SUMMARY

Nepal has only freshwater wetlands and it occupies 743563 ha or roughly 5% of Nepal's total land area. The present study was carried out in the wetlands of Koshi Tappu Wildlife Reserve and its surroundings. Due to the presence of different types of seasonal and perennial wetlands, this reserve was designated as a wetland of international importance and added to the Ramsar list on 17th December 1987. The KTWR and its surrounding areas include different types of wetlands like rivers, streams, lakes, ponds, floodplains, swamps, marshes, reservoir, and paddy fields. These wetlands are suitable habitat for diverse groups of plants and animals especially the aquatic macrophytes, fishes, birds, amphibians, reptiles, mammals and aquatic insects.

The air temperature of the study sites ranged between 18. 2 ±0. 432 °C and 33. 6 ±0. 290 °C during the study period. The maximum air temperature was recorded in the month of May and minimum in the month of January of the second year study period at Site 3 (Table 9). The monthly data of air temperature of the whole study period when pooled in seasonal values, it showed highest air temperature in rainy season (Table 18). The air temperature showed positive and significant correlation with water temperature, free carbon dioxide and biological oxygen demand at all the sites (Tables 4, 7, 10 and 13). It showed significant difference among seasons at 1 % significance level.

The maximum water temperature was recorded in the month of May at Site 2, Site 3 and Site 4 but at Site 1, it was recorded maximum in the month of August during the study period. The maximum water temperature was 29. 5 ± 0. 535 °C in the month of May of the second year study period (Table 9) at site 3 and minimum 14. 3 ± 0. 550 °C in the month of January of the first year study period at Site 1 (Table 2). When the monthly data of water temperature of the whole study period were pooled in seasonal values, it was recorded maximum in summer and minimum in winter (Table 18). The water temperature had positive and significant correlation with free carbon dioxide and biological oxygen demand at all the sites (Tables 4, 7, 10 and 13). It showed significant difference among seasons at 1 % significannce level (Table 20).

The transparency of water of the study sites ranged between 13 ± 0.337 cm (Table 2) and 62.6 ± 0.904 cm (Table 3) during the study period. It was recorded maximum at Site 1 in the month of January of the second year study period and minimum also at Site 1 in the month of July of the first year study period. The maximum transparency was recorded in winter season followed by summer and rainy seasons (Table 18).

The maximum P^H was recorded 8.4±0.152 at Site 4 in the month of January of the second year study period (Table 12) and minimum 7.1 ±0.163 and 7.1± 0.240 in the month of April and June, respectively at Site 2 in the second year study period (Table 6). The maximum P^H was in winter season followed by rainy and summer seasons at all the sites (Tables 18). The P^H showed positive and significant correlation with dissolved oxygen and inverse and significant correlation with free carbon dioxide and biological oxygen demand at all the sites (Tables 4, 7, 10 and 13). It showed significant difference among seasons at 1 % significance level (Table 22).

The dissolved oxygen of the study sites varied between 5.11 ±0. 223 mg/L and 11.3±0. 258 mg/L during the study period. The minimum dissolved oxygen was recorded in the month of May of the second year study period at Site 3 (Table 9) and maximum in the month of January of the second year study period at Site 1 (Table 3). In other sites also the maximum dissolved oxygen occurred in January month. Seasonally the maximum dissolved oxygen was recorded in winter season followed by rainy and summer seasons at Site 2, Site 3 and Site 4 but at Site 1, it was maximum in winter season followed by summer and rainy seasons (Table 18). It showed positive and significant correlation with total alkalinity and total hardness but inverse and significant correlation with air temperature, water temperature, free carbon dioxide and biological oxygen demand at all the sites (Tables 4, 7, 10 and 13). It showed significant difference among sites and seasons at 1 % significance level (Table 23).

The free carbon dioxide of the study sites ranged between 4.15 ±0.179 mg/L and 6.62 ±0.185 mg/L during the study period. The minimum free carbon dioxide was recorded in January of the second year study period at Site 1 (Table 3) and maximum in April of the second year study period at Site 4 (Table 12). Seasonally the maximum free CO_2 was obtained in summer season followed by rainy and winter seasons at all the sites except Site 1 where maximum was recorded in rainy season followed by summer

and winter seasons (Table 18). It showed positive and significant correlation with water temperature and biological oxygen demand and inverse and significant correlation with dissolved oxygen at all the sites (Tables 4, 7, 10 and 13). The free CO_2 had significant difference among sites and seasons at 1% significance level (Table 24).

The total alkalinity of water of the study sites ranged between 125.59 ±1.138 mg/L and 46.32 ±0.721 mg/L during the study period. It was recorded maximum in January of the first year study period at Site 3 (Table 8) and minimum in July of the first year study period at Site 1 (Table 2). The maximum total alkalinity appeared in winter season followed by summer and rainy seasons (Table 18). It had positive and significant correlation with total hardness and chloride at all the sites (Tables 4, 7, 10 and 13). It showed significant difference among seasons at 1 % significance level and significant difference among sites at 5 % significance level (Table 25).

The total hardness of water of the study sites ranged between 83.45 ±0.584 mg/L and 27.63 ±0.679 mg/L during the study period. The maximum total hardness occurred in March of the second year study period at Site 4 (Table 12) and minimum in July of the first year study period at Site 1 (Table 2). At other sites also the maximum total hardness were occurred in March and minimum in July. The maximum total hardness was in winter season followed by summer and rainy seasons at all the sites (Table 18). It had positive and significant correlation with transparency, dissolved oxygen and total alkalinity and inverse and significant correlation with air temperature and water temperature at all the sites (Tables 4, 7, 10 and 13). Total hardness showed significant difference among seasons and sites at 1% significance level (Table 26).

The chloride content of water of the study sites ranged between 18.73 ±0.205 mg/L and 7.25 ±0.216 mg/L during the study period. The maximum chloride was recorded in December of the first year study period at Site 2 (Table 5) and minimum in September of the first year study period at Site 1 (Table 2). The maximum chloride was in summer followed by winter and rainy seasons at Site 1 and Site 4 but at Site 2 and Site 3, maximum was in winter season followed by summer and rainy seasons (Table 18). It showed positive and significant correlation with transparency and total alkalinity at all

the sites (Tables 4, 7, 10 and 13). It showed significant difference among sites at 1 % significance level (Table 27).

The BOD of water of the study sites ranged between 0. 65 ±0. 039 mg/L and 2. 36 ±0. 082 mg/L during the study period. It was recorded maximum in May of the second year study period at Site 4 (Table 12) and minimum in January of the second year study period at Site 1 (Table 3). The maximum BOD was recorded in summer season followed by rainy and winter seasons (Table 18). It had positive and significant correlation with air temperature, water temperature and free CO_2 and inverse and significant correlation with P^H and dissolved oxygen at all the sites (Table 4, 7, 10 and 13). It showed significant difference among seasons at 1 % significance level (Table 28).

A total of 65 species of macrophytes belonging to 53 genera and 32 families were recorded in the present study. Among them 21 species were hyperhydates, 12 species were helophytes, 9 species were submerged vittates, 9 species were tenagophytes, 8 species were epihydates, 3 species were submerged rosulates and 3 species were pleustophytes (Table 29).

The aquatic macrophytes of the study area represents 27.08% , 42.74% and 55.17% of total aquatic plants of Nepal in terms of species, genera and family, respectively. Among the collected species majority of species were collected from the oxbow lake areas.

Typha angustifolia, Eichhornia crassipes, Nelumbo nucifera, Alternanthera sesilis, Phragmites karka, Saccharum spontaneum were most dominant plant species. Two exotic species e.g. *Alternanthera philoxeroids* and *Eichhornia crassipes* were found in the study area.

Two species of annelids (Table 30) and 23 species of arthropods were identified (Table 31). The highest number of arthropods belonged to order coleoptera and hemiptera. Mainly *Chironomous* larvae, *Culex* larvae, *Anopheles* larvae, *Hydrometra* sp., *Gerris* sp. and *Macrobrachium* sp. were abundant in the study area.

A total of 16 species of molluscs belonging to 4 orders, 8 families and 10 genera were recorded (Table 32). Seven species of these were edible. These consumed by different local people (Table 33). Among the total recorded species, 3 were harmful to human beings in different ways. The most abundant species in that area were *Bellamya bengalensis* and *Lymnaea acuminata*. *Achatina* is a serious pest of vegetables and crops in this region (Table 34).

92 species of fish belonging to 54 genera and 25 families were found in the Koshi Tappu Wildlife Reserve and its surroundings. According to this study, the study area represents 51.39 % and 83.33% of total fishes of Nepal in terms of species and family, respectively. Among the collected species majority of species belonged to cyprinidae family (Table 35).

A total of 23 species of herpetofauna were recorded from the wetlands of Koshi Tappu Wildlife Reserve and its surrounding (Table 36). Of these 8 species were amphibia and 15 species were reptiles. This study area represents 15.38 % of total amphibians of Nepal and 12 % of total reptiles of Nepal. Among the amphibians 4 species were found rarely and among the reptiles also 4 species were found rarely and 6 species were found very rarely at local level (Table 36).

100 species of water birds belonging to 62 genera and 19 families were found in the study area (Table 37). The present study recorded 11.89 %, 51.81 %, and 53.47 %, species of birds of total birds of Nepal, total wetlands' birds of Nepal and total terai wetlands' birds of Nepal, respectively. The maximum species was recorded in winter season. This study revealed decreasing trend in number of bird species in comparison to previous record.

Altogether 21 species of mammals belonging to 19 genera and 13 families were observed in the study area. Among them 12 were found rarely and 7 were occasionally found at the local level (Table 38). The present study recorded 11.60 %, and 33.33 % mammals of the total mammals of Nepal in terms of species and family, respectively. The most important mammal of the Koshi Tappu Wildlife Reserve is wild water buffalo ((*Bubalus bubalis*).