alluvial Gangetic plan of northern India. It lies at an altitude of 60m-300m between Indian boarders and the outer foothills. The forest land is dense, particularly in west Nepal but the other parts have been exposed due to habitat distribution and ruthless felling of trees.

The Bhabar appears to rise from the Terai in the north & comprises a narrow but continuous belt of forest locally known Char Kose Jhadi which is a few kilometers in width. It is separated by Siwalik along the north. In Nepal Siwalik range is called Churia. The ground of Bhabar is formed by the accumulation of gravels, boulders, stone and sand which are washed down from the foothills. Water is scarce in this part all through the year except during the monsoon when the sizable streams often run from the hill.

b) Foothill:

The foothills are also known as Siwalik or Curiya hills rise abruptly and reach to an elevation of 1500m and the range of elevation is from 700m to 1500m. Churiya hill is wider in the west and far west Nepal, while narrow in the east Nepal. It is mainly composed of sedimentary rocks and also has big boulders. Broads and gently

sloping valleys called Dun valleys lie here. The important within this region being the Dang valley in the west Nepal, Chitwan valley in central Nepal and Trijuga valley in the east Nepal. These are under intensive cultivation. Due to the removal of the forest cover serious soil problem has arisen in this part in the recent year.

c) Mahabharat range:

The range which falls between foothills in the south and midland in the north.This hill range is cut throughout three places by river Koshi, Gandaki, and Karnali.It is composed of hard rocks like granite or quartzine and limestone. The elevation of this range is from 1,500m to 27,000m. Rainfall is relatively maximum in the north than in the other parts. Most of the major rivers such as Babai, the Rapti which flow from northern and southern edge of Mahabharat range separate the Mahabharat range from the Midland on the north side and foothills in the south side.

d) Mid lands:

Midlands at the base of himalayas lying north to the Mahabharat comprises the central region of the country. Average altitude of the region is 2,000m with elevation ranging from 600m. to 3,500m. These comprise the high lying valleys. The central range of mountains within places rises to about 3,500m. The important valleys in the midlands with very dense population are Kathmandu, Pokhara, Trishuli and Banepa. Agriculture is intense in the part of the country where the farmers have made terraces on the steep hill sides. Often up to the top of the high mountainsIn this region forests have been severely degraded and soil erosion has taken places at an alarming scale. All the rivers which flow down from the main snow ranges to the plains drain out their waters into three great rivers; Sapta Koshi in eastern Nepal, Narayani in central Nepal and Karnali in far western Nepal. The midlands are rich in schites and quartz rocks.

e) Himalayas:

This zone of the Himalaya lies in the northern part of the country and stretches from the east to west of Nepal. This region comprises sub alpine & alpine ecological zones. The lower part has summer grazing pasture land whereas the upper part has high altitude plants with species which are adapted to withstanding the extremes of cold and desiccation. Heavy snowfall takes place during winter months. Above 56,50m, the places are covered with snow and trace of important vegetation can be seen beyond 6000m even these are not found in the highland which is called arctic desert region or nival zone.

f) Inner Himalayas:

In the higher Himalayas there are several inner Himalayas with desert condition such as upper Kaligandaki and Bheri valleys located above 3600m. These are very drydry valleys where monsoon climate is absent. The rocky terrians in this region comprises high altitude desert flora including *Juniperius indica, Sophora moorcroftiana*, and *Caragana brevispina.*

g) Arid Zone:

In the northern part of Dhaulagiri and Annapurna Himal lies and almost treeless place known as arid zone or Tibetan Plateu. It includes parts of Dolpa, Mustang, and Manang. In climate and vegetation, the region is Tibetan in character. It comprises the flora *Lonicera spinosa, Hippophae tibetana, Caragana gerardiana* are some of the common plants.

2.2 Phewa lake watershed

Present study will be conducted in the mid hills of Nepal. The specific study site include Phewa lake water shed area and it's shore area called Khapaundi and Faure which is the main habitat of traditional fisher community called Pode or Jalari. This area is located in the southern part of the Pokhara valley. Pokhara valley is situated in the western part of Nepal at latitude of 28°13' North and longitude of 84°0' East on a relative subsidence between the greater Himalayan and Mahabharat range. It is sub tropical in climate with a minimum temperature of 6.5°C in January and maximum of 32°C in June/ July. The valley is characterized by heavy annual rainfall. The annual rainfall is 3,310 mm of which 80% falls between June and September. The peak mean rainfall is in July is 880 mm and lowest rain fall in November and December of 13 mm (Rai, 2000).

2.2.1 Demographic status of Phewa Lake

As per 1991 census the total population of the watershed was 31,578 out of which 49.7% were male and 50.3% female. Population density is 258 people per km^2 while the density accounted for agriculture and forest land is 912 and 586 persons per km^2 respectively. Bhramins are the dominant cast group comprising 48% of total

population. The occupational castes like Damai, Kami, Sarki cover 27% of people while Gurungs are 14% of the total population. Remaining 11% is covered by other castes.

Only half of the people are literate and it is very low among the socio economically backward people. The major economic input of the people is through agriculture as about 85% are farmers followed by the tourism and remittance from the Arab countries. Business activities are confined to lakesides and city core area.

2.2.2 Characteristic features of Phewa Lake

Phewa lake is situated at the southwest edge of Pokhara valley (28°5' E altitude 742 m) with a watershed area of approximately 110 km^2 (Ferro and Swar, 1978). The total surface area of the lake was estimated to be 500ha by Ferro and Swar (1978), while Rai et al. (1995) reported it to be 523 ha. More recently Lamichhane(2000) estimated it to be of 443 ha of water surface area with a maximum depth of 23 m. Phewa lake is fed by two perennial streams - Harpan Khola and Andheri Khola as well as several other seasonal streams.

The lake has single outlet from where its water is diverted for irrigation and hydropower generation. About 1700 wooden plank boats and their crafts are operating in the lake mainly for tourism services. It is estimated that 16% of Pokhara's total income is generated through tourism (Oli, 1997). Presently the lake is facing severe environmental problems as a result of nutrients loading from agriculture, landslides and rapid urbanization in the surrounding area. Sewage from the surrounding settlements is directed into the lake (Lamichhane, 2000) as a result of which its volume continues to rise dramatically in response to an increament in tourism activities.

2.2.3 Fauna of the Phewa Watershed Area

In the lake twenty two species of fishes have been recorded of which the commonly available species are Sahar, Kande, Dudhe, carp etc. Among them 17 are native species. Also six species of amphibians, 14 species of reptiles and 104 species of birds (of which 14 are migratory) and 34 species of mammals have been recorded in the Phewa watershed.

2.3 Jalari community residing in the Phewa watershed area

Jalari community in Pokhara valley is the traditional fisher community that has been catching and selling fishes since ages and they still continue to do so in present day also. There are about 50 different Jalari households residing near the study area. The community traditionally depending on fishing activities for their livelihood led a nomadic life along the rivers and lake carrying cartnets to feed their families (Wagle, 2007). It is believed that Jalari were migrated to Pokhara valley many years age probably from Kathmandu. Now a very few Jalaris know about their history, their ancestral home and their migration to Pokhara (Wagle et al., 2008). However, the young generation Jalaris say that their ancestors migrated to the lake area of Pokhara valley from Simalchure Pokhara. Their main language is Newari yet they are not Newars. In the early 1960s when the fish catch declined due to over fishing, the Jalari's only source of livelihood was threatened. In response to this the Fiheries Development Center which is now Agriculture Research Centre (Fisheries), Pokhara, was established in the year 1962 with an objective of assisting the poorest fishing communities through cage culture and open water fisheries.

Basically they are very poor group of people as their livelihood is dependent only on capture fisheries and culture fisheries from lake Phewa and river Harpan Khola (Prajoo, 2007). Now most of them have been able to raise their economic status by the implementation of cage fish culture. Different types of fishes are cultured here in cages. Main fishes cultured in the cages are grass carp, bighead carp and silver carp. The people in this community are organized into different kinds of groups which are involved in the development of their community and also protect lake and its indigenous fish species from external influence like pollution illegal fishing or clearance of excessive water plants i.e. *Jal Kumbhi*.

Few members of this community are literate and most of them are illiterate and poverty stricken (Wagle et al., 2007). But now a days, the awareness toward education is growing among there people. Therefore most of them are sending their children to the schools. Only some can afford the boarding schools while others go to the public schools. There is a social barrier between the Jalari community and other castes people who view them as the lower caste people. This notion is enough to give the community a kind of harassment.

2.4 Women in Fisheries and Agriculture

Nepal being rich in water resources women too have been playing major roles in fisheries and agriculture since the very ancient time of human civilization. Mostly women from lower ethnic groups such as Mushar, Dhangar, Dom, Paswar, Malah, Danuwar, Majhi and Tharu are involved in aquaculture and capture fisheries. Most of the females of better economic conditions do not participate in fishery activities fearing that it may violate their reputation. Hence women's involvement in production system like making gears, weaving crafts nets, maintaining, collecting and selling fishes have raised their socio economic status. Such women are economically independent partially if not fully and thus do not have to look at their male members for their petty needs (Bhudhathoki, 2003).

2.5 Cage culture in Phewa lake

Cage culture started in the lakes of PokharaValley in 1972 AD. It was later introduced in Indrasarobar reservoir, KuleKhani in 1983 AD (Swar et al., 1992). The cage fish culture in Nepal is an extensive type where external feed is not supplied and fishes feed on naturally available planktons for growth(Gurung 2001). The cage fish culture in Nepal is recently developed, the concept was perceived when brood fish was to be held alive in cages during shortage of water in lake Phewa (Swar et al. 1992).

At present cage fish culture activities with community participation is carried in three lakes of Pokhara valley (Phewa 523 ha., Begnas 328ha and Rupa 135ha). Growth of plankton feeding fish such as big head carp (*Aristicnthys nobilis),* and silver carp (*Hypopthamichthys molitrix*) in cage was encouraging (Rajbansi et al. 1984, Pradhan 1987 a, b, Swar et al. 1988, Rai et al. 1992, Swar et al. 1992 and Karki 2000). According to Swar et al. (1992) there is 3-3.4m annual fish production from Phewa lake. The fish production from cage mainly depends on the primary production of the lake(Sarvala 1993). Types of cages used in Pokhara valley lakes during last 30 years are bamboo cages, wooden cages, iron cages, angle iron cage and nylon or polyethylene net cage. Stocking density of fish varies according to trophic status of the lake. In lake Phewa 10 fingerling m^3 are stocked in production cage (Rai et al., 1992) several factors play an importantrole in determination of production in extensive type of cage fish culture. Productivity and trophic status of the lake is one of

the main factors, while suitable management, determination of stocking rate, ratio of species are also equally important. Pradhan et al. (1979) mentioned that other factors such as wind direction, flow of water, biology of the species to be cultured, feeds, water temperature and other limnological parameters and sites where cages are to beset also play important role in determining production. A study by Davis et al. (1998) showed that the growth of planktivorous fish in lake Phewa could be obtained through lowering the cage by utilizing the sub-surface chlorophyll peak during the monsoon season.

A number of researchers in the country have studied on the socioeconomic status and ethnobiological knowledge of some fishing communities. Thapaliya(1998) has studied the bote ethnic group. Swar (1980) estimated that there wereabout 80,000 fisher populations in the country. However, it is found that there has recently been a three to five fold increase in the fishing populations deepening poverty in Nepal (Gaurung, 2003a). Guvaju et al. (2002) have studied on the contribution of cold water fishes in the livelihood of mountain people of Nepal. They reported that indigeneous cold water fishes have significant contribution as nutritional protein supplement and as a means of income source for the livelihood of local ethnic fisher communities.

2.6 Fish diversity and status in Pokhara valley

Fishes spp. reported from Poikhara valley by different authors are variable. John and Dhewajoo (1989) reported 23 species, Fisheries Research Center (1991/92) reported 18 species and Pokharel (1999) reported 25 species of fishes from water bodies in this valley. Recently Pokharel (1999, 2004) reported 42 species of fishes from the lotic and lentic water bodies. The most common species are Cyprinoids (carps) with 31 species, followed by Siluroids (cat fishes) with 6 species and remaining other 5 species are eels, Belonoids, snakeheaded spp. and spiny eels. Out of 42 species, 32 are indigineous and 4 are exotic spp. The fishes recorded from the lake alone comprise 28 sepcies while these from the river bodies comprises 26 species. A total indigenous of 22 species belonging to 5 orders, 6families and 16 genera were reported by Prazoo(2007). The most common species distributed in Harpan Khola were *Puntius* spp. *Schizotnarax* spp., *Tor putitora* and *Heteropneustes fossilis* (Prazoo, 2007).

Regarding, the status, *Tor tor* or *T. putitora* is endangered, *Neolissocheilus hexagonlepis*, C*hagunius chagunia*, *Schistura beavani*, *Amblyceps mangois*,

Myersglanis blythii, *Labeo angra* and *Anguilla bengalensis* are vulnerable and *Lepidocephalus guntea* and *Glyptothorax pectinopterus* are rare remaining other species are common occasional or insufficiently known.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study area

For the present study, field work was carried out for 6 months, starting from month of January to July 2010. The sampling sites were visited two times every month for the collection of fishes and information about socio-economics of Jalari community. Phewa Lake is the study site of present study. It is situated at the south western part of Kaski district in between 25º7' and 28º10' North latitude and 83º50' and 84 º 50' East longitudes at 884 m above the sea level and 200 km. west from Katmandu valley. Pokhara valley is famous for many lakes; of which Phewa is the most important one. The lake is fed by several tributaries like Harpan Khola, Hani Khola, Khahare Khola, Sedi Khola and numerous other seasonal streams. The total surface area of the lake is about 443 hector and total watershed area of 110 km^2. It has a maximum depth 23 m (Lamichhane, 2000) and minimum depth of 7.5m. The lake has only one main outlet. The reported surface water temperature of lake ranges from 15.5 – 27.0^{0}C. Pokhara is an area of heavy monsoon with mean annual rainfall of 3,710mm. Maximum rainfall occurs in July and from November winter rainfall starts and continues upto April. Water of Phewa Lake mixes with Furshe Khola lying in the southern part of Pokhara valley. Several native carps were reported in the Phewa Lake.

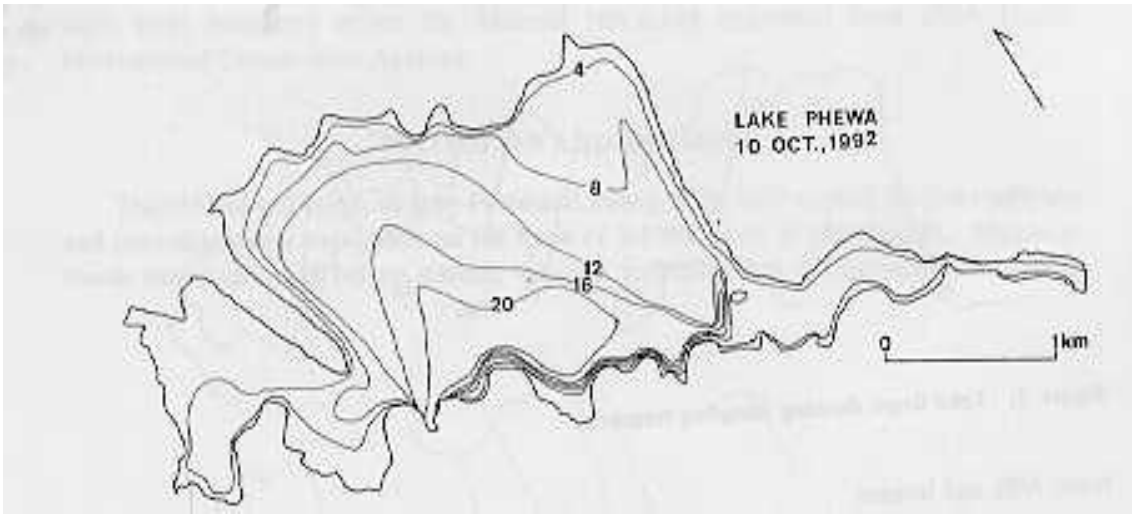

Fig 1. Bathymetricmap of Phewa lake.

Fig 2. Phewa lake with the study area. Fishtail mountain is seen in the backdrop

3.2 Sources and types of data

The sources of data were both primary and secondary. Primary data were collected by observation, questionnaire survey, structured interview and participatory methods and some case studies while secondary data were collected from the Fishery research centre, Pokhara, CNAS publications, Central library, different scientific research publications of home and abroad, NAST journals etc.

3.2.1 Data on fish diversity and ditribution frequency by obervation and study

For this study three different samples were chosen each 500m apart from each other. In each station fishes caught by the fishermen were counted, analized and collected for the study. Collected fish species were preserved in 3-5% formalin solution afer giving longitudinal incision in the ventral side near intestinal region. The incision would let the formalin solution get inside and prevent decomposition of the internal organs. Collected specimens were taken to the Central Department of Zoology, Kirtipur for identification and status study.

Sampling stations

Three sampling sites were selected on the basis of the settlement of local fisher community.

Station I: The first station site was selected at Khapaudi area which is about 500m away from Fauri. This part of the study site is densely

populated with the Jalari populations. The number of cages is also high in this area. One can see properly arranged cages in the cage.

Station II: The second site was selected at a distance of about 500m far from I station. Density of Jalari populations is lesser here as compared to the first station.

Station III: The third station site was selected at a distance 500m away from Talbarahi Temple. Almost all the Jalaris have their own cage for fish culture. Hence, in this area the Jalaris are envolved in both capture fishery and cage fish culture.

3.2.2 Household Level survey

In order to get reliable and quantifiable data on the socio-economic status and ethnoicthyological knowledge of the community a list of Jalari households was prepared. Ninely percent households were chosen randomly for household level survey. Heads of the households were interviewed for various household level data with the help of a set of questionnaires. Before the study was conducted, pilot survey was done in the main habitat of Jalari community near Phewa lake which is Khapaundi VDC ward no.2 of Pokhara sub-municipality.

3.2.3 Structured Interview

Heads of the sampled households were chosen for Structed Interview. Interview was taken with the help of predesigned questions on their ethnoichthyological and ethnoecological knowledge. These fishing populations from generations together have been interacting with the fish and fishery resources and the knowledge gained during this course of interaction is handed over from one generation to next orally without any written text. This knoweledge after undergoing trials and errors though series of generations become ripe and solid. Study and documentation of such ethnoichthyological knowledge is important especially in view of the dwindling state of the indegenous fish resources and also the erosion of such cultures where such knowldge is deeply rooted.

3.2.4 Direct Observation

Participatory observation was the main method for collecting primary data. In this regard the researcher participated in a number of village activities during the study period to get a feel of their lifestyle and also to be familiarized with Jalari community. This type of observation was very helpful in collecting correct informations.

3.2.5 Participatory Rural Appraisal

PRA is an approach of shared learning between local people and researchers. It has been described as a growing family of approaches and methods to enable local people to express, enhance, share and analyze their knowledge of life and conditions, to plan and act. This method involves less time, cost and energy of the researcher. Researcher here acts as a facilitator and his skill is very crucial in obtaining reliable and valid information rather than the procedure itself. If the process is conducted in a gender sensitive way, it will enable local people especially women, to feel comfortable and share their opinion. Also, there is division of knowledge by sex, with women knowing more remedies than men. PRA is an approach where it is insured that voiceless are heard, that the other norms are followed, that learning occurs, and practical results are produced. However, accurate information from PRA is obtained only when the method of facilitation is an appropriate one. “The scientific rigor and validity of this approach depends on the concept of triangulation, with data collected from one source being validated or rejected by checking it with data from different sources and using different methods”(Bajracharya, 2003). A comparison of results using PRA and conventional sample surveys has shown that PRA are valid and the approach is reliable

3.2.6 Case studies

Case study was done on a few household heads for an indepth knowledge on their family history and their experiences on fish and fisheries. Data from participatory approaches were collected. It was insured that the people from both the gender participated the participatory program.Form this study one gets to know about their responses towards the society and the surrounding biological resources. Positive attitude of the surrounding people towards the aquatic resources in general and fish resources in particular is important in conservation of these resourses. It is also easier

to document the fishing community's indigenous knowledge regarding the fish ecology and biology from this investigation. Such a body of age old traditional knowledge could be incorporated into modern scientific knowledge while formulating fish conservation policies.

3.3 Laboratory work

Collected fish specimens identified with the help of available literature on fishes of Nepal (Shrestha, 1981; Shrestha, 1995; Shrestha, 2001 and Shrestha, 2008). After identification all the fishes were classified. Along with local names zoological names and authority names were noted down and tabulated for clear and scientific presentation.

Data on ethnoechthyological knowledge were also tabulated under the headings local name, scientific name, parts used for various uses of fishes and method of preparation of ethnomedicine in case of zootherapeutic fishes and ailment treated.

3.4 Statistical Analysis:

The distribution pattern of fish species in Phewa Lake was calculated by using Mean, Standard deviation, Variance and Variance Mean ratio. The formulae to calculate these statistical tools are given as follows:-

1. **Mean:** It can be defined as the sum of observations divided by the number of observations.

$$\text{Mean } (\bar{X}) = \frac{Total\ no.of\ fish\ collected\ in\ different\ station}{No.of\ station}$$

2. **Standard deviation:** It can be defined as the square root of arithmetic mean of square deviation taken from arithmetic mean.

$$\text{Standard deviation } (\sigma) = \sqrt{\frac{\Sigma(x-\bar{x})^2}{N}}$$

3. **Variance:** It is the square of standard deviation.

Variance (V) = Square of the standard deviation.

4. **Variance Mean ratio:** It is the ratio of variance to mean. Jackson, 1968, If $\frac{V}{M}$ = 1 (distribution is random)

If $\frac{V}{M}$ < 1 (distribution is uniformed)

If $\frac{V}{M}$ > 1 (distribution is clumped)

CHAPTER FOUR

OBSERVATIONS AND RESULT

4.1 Socio-economic status of Jalari community:

To understand the impact of fishery on the socio economy of the Jalaris quantitative data on the age of respondent, educational status, marital status, family size, family structure and total annual income from fish and fisheries (catch fishery and cage culture) have been gathered and analysed to arrive at a definite conclusion.

4.1.1 Age

Age is an important demographic characteristic feature. Age makes a difference in working hour and involvement in decision making process. In the present study people below an age of below 15 have not been included for they are considered to be immature for giving information. To analyze the data, age groups of the individuals were categorized in to three groups: 15-25, 26-35 and > 36 years of age. From the data it is found that the highest percentage of respondents is from age group above 36 with 47% and the lowest percentage of the respondents of 13% from the age group 15-25 years (Table 2).

Table 2: Respondents classified according to their age.

S.N.	Age (years)	Number	Percentage
1	15-25	4	13
2	26-35	12	40
3	Above 36	14	47
Total		30	100

4.1.2 Educational status of Jalari community

The majority of the rural population is illiterate with more illiteracy in women. In Jalari community out of 176 members in the study area 96 members are totally illetrate which is 55%of total population (Table 3 and Fig 3). But the scene is different now for even the illeterate parents are sending their children to the school. These parents have now understood the value of education.

Table 3: Literacy Status of Jalari community

S.N	Education	Number	Percentage	Remarks
1	Illiterates	96	55%	
2	Primary	47	27%	
3	Lower secondary	13	7%	
4	Secondary	13	7%	
5	HSEB	4	2%	
6	Bachelor Level	3	2%	
	Total	176	100%	

Source: Field survey of present study

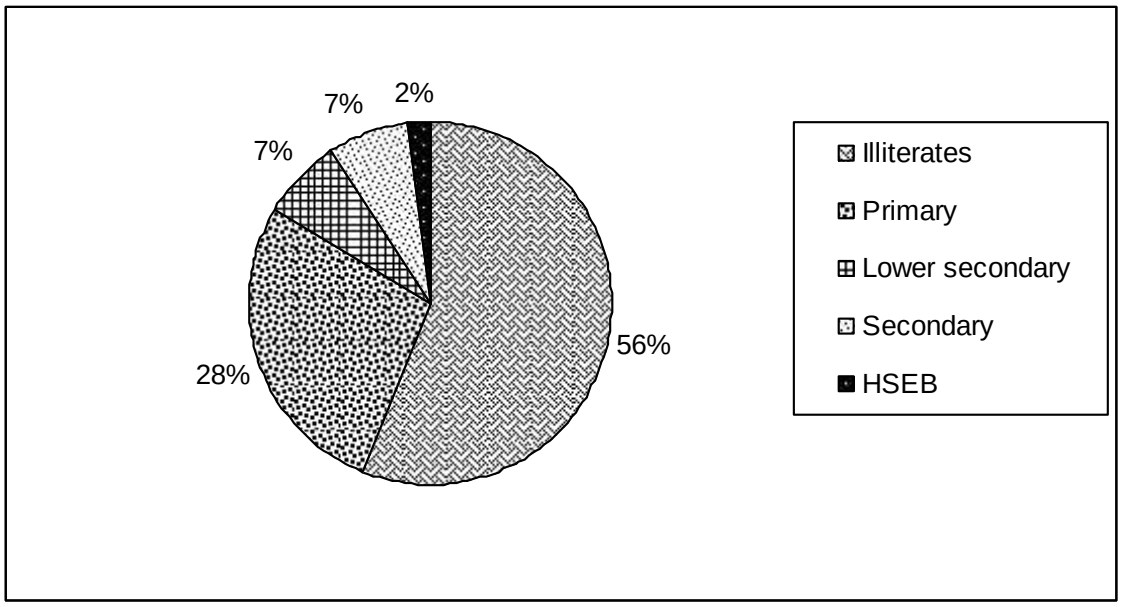

Fig 3. Pie Chart showing educational status of Jalari community.

4.1.3 Occupations and annual household income

The main occupation of Jalari community is fishing which can be splited into two parts viz. capture fisheries and cage fish culture. Both men and women are involved in fish catching. Similar case has been observed in the fish marketing too for both male and female are seen selling fishes that they catch in the morning in local

market. In this way women too earn some money to spend. This has made their life easier. Besides their involvement in fish and fisheries very few people are involved in other service sectors. Like in other communities going for job in gulf countries is not common among the Jalaris. Very few members in this community have part time job in some private or government offices as sweepers or security guards. On the whole the livelihood of the Jalaris is solely dependent on the fish and fisheries in the Phewa lake.

Income determines the economic status of people. Because their main income source is fishing, the senior members are involved in fishing usually by the use of gillnet. In an average two members in a family are involved in fishing activity. The average fish catch day per is 2.6 kg which is the main source of daily expenditure. On the basis of gross household income the respondents were classified into 5 categories. Household which has an income of Rs 50,000-2,00,000per year belong to the low income group. Middle income group are those whose annual income ranges from more than Rs2,00,001-3,00,000 and high income groups are those whose income ranges from Rs 3,00,001 – 4,00,000 and above per year (Table 4).

Table 4: Respondents'gross family income per year:

S.N	Gross family income per year in Rs	Number	Percentage	Remarks
1	50,000-1,00,000	1	3%	26%
2	1,00,001-1,50,000	3	10%	
3	1,50,001-2,00,000	4	13%	
4	2,00,001-2,50,000	12	40%	47%
5	2,50,001-3,00,000	2	7%	
6	30001-350000	4	14%	27%
7	3,50,001-4,00,000	1	3%	
8	above 4,00,000	3	10%	
	Total	30	100%	100%

Source: Field survey.

In this study, maximum percentage i.e 47%of the respondents belong to middle income groups. Thus majority of the Jalaris have good anuual income. Most of them have their own land, live in the concrete cement houses and have some bank balance too.

4.1.4 Family structure and size

Size and structure of the family determine its economic status. The average family size of Jalari community is 5.8. Normally daughters are found busy in the household work. Till now the Jalaris think that only sones are supposed to go to school. Gender descrimination is rampant among the community. About 50% of them have nuclear family structure followed by 45% in the joint family structure and only 5% are extended families (Table 5).

Table 5 : Family structure of Jalari community

S.N.	Family structure	Number	Percentage
1	Nuclear family	15	50%
2	Joint family	10	45%
3	Extended family	5	5%
Total		30	100

Source:Field survey of present study

4.2 Fishery Resources

From the present study a total of 21 native species of fish belonging to 5 orders, 6 families and 16 genera are recorded (Table 6). The most common species found in Phewa Lake is *Puntius* sp. followed by *Barilius* sp., *Garra annandalei* and *Channa gachua*. Species such as *Neolissocheilus hexagonalepsis, Changunius changunia, Tor putitora and Schizothorax richardsonii* were not commonly captured during the study period. It is learnt that *Tor putitora* and *Neolissocheilus hexagonalepsis* are caught only during the month of July and August. Besides indigenous fishes, five exotic fish species are also recorded from Phewa Lake. They are *Clarias gariepinus, Aristicthys nobilis, Hypothalmicthys molitrix, Ctenopharyngodon idella* and *Tilapia mossambica.*

Table 6 : List of fishes found in Phewa Lake

S.N.	Genus	Species	Local name
1	***Channa***	***gachua***	Bhoti
2	***Clarias***	***batrachus***	Magur
3	***Heteropneustes***	***fossilis***	Singhe
4	***Barilius***	***barna***	Bagefageta
5	***Barilius***	***vagra***	Lamfageta
6	***Barilius***	***bendelensis***	Chiplefageta
7	***Neolissocheilus***	***hexagonalepsis***	Katle
8	***Tor***	***putitora***	Sahar
9	***Chagunius***	***changunia***	Rewa
10	***Schizothorax***	***richardsonii***	Asala
11	***Xenentodon***	***cancilla***	Dhungebam
12	***Mastacembalus***	***armatus***	Chuchebam
13	***Danio***	***devario***	Sera
14	***Danio***	***dangila***	Deutamachha
15	***Puntius***	***sarana***	Bhitte
16	***Puntius***	***conchonius***	Bhitte
17	***Puntius***	***sophore***	Bhitte
18	***Esomus***	***dandricus***	Junge
19	***Brachaydanio***	***rerio***	Zebra fish
20	***Acanthocobatis***	***botia***	Gadela
21	***Garra***	***annandalei***	Buduna

4.2.1 Systematic Position of Icthyofauna of Phewa Lake

The classification and systematic position of Icthyofauna reported from Phewa Lake are as follow (Table 7).

I. **Order: Cypriniformes**

The classification and systematic position of Icthyofauna reported from Phewa Lake are as follows:

II. **Order: Cypriniformes**

Family: Cyprididae

Sub-family: Cyprininae

1. ***Neolissocheilus hexagonalepsis*** **(Mc Clelland) 1839**
2. ***Tor putitora*** **(Hamilton- Buchanan) 1822**
3. ***Changunius changunia*** **(Hamilton- Buchanan) 1822**
4. ***Puntius sophore*** **(Hamilton- Buchanan) 1822**
5. ***Puntius conchonius*** **(Hamilton- Buchanan) 1822**
6. ***Puntius sarana*** **(Hamilton- Buchanan) 1822**
7. ***Esomus dandricus*** **(Hamilton- Buchanan) 1822**

Sub-family: Rasborinae

8. ***Barilius vagra*** **(Hamilton- Buchanan) 1822**
9. ***Barilius barna*** **(Hamilton- Buchanan) 1822**
10. ***Barilius bendelensis*** **(Hamilton- Buchanan) 1822**
11. ***Danio devario*** **(Hamilton- Buchanan) 1822**
12. ***Danio dangila*** **(Hamilton- Buchanan) 1822**
13. ***Brachiyodanio rerio*** **(Hamilton- Buchanan) 1822**

Sub-family: Garrinae

14. ***Garra annandalei*** **(Hora) 1921**

Sub-family: Noemacheilinae

15. ***Acanthocobatis botia*** **(Hamilton- Buchanan) 1822**

Sub-family: Schizothoracinae

16. ***Schizothorax richardsonii*** **(Gray) 1832**

II. Order: Siluriformes

Family: Claridae

17. ***Clarias batrachus*** **(Linnaeus) 1758**

Family: Heteropneustidae

18. ***Heteropneustes fossilis*** **(Bloch) 1785**

III. Order: Perciformes

Sub- order: Channiodei

Family: Channidae

19. ***Channa gachua*** **(Hamilton) 1822**

IV. Order: Beloniformes

Sub-order: Belonoidei

Family: Belonidae

20. ***Xenentodon cancilla*** **(Hamilton- Buchanan) 1822**

V. Order: Synbranchiformes

Sub-order: Mastacembeloidei

Family: Mastacembeloidae

Sub-family: Mastacembelinae

21.*Mastacembalus armatus* (Hamilton- Buchanan) 1822

Table 7 : Classification and nomenclature of ichthyofauna of the Phewa lake

Order	Sub order	Family	Sub Family	Genus	Species
Cypriniformes		**Cyprinidae**	**Cyprininae**	***Neolissocheilus***	***hexagonalepsis***
				Tor	***putitora***
				Changunius	***changunio***
				Puntius	***sophore***
				Puntius	***conchonius***
				Puntius	***sarana***
				Esomus	***dendricus***
			Rasborinae	***Barilius***	***vagra***
				Barilius	***barna***
				Barilius	***bendelensis***
				Danio	***devario***
				Danio	***dangila***
				Brachiyodanio	***rerio***
			Garrinae	***Garra***	***annandalei***
			Noemacheilinae	***Acanthocobatis***	***botis***
			Schizothoracinae	***Schizothorax***	***richardsonii***
Siluriformes		**Claridae**		***Clarias***	***batrachus***
		Heteropneustidae		***Heteropneustes***	***fossilis***
Perciformes	**Channiodei**	**Channidae**		***Channa***	***gachua***
Beloniformes	**Belonoidei**	**Belonidae**	-	***Xenentodon***	***cancilla***
Synbranchiformes	**Mastacembeloidei**	**Mastacembeloidae**	**Mastacembelinae**	***Mastacembalus***	***armatus***

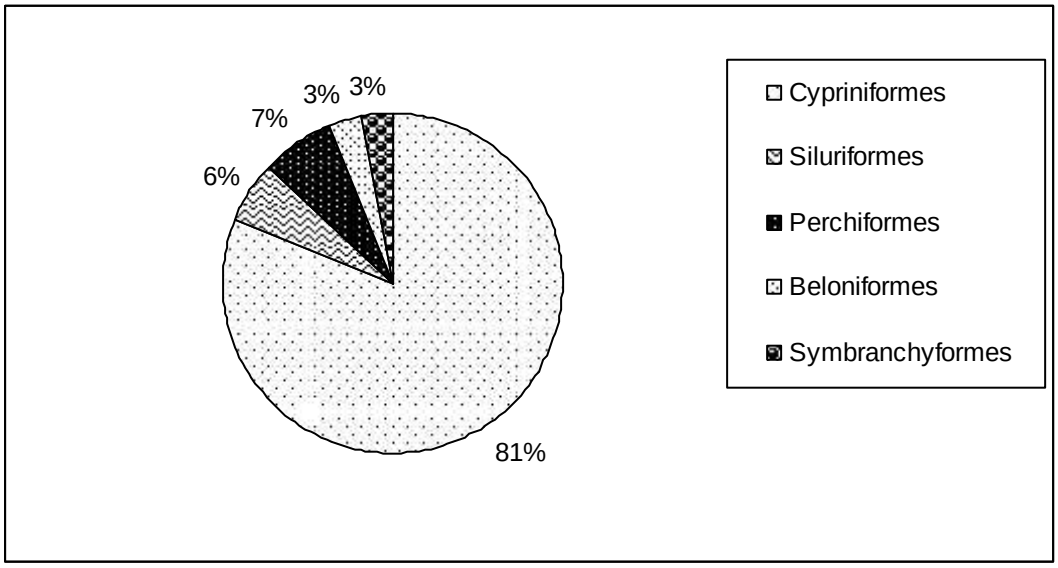

Fig 4. Pie Chart showing fish composition order-wise in Phewa Lake.

4.2.2 Fish Distribution pattern and frequency occurrence in Phewa Lake

A total of 513 fish spp. were collected from all three sampling stations in. The maximum number was 60 of *Puntius sophore* and the minimum number was 5 of *Schizothorax richardsonii***.** Similarly, the highest frequency occurrence was for *Puntius sophore* **(**11.69%) and lowest for *Schizothorax richardsonii* **(**0.97%). The distribution pattern of fishes in Phewa Lake was found to be clumped and uniform in distribution (Table 8).

Table 8. Frequency occurrence of fishes in Phewa Lake.

S.N	Genus	Number	Frequency (%)	Sampling station		
				I	II	III
1	*Channa gachua*	37	7.21	+	+	+
2	*Clarias batrachus*	14	2.72	+	+	+
3	*Heteropneustes fossilis*	18	3.50	+	+	-
4	*Barilius barna*	38	7.40	+	+	+
5	*Barilius vagra*	36	7.01	+	-	+
6	*Barilius bendelensis*	40	7.79	+	+	+
7	*Neolissocheilus hexagonalepsis*	8	1.55	-	+	+
8	*Tor putitora*	7	1.36	+	+	-
9	*Chagunius changunia*	8	1.55	+	+	+
10	*Schizothorax richardsonii*	5	0.97	+	-	+
11	*Xenentodon cancilla*	16	3.11	+	+	+
12	*Mastacembalus armatus*	12	2.33	+	+	+
13	*Danio devario*	10	1.94	+	+	+
14	*Danio dangila*	13	2.53	+	+	+
15	*Puntius sarana*	58	11.30	+	+	+
16	*Puntius conchonius*	55	10.72	+	+	+
17	*Puntius sophore*	60	11.69	+	+	+
18	*Esomus dandricus*	13	2.53	+	+	-
19	*Brachaydanio rerio*	12	2.33	+	+	-
20	*Acanthocobatis botia*	14	2.72	-	+	+
21	*Garra annandalei*	39	7.60	-	+	+
Total		513	100			

Fish catch composition and frequency distribution in December:

In the month of Decemeber 2009, a total of 144 fishes were collected. The maximum number was 22 of *Puntius sophore* and the minimum number was 2 of *Schizothorax richardsonii, Neolissocheilus hexagonalepsis, Tor putitora* and *Chagunius changunia* with the highest frequency occurrence for *Puntius sophore*

(15.27%) and lowest of 1.38 for all of them (Table 9)**.** During study, *Barilius* spp and *Channa gachua* were also recorded dominant after *Puntius sophore.*

Table 9. Fish catch composition and frequency distribution in Phewa Lake in December, 2009.

S.N.	**Genus**	**Total catch**	**Frequency (%)**	**Sampling station**		
				I	II	III
1	*Channa gachua*	11	7.63	5	2	4
2	*Clarias batrachus*	6	4.16	2	-	4
3	*Heteropneustes fossilis*	5	3.47	4	1	-
4	*Barilius barna*	12	8.33	3	6	3
5	*Barilius vagra*	10	6.94	4	-	6
6	*Barilius bendelensis*	20	13.88	2	10	8
7	*Neolissocheilus hexagonalepsis*	2	1.38	-	1	1
8	*Tor putitora*	2	1.38	1	1	-
9	*Chagunius changunia*	2	1.38	-	1	1
10	*Schizothorax richardsonii*	2	1.38	1	-	1
11	*Xenentodon cancilla*	4	2.77	1	2	1
12	*Mastacembalus armatus*	3	2.08	1	1	1
13	*Danio devario*	3	2.08	1	1	1
14	*Danio dangila*	4	2.77	1	2	1
15	*Puntius sarana*	13	9.02	4	3	6
16	*Puntius conchonius*	6	4.16	2	1	3
17	*Puntius sophore*	22	15.27	5	8	9
18	*Esomus dandricus*	4	2.77	2	2	-
19	*Brachaydanio rerio*	4	2.77	1	3	-
20	*Acanthocobatis botia*	3	2.08	-	2	1
21	*Garra annandalei*	6	4.16	-	2	4
Total		144	100	40	49	55

4.2.3 Important Fishes of Phewa lake with their Ecological Behaviour

From this study a total of 26 fish species are reported from Phewa Lake. Among them, 21 species are indigenous species and the rest five species are exotic. Ecological description and behaviour of some of the important fish species have been described here.

I. Neolissocheilus hexagonolepsis (Mc Clelland)

Neolissocheilus hexagonolepsis is commonly known as 'Katle' in Nepali. It is well known colorful game fish of Nepal. It is olive green dorsally and with splashes of golden on sides**.** There is a yellow band just above the lateral line. Fins are slate grey, faint towards the margin. The fish breeds in April through July to September. It is an omnivorous fish. This fish feeds on aquatic plants and known to control them. Males attain maturity at 9-12 cm and female at 23 cm. It is distributed all over torrential rivers of Nepal from 300-1,500 m. Spawning ecology and behavior has been worked out by in detail by Shrestha (1989).

Diagnostic character: D 12 (3/9); P 17; V 9; A 7 (2/5); C 19; L.l 28-31; L.tr. $4\frac{1}{2}$ - $4\frac{1}{2}$;

TL = 60cm.

II.Puntius sophore (Hamilton- Buchanan)

Puntius sophore is commonly known as 'Bhitte' or 'Pothi' in Nepali. It is deep bodied fish having distinct orange golden spot below the eye and a distinct black blotch on caudal peduncle and dorsal fin base. Coloration varies with seasons; back is mostly olive green, side silvery with reddish flush and silvery on the belly. The opercles are golden red and tip of the fins reddish. There is a faint black bent on the lateral line. Barbels absent. Lateral line system is complete. The fish breeds from May to July. It lives in lakes and over grown low land rivers in which the water flows vary slowly.

Diagnostic character: D 11 (3/8); P 15-16; V 9; A 8 (3/5); C 19; L.l 22-26; L.tr. $5-5\frac{1}{2}$ / $5-5\frac{1}{2}$; TL = 8cm.

III. Barilius bendenlensis (Hamilton- Buchanan)

This fish is commonly known as 'Chiple-fageta' in Nepali. It is a medium sized hill stream fish having fine pores on the snout. The body is crossed with 8-12 lateral bands and dashed with bluish green silvery tinge. The fish has black spots at the base of each scale. Generally the paired fins are whitish, tinged with orange. Barbels are two pairs. The fish breeds in April to August. Spawning of fish takes place in small stream with gravel bed where water is clear and oxygenated. It is fairly common fish of rivers lakes and ponds where the flow is moderate. This fish is found in the altitudinal range 100-2,000m.

Diagnostic character:

D 9 (2/7); P 15; V 9; A 11 (3/8); C 19; L.l 40-43; L.tr. $7-8/5$;TL = 15cm.

IV.Clarias batrachus (Linnaeus)

This fish is commonly known as 'Magur' or 'Mungri' in Nepali. It is a blackish catfish with splashes of yellow brown color with vertical head and laterally compressed tail. The dorsal and anal fins are long. The caudal fin is separated from dorsal and anal fins. Body color is brownish black. It has four pairs of barbels. This fish breeds in monsoon (May to August) in marshes and paddy fields. It constructs nest hole of about 20 cm in diameter usually 2-5cm below the surface of the water. Female produces a about 3,000 greenish sticky eggs.

Diagnostic character: D 65-70; P /8-11; V 6; A 47; C 17; TL = 47cm.

V.Xenentodon cancilla (Hamilton- Buchanan)

This fish is commonly known as 'Dhunge Bam' in Nepali. It is an elongated fish with beak like jaws. Body is greenish above and whitish below. A series of four or five blotches are found on sides of body between pectoral and anal fins in adults. Dorsal and anal fins have dark edge. The lower jaw is slightly longer than upper. Dorsal and anal fins are closed to tail. Its altitudinal range is 80-800m.

Diagnostic character: D 16-17; P 11; V 6; A 17; C 15; TL = 30-40cm.

***VI. Mastacembelus armatus* (Hamilton- Buchanan)**

This fish is commonly known as 'Chuche Bam' in Nepali. This fish has elongated body having anal and dorsal fins confluent with caudal. It has pointed snout. Generally body color is brownish becoming lighter on belly. There is a row or distinct rounded black spots along base of dorsal fins. The body of fish is covered with small scale. This fish breeds in June and July.

Diagnostic character: D 32-39/74-90; P 23; A 3/75-88; C 14-17; TL = 61cm.

4.3 Fishing Practices and Fishing implments used in Phewa lake :

For the Jalari community residing in Phewa watershed, fishing the only occupation.Most of them are engaged in cage fish cultur along with capture fishery but few of them totally rely upon capture fishery for carrying their livelyhood. Fishes from the lake were caught with the help of boats as most of the fishermen near the lake owned a boat. But for fishing in the river, there is no need of boat as the river is quite shallow. Fishing activity is high during the summer in the lake and autumn season is considered to be favourable for fishing. Not only capture fishery even cage cultured fishes are harvested during this season.

Fishing activities occur in large scales mostly in the night time as the fishes collected at night could be sold in the market the next morning.A group of fishermen leave home for fishing in the lake at about 7pm and spend about five to seven hours in the lake in catching the fishes. They also fix the gillnet in the lake for the whole night and collect the fishes trapped in the gillnet the next morning.The fishes thus collected are kept in a basket which is locally called **Phurlung**. **Phurlung** is basically a bamboo basket used mostly by the fishermen of hilly region.Fishing activities in the daytime are also seen but mostly these are for fun and catch is taken home for consumption rather than selling in the market. People of other castes residing close to lake also do fishing but only for fun.Some of these people are observed buying fishes from local fishermen and taking these to the retail market. Fishermen are found to use different types of traditional and non –traditional fishing methods. The most common implements used in the study area were given below:

4.3.1 Nets:

A net is basically a piece of webbing of fine nylon or cotton threads in which the twins are intersected into regular meshes. Two types of nets have been found during investigation which are:

1. Gill net:

Gill nets commonly known as *Tiyari Jaal* are the most popular and very commonly used fishing device in Phewa lake. These nets are passively operating nets which are set across the lake at differentsites on previous day and the fish is collected early in the morningof following day.The mesh sizes are required for catching different sizes of fishes.Here the gill nets of meshsize 1cm-10cm are used so that fishes of all sizes could be captured.

2. Cast net

Cast net is round in shape and locally known as Haate Jaal.Thenet is mostly operated by one fishermen.It is used in plain waters where the current of water is slow.It is also made of nylon thread.The circumfereance of the net is wide which decreases towards the apex.Along the end of the net, the sink or load of iron are attached to make the net sinkable in water.Usually a net is operated inthe smoothbut shallow water areas.While operating net,the fishermen holds along rope extending fromthe apex or the centre of the net in his hand tightly and throws the net with a jerk into the water in a circular way.The sinkers settle down at the bottom of the river enclosing net area.After a little moment, the net is dragged with the help of central rope and the catch is collected in the bamboo basket.

4.3.2 Fishing with Mosquito net:

Catching fishes with mosquito nets are common among the local inhabitants other than the traditional fishermen.Mostly, it is practiced by the children and non fishing community for fun purposes. It takes two people to handle a mosquito net.In this method ,the open end of the net is faced toward the current of water .The upper ends of the open net is held by the hands of the fishermen and the lower end which lies in the bottomof the river is held by their legs.The net is then dragged opposite the current of the river. This method is easy and provide lots of fun for non fishing communites like Brawn,Chhetry, Gurung, Magar, Sharki,etc.

4.3.2. Balchhi(Hook and line)

Fishing with rod and line is locally known as “Balchhi Hanne”. The local balchhi is hook which is tied to a long nylon thread the other end of which is tied to bamboo rod. Nowadays, imported fishing rodarealso available in the market. But most fishermenprefer the old traditional balchii. Small village boys enjoy fishing with rod and hooks. Small pieces of fish, earthworms or bread or maize are used as bait. Sometimes many hooks with baits are attached vertically in a long rope and placed overnight under water.The fishes trapped are collected the next morning. Fishes like *Tor* sp., *Neolissocheilus* are caught by this method.

4.4.Non conventional Methods of Fishing

4.4.1. Use of Explosive/ Blasting

This method is carried out by a group of people who do it more for fun than for earning a livelihood.Explosives used in road construction are also misused in killing fishes. It is very harmful as it destroys eggs,fingerlings and fries of many spcies along with incalculable number of fishes causing a serious decline in fish population.This method also eliminates many benthic organism, which are essential for the continuity of food chain in the aquatic ecosystem.

4.4.2. Electro- fishing

This method of fishing is very much common here.In this method, an electric current is applied in the water which not only kills the targeted fiahes but also the whole aquatic fauna residing within the affected area.For this the fisherman inserted an electric wire tied on a bamboo pole inside the water.The other end of the wire is connected to the battery and the electric current is passed. The affected fishes then start floating in water, which are collected by net or bare hand.

4.4.3. Fishing with bare hand

Fish like *Channa* spp. are sometimes caught with hand during rainy season when they get into paddy fields of farmers and also they are caught by removing stones under which they tend to hide.

4.4.4. Use of poisons:

This method is locally known as “Bish Rakhne” which is usually applied in shallow stagnant water or deep pools killing innumerable number of fishes along with various other aquatic animals.According to local people, this method is practiced very seldom but non fishing community use poison occasionly.Local people reported that beside plant poison, the chemical poison was also found being used in the study area. The chemical was mixed of water and sprayed in all sides of pool water areas. The commonly used chemical poisons are DDT (Dichlorodiphenyl trichloroethane), BHC (Benzene hexachloride), Thiodine, lime stone etc.Although thease methods are responsible for the indiscriminate killing of the fishes and different people are stepping forwards to stop this act, it is still an practice extensively. It is probably due to the easily availability poisons in the local market.

People in this area during study period are found to be involved in both fish culture and capture fishery.Cage culture is the most prominent method practiced here in lakePhewa . All of the members in the study area are involved in both cage culture and capture fishery.

4.5. Cage fish culture in phewa lake:

Fish fauna in cage at Phewa lake exclusively depends upon the planktons that contains nitrogen(N) and phosphorus (P) .These two nutrients are major elements responsible for eutrophication. Since fish becomes the food for human, N and P are displaced from the lake to the land. Therefore, the subsistence cage farming is often cited as an environment friendly livelihood.

Cage fish culture of plankton feeder fish in nylon or polyethylene knotless floating cages of approximately 5m X 5m x2m is a popular method of fish production in the lake. Silver carp, Bighead carp and Grass carp are reared at the rate of 10 fish per cubic meter. The farmer stocks 25 g fingerlings in 25-35 mm mesh cage and they become harvestable at 500- 1000g in 12-15 months. Cages may yield 1.35-5.5 kg of fish per cubic meter per year .The gross production of fish mainly depends on the trophic status of lake and excluding losses of 10-20% due to mortality and escape. Fish production from cage culture is nearly 37 mt. but now it has reached upto 48 mt. In addition, 6-8 mt of fish are producted annually in experimental cages by the Fisheries Research Centre Station, Pokhara. In 2003 the cage fish was estimated to be

53 mt. And monetory income from 4-6 cages was adequate to cover all the expences of a typical fisher family comprising 5 members for a year. Now some fishers owning as many as 16 cages are producing about 3000-4000kg of marketable fish per annum.The annual income of these fisher comes to approximately 200-300 thousand Nepalese rupees.The fishers also pay 30-50 thousand Nepalese Rupees annually as an income tax to the Distric Development Committee after the fish harvest. Most families now own their own land, have houses with toilets, gas stoves,T.V, afew also possess motorbikes. According to an old member of Jalari community(Shivaji Jalari) few years ago, it was difficult to find a single literate member in the community but now with the adoption of cage culture practices their annual household income has increased. Now with better socioeconomic status the community members are able to send their children to boarding schools. It has been found that more than ten students from the Jalari community are now ready for university level education.

4.6 Ethnoicthyological Knowledge of the Jalari community

In the course of man resource interaction over a long period of time, man acquired a complex body of knowledge about resources use, management and conservation and this knowledge was handed down from one generation to the next in the form of culture, religion, traditions, customary laws, festivals, folk tales, art, paintings, woodcrafts, folksongs, legends etc. “This knowledge is handed down from one generation to the other without resort to any formal documentation and is thus time tested, ripe and deep-rooted in their culture. Himalayan communities through trial and error over generations have evolved their own mechanisms to handle them and these mechanisms are of great importance in conserving the varieties of ecosystems there. “Systematic recording and documentation of such knowledge and practices could be of immense use in planning future developmental activities because these practices and the knowledge, were developed by original people to help themselves in the world to feed and shelter themselves and also protect themselves” (Luisa Maffi, 1996). Documentation of such time tested indigenous knowledge and practices in the mountainous landscape like Nepal will be of immense use in the future developmental planning in the country.

Jalaris too have been interacting with the fish resources of the lake Phewa for a long period of time. They were totally dependent upon these aquatic resources for their livelihood for a few decades ago. But now the situation is different with the

advent of modern development processes. Fish resources are declining in number and these Jalari populations too are losing their cultural traits and the ethnoichthyological knowledge which is deep rooted in their culture is on the verge of extinction,so present study attempts to document ichthyological knowledge of the population.

All the fish species have food value. Fish is the main source of good quality protein to the rural populations of the country. Besides the food value, three fish species are found to be of medicinal and magico-religious value to them. In other words Jalaris have relationship with the fish resources both at material and spiritual levels. Table10 explains these uses in detail.

Table10: Fishes mainly used by the local community for medicinal and other purposes

Scientific name	Parts used	Method of Preparation	Ailments treated
1.Macrognathus spp.	Whole fish	Spiritual healers apply special mantra to the fish and is given to the person suffering from "evil eye" effect.	Such fish is given to the patient suffering from percieved "evil eye" problem
2.Tor Spp.	Gall bladder	Whole oth the gall bladder with bile inside is swallowed to get rid of excessive heat from the body.	This type of intake is popular especially in the summer to keep the body cool.
3.Catla spp.	Whole fish	The fish is cooked with spices but without oil and is given to the dysentery patient.	Such preparation is given to the person suffering from dysentery.

Source: Field survey of present study

CHAPTER FIVE

DISCUSSION

Phewa Lake, the present study area lying in the south western part of Pokhara valley is rich in fish diversity. All the inhabitants of Pokhara valley are either directly or indirectly dependent upon this Lake Phewa for the overall development of their livelihood, society and Pokhara valley as a whole. The lake on the other hand is dependent upon its feeder streams like Harpan Khola and Khahare Khola. The regular flow of water in the lakes comes from the Harpan Khola which provides perennial source of water. The migratory species of fishes like sahar and katle of the lake travel upstream from the lake towards the river in breeding season and return to the lake after the end of breeding season.

In the present investigation, the total of 21 species from 16 genera, 6 families and 5 orders were recorded. Among them the family Cyprinidae was found to be the most dominant of the lake species which includes 11 genus and 16 species. Among the three sampling sites, the largest number of fish species was found in station II with 19 species. The published literature in fish biodiversity of Pokhara lakes is scanty in comparison to the study on limnology. Ferrow and Bagdgari (1980) have studied the commercially important species of fishes of Pokhara valley. Pokharel (1998) has studied the fish diversity and feeding habits of fishes of major lakes of Pokhara valley and reported 16 species of fishes from Phewa Lake.

Out of total 513 number of fishes collected from three different sampling sites, the largest number of fish catch recorded belonged to the family Cyprinidae with 430 in number. Among three stations largest number of catch was recorded in station III with 229. The highest estimated catch was recorded in July and lowest in January.

Out of total 513 number of fishes collected from three different sampling sites, the maximum number of fish collected was 60 for *Puntius sophore.* Similarly the minimum number of fish collected was *Schizothorax richardsonii* which is only 5 in number. The frequency occurrence was highest for *Puntius sophore* i.e 11.69% and lowest for *Schizothorax richardsonii* i.e 0.97% only. The fishes like *Channa gachua*,

Clarias batrachus, Barilius barna, Barilius bendelensis, Changunius changunia, Xenentodon cancilla, Mastacembelus armatus, Danio devario, Danio dangila, Puntius sarana, Puntius conchonius and *Puntius sophore* were recorded from all the three stations during the study period. According to the local fishermen, the frequency of occurrence of the local fishes like *Tor putitora, Schizothorax richardsonii, Xenentodon cancilla,* and *Heteropneustes fossilis* is rapidly decreasing day by day. Mosly captured fishes are exotic species viz. *Tilapia mossambica* and *Clarias gariepinus* which enter the lake through different sources. The main reason for an increasing number exotic species in the Lake is primarily because of the religious Buddists who release these fishes in the lake and secondarily because of some exotic fingerlings from the surrounding water bodies making their way into the lake.. These exotic species have high growth and reproductive rate. There is also an intra species competition for food and shelter with the local fishes. So, population of fish and richness of fish diversity have been reported to be decreasing gradually. Present study also confirms this reality. Fishing implements used by the Jalari community are also studied. The main fishing implements are found to be gill net, hook line and cast net. After an introduction of gill nets, the popularity of other devices have been found to be reduced. It may be because of the efficient nature of these types of catching devises and also convenient for handling. But indiscriminate fishing by means of improper gill nets which fishermen have been found to use in the lakel, eradicate the young fishes. It is also found that gravid females are also caught in the breeding season. Mosquito net is also used for prawn capture. Habitat degradation and use of non conventional fishing appliances were found to be main reasons for the gradual decrease of population of fish species. Like electro fishing, use of poison killed and destroyed the natural habitat of fishes. Although Jalari people are traditional fishermen because of economic hardships they are compelled to use all kinds of fishing implements. If they are given other alternatives of livelihood their age old indigenous knowledge about use and conservation of the local fishes could be saved and used in drafting resource conservation policy. In the present investigation, there were about 90 households of the Jalari community residing around the Phewa Lake. The fishermen in Phewa Lake were also called ‘Pode’ by the local people. Most of the fisher groups took fishing as their main profession. Only negligible number of the fishing populations was found to take fishing as a part time job. Occasional fishermen did fishing for recreational purpose. Generally Jalaris who

were full time fisher populatins were found to residein the Phewa watershed area. Fish and Fishery Resources contributed to the sustenance of livelihood to these fisher populations. Most of the Jalaris who are now engaged in cage fish culture have better economic condition.

During the study period, the socio-economic condition of the fisher community was studied. Out of 90 households and the heads of these households as respondents, 30 respondents were chosen for gathering information. It was thought important to find out the age of the respondents in fishing activities. This would give a picture of the involvement of productive age group people in fishing. It was found that the group of age 26-35 was the most active fishing population and about 40% of this age group populations were involved in fishing activities. The fishermen, in the study site, were not aware about the family planning program. About few years ago most of them lived in small houses made up of stone, and mud with thatched roofs .But now they live in cemented house with galvanized sheet on the roof and some of them have concrete cement buildings too. In the community the literacy rate was found to be very low. About 55% of the respondents were illiterate. Among the literates also 34% were under SLC only 2% attained bachelor level classes. Now most of the fishermen send their children to the school and some can afford even boarding schools. The market for fish was not a problem as fishermen could directly supply fishes to the hotels, individual customers and to the contractors. They were found to sell the fish at the rate of Rs 120-250 per kg. All Jalari people together have formed a group called “Phewa Fisheries Group.” This association is basically involved in conserving the fish resources and also in cleaning activities of lake. Women of this community were found to be involved in an association called “Mothers’ Group”. Most of them were found to have an active role in developmental activities and welfare of Jalari community.

CONCLUSION AND RECOMMENDATIONS

Conclusion

Following conclusions can be drawn from the present study:

- Phewa Lake is rich in fish diversity. Altogether 21 species under five orders, 6 families and 16 genera are recorded.
- The distribution patterns of *Channa gachua, Barilius bendelisis, Puntius sarana* and *Garra annandalei* are clumped where as rest of the species are uniform in distribution.
- Economically important fishes found are *Neolissocheilus hexagonolepsis* (katle), *Puntius sophore* (bhitte), *Barilius bendelisis* (chiple faketa), *Clarias batrachus* (magur), *Xenentodon cancilla* (dhunge bam) and *Mastacembelus armatus* (chuche bam).
- The socio-economic condition of fishermen living in the vicinity of Phewa Lake is found has been foundto be improved after cage culture. Most of them can now fulfill their livelihood needs from the fishery activities. It would be better if they adopt other professions such as shopkeeping, labor, agriculture and others
- The literacy rate of the fisher community is poor. Some steps should be taken from the government level to improve their literacy status. The indigeneous knowledge of the community is important and needs to be studied in detail before the knowledge vanishes from the area for ever. The knowledge is found to be very useful in conserving icthyofauna of the Lake .

Recommendations

In order to uplift the socio-economic condition of local fisher community and to conserve their Ethnoicthyological knowledge the following suggestions are recommended:

- Phewa Lake should be set aside as protected area with the implementation of all conservation and management techniques to promote biodiversity conservation program.
- Research should be conducted regularly for assessing population density and habitat of biologically important fishes in the lake. Restocking with the fingerlings of indigenous species should be promoted.
- Release and stocking of the exotic fish species in the lake should be immediately stopped.
- The discharge of municipal sewage in the lake should be strictly prohibited.
- *Barilius* sp., *Puntius* sp., *Danio rerio, Danio drvario, Esomus dandricus, Brachaydanio rerio* should be developed as aquarium fishes.
- The socio-economic condition of the fisher group should be uplifted by launching development programs from government and other related NGOs and INGOs.
- Strict rules regarding the use of fishing implements should be there in Lake.Many of the non conventional fishing implements such as use of poison, electric current and small mesh sized gillnet should be prohibited.
- The indigeneous knowledge of fisher community should be studied and documented for the conservation of indigeneous fish species.

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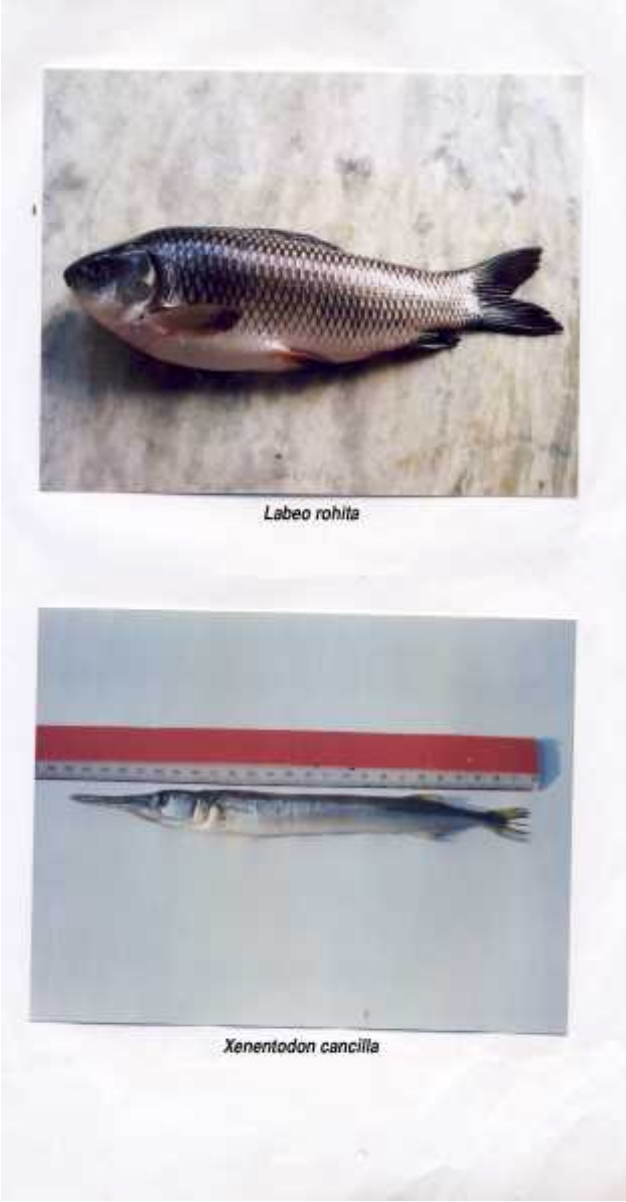
Plate. I

Commonly capture fishes in Phewa Lake



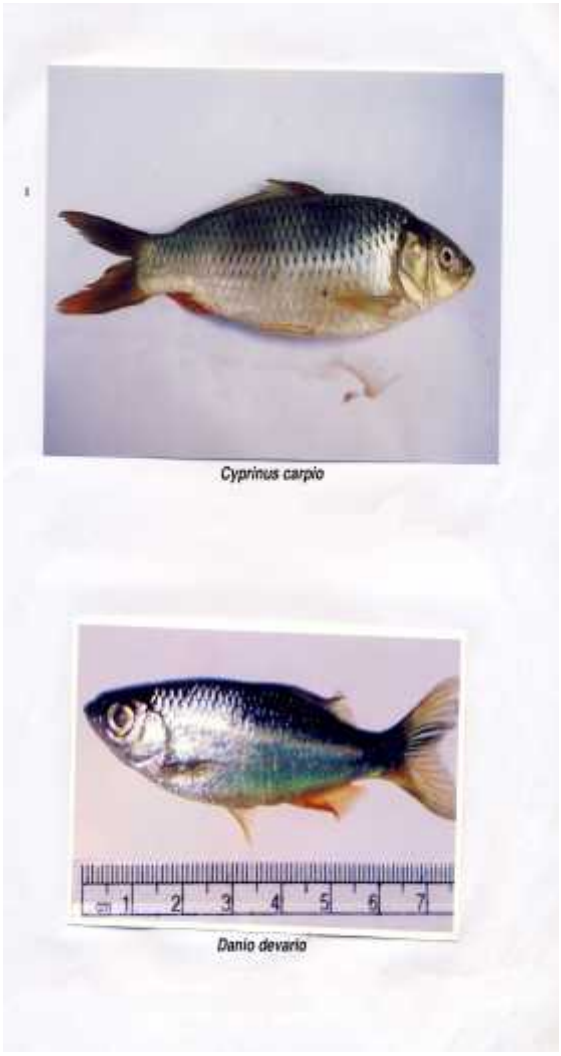
Labeo rohita

Xenentodon cancilla

Neolissochelius hexagonalepsis

Hypothalmichthys molitrix

Plate. II
Commonly capture fishes in Phewa Lake



Cyprinus carpio

Danio devario

Ctenopharyngoden idella

Tor putitora

Schizothorax richardsonii

Channa gachua

Plate. III

Local fisherwomen with fish in her Phurlung.

Local fisherman with local hook and line.

Jaliri women webing net in group.

Plate. IV

Local fisherman with Cast Net.

Jalari woman throwing Gillnet in Phewa Lake

Cage fish culture in Phewa Lake.

Plate. V

Phurlung

Investigator collecting information from Respondents by PRA method.

Plate. VI

Investigater with local Jalari women Group

Investigater collecting data durng Structured Interview.

ANNEX - I

HOUSEHOLD QUESTONNARE

Date :……

A. List of questionnaire use in interview with Jalari community of khapaundi

1. Name:
2. Age:
3. Sex:
4. Address:
5. No. of members in family:
   i. Male ii. Female iii. Children
6. Who earns money for daily life?
7. How much earn per day by open water fishing?
8. From how many years you involve in this occupation?
9. Is it your part time or full time job?
10. What kinds of instrument you use in fishing?
11. How many members are involved in fishing in your family?
12. How much you earn per month by fishing?
13. What do you do besides fishing?
14. How many days you spent in fishing per year?
15. Which season is best for fishing?
16. What kinds of methods you use during fishing?
17. Do you use poison for fishing?
18. How much fish do you catch per day in open water?
19. Which site is best for fishing?
20. Which species in generally caught during fishing?
21. How many cage do you have in phewa lake?
22. From how many years you involve in cage culture?
23. Which species is generally cultured?
24. Is your livelihood improved by cage fish culture?
25. How much you earn per year by cage fish culture?
26. What is your status in society before and after cage culture?
27. Are you educated?
28. Educational status of your family:

i. Under SLC
ii. SLC
iii. +2 level
iv. Bachelor level
v. Master level

29. How you shell in market or other places?
30. Which type of problem you face during fishing?
31. Where is the main market of fish?
32. What is the main problem of your community is facing?
33. Are you trained for fish farming?
34. Do you shell fish dried also like fresh fish?
35. Has fishing community shifted to new professions?
36. Any suggestions would you like to give for improvement of fishing in Phewa Lake?
37. Exotic species to barren to cage culture or not?
38. Which species harm mainly and how?
39. Can you compare your status with other community like in education, social status etc?
40. Do you think fish culture in phewa lake can be a industry if yes/No how?
41. What kind of help do you expect from government for your livelihood improvement?

ANNEX - II

LIST OF Different AGE GROUP INFORMATS

S.no.	Name	Age
1.	Som maya/Juthe Jalari	63/59
2.	Lok Bdr./Sanumaya Jalari	45/40
3.	Krishna/Depa Jalari	29/25
4.	Mangale/Bishnu Jalari	35/32
5.	Mangale/Setimaya Jalari	65/50
6.	Shyam/Kanchi Jalari	55/50
7.	Dharma/Lakumaya Jalari	42/36
8.	Mangal/Radika Jalari	30/27
9.	Buddhi/Juti Jalari	35/29
10.	Raju/Rasmaya Jalari	36/36
11.	Buddhi/Rama Jalari	65/40
12.	Buddhi Bir/Maya Jalari	72/70
13.	Parbati Jalari	35
14.	Dipak/Kabita Jalari	45/40
15.	Sita Jalari	40
16.	Somati Jalari	70
17.	Santa Bdr./Mishri Jalari	55/45
18.	Setumaya Jalari	70
19.	Sate/Binu Jalari	46/38
20.	Sanu kancha/Bishnumaya Jalari	45/38
21.	Ramchandra/Sukuli Jalari	50/45
22.	Kritiman/Seti Jalari	50/50
23.	Shivaji/Mishri Jalari	69/65
24.	Dev Bdr. Jalari	40
25.	Aaite/Summaya Jalari	35/30
26.	Krishna Bdr./Bishnumaya Jalari	40/38
27.	Gyan Bdr./Chenmaya Jalari	41/37
28.	Anita Jalari	45
29.	Gita Jalari	43
30.	Shanti Jalari	26