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Utilization Status of Wetland Flora by Indigenous Peoples and Local Communities in Major Lakes of Pokhara Valley, Nepal

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Abstract

This study aims at exploring the utilization and conservation status of wetland flora by indigenous peoples and local communities by documenting the use patterns based on their indigenous and local knowledge in the three major lakes - Phewa, Begnas and Rupa in Pokhara valley, Nepal. It assesses the species distribution and ecosystem health of both aquatic and terrestrial biodiversity and ecosystem services generated by the plant species found in the lake basins of these lakes. The focus of the study is on assessing biological status of and trend in the use practice of these floral species found in and around the lakes by the communities based on their diverse and traditional practices. Three methodological tools: Plant Collection and Herbarium Analysis, Key Informant Interview (KII) and Focus Group Discussion (FGD) were applied for collection and analysis of data. The collected herbaria were cross-checked with the herbarium specimens available at the Tribhuvan University Central Herbarium (TUCH). A total of 81 wetland-based plant species of 72 genus and 42 families were recorded. Out of which 39 plants species were found being used for medicinal purposes, while 6 plant species was used for food, 4 plant species used for fodder purposes and 3 plant species used for both medicine and food purposes and only one plant species used for firewood purpose in the three-lake basin areas. Change in status of availability of plants over the years was studied with the help of the knowledge and insights of indigenous peoples and local communities. The study found out that around 18 plant species are in declining form and 6 species are in increasing form while 57 species are in stable form in and around the lake basin areas.

Keywords: Aquatic and terrestrial biodiversity, Ecosystem-based adaptation, Indigenous and local knowledge, Wetland ecosystems

Introduction

The socio-economic and ecological importance of the lake ecosystems of Pokhara Valley, particularly Phewa, Begnas, and Rupa, is significant for conserving aquatic biodiversity and supporting lake basin communities, especially in the context of climate change (https://www.ramsar.org/). These wetlands host diverse floral species providing essential ecosystem goods and services (EGS) that sustain the livelihoods of Indigenous Peoples and Local Communities (IPLCs). In Nepal, over 17% of the population is dependent on wetland resources for their livelihoods (K.C. et al., 2014). The conservation of the lake biodiversity relies heavily on preserving Indigenous and Local Knowledge (ILK), which has gained recognition for its vital role in natural resource management, particularly in countries like Nepal (Brokensha et al., 1980; Ministry of Environment, Science and Technology [MoEST],2015).There are 21 ethnic communities in Nepal that use ILK to sustainably manage natural resources (National Lake Conservation Development Committee [NLCDC], 2021; Ministry of Forest and Soil Conservation [MoFSC], 2006).

Critical role of indigenous and local knowledge in conservation

Indigenous Peoples and Local Communities (IPLCs) have relied on wetland resources for generations as an integral part of their livelihoods. However, in recent years, excessive human pressure and weak resource governance by government

and community-based agencies have led to the degradation of these ecosystems, disrupting the age-old relationship between IPLCs and wetlands. Communities extract resources such as fodder, fuelwood, fiber, and medicinal plants using both modern methods and ILK. ILK is traditionally linked to conservation, sustainable harvesting, and cultural or religious practices. Scientific knowledge is also applied, particularly in fishing, green felling, and agricultural expansion. The loss of ILK can lead to ecological degradation as ethical and sustainable practices are replaced by short-term economic interests (Karki &Adhikari, 2015; Loh & Harmon, 2014). When species used in traditional practices are forgotten, they may lose their cultural significance and protection, posing risks to both biodiversity and traditional knowledge systems (Brosi et al., 2007; Karki &Adhikari, 2015). Documenting ILK is, therefore, vital not onlyfor cultural preservation but also for promoting sustainable development (Mercon et al., 2019).

In Nepal, ILK systems have been ignored in the past but are gradually being recognized and valued. Farmers in the Tarai and Midhills regions have developed different agro-forestry models and adaptation practices to cope with recurring floods, droughts, landslides and high rates of soil erosion. This diverse knowledge system demonstrates that indigenous and local knowledge and practices are at the core of the community resilience building process due to their inherent strength in anticipating and preparing for disasters before they occur (International Centre for Integrated Mountain Development [ICIMOD], 2007; Karki & Adhikari, 2015; MoEST, 2015). Indigenous and local knowledge also contributes to building social capital, which is essential for securing and enhancing livelihood opportunities (Berkes et al., 2000). Although there are still gaps in the systematic use of ILKP, several agencies and researchers (Egeru, 2012; Karki et al., 2017) have made efforts to develop uniform approaches, participatory processes and mechanisms for working with indigenous communities and promoting local knowledge systems.

However, the loss and degradation of ILK in the context of wetland conservation in the Pokhara Valley in recent years have hampered the planning and implementation of ecosystem-based adaptation and resilience building effort (Dixit et al., 2015). Such indigenous and local knowledge pools that are handed over through generations, are rich in both social and technical dimensions and are highly applicable to ecosystem based adaptation strategies (Karki et al., 2017). The availability of diverse and rich ILK and skill, has made local communities' people in the region particularly knowledgeable and skillful in the use and application of plant biodiversity based conservation values and practices. Many traditional systems of forest and water management systems use ILK, which continues to guide sustainable resource use. Despite its potential, this valuable knowledge pool remains unexplored, poorly archived and largely underutilized in the current ecosystem based adaptation (EbA) strategies and action plans are concerned (MoEST, 2015).

Very few research works have focused on the growing threats to wetland ecosystem and their associated floral biodiversity. Invasive Alien Plant Species (IAPS) is now one of the most significant drivers of plant population declines and species extinctions, particularly in island and fragile ecosystems worldwide (Donlan et al., 2003; Reaser et al., 2007). There are 166 alien plant species in Nepal, of which, herbs account for approximately 76%, followed by shrubs 16%, climbers 6% and trees 2% (Siwakoti, 2012).These invasive species pose a serious threat to native plant communities, especially in wetland habitats, where competition for space and nutrients is intense.

Despite such threats, Nepal is known for its rich biodiversity and cultural diversity. According to the 2021 Census, there are 142 caste and ethnic groups in the country (Guragain, 2024). Many of these groups maintain a deep connection with their surrounding ecosystems through ILK). However, documentation of wetland species and associated ILK remains limited, largely due to the lack of understanding about their inter relationship. This is particularly concerning given that an estimated 101 ethnic

groups living in Nepal rely directly or indirectly on local biodiversity and ecosystem services. The largest ethnic group is Brahmin (27%), followed by Gurung (16%) and Chhetri (14%), while 89 ethnic groups comprise less than 1% of the total population (Central Bureau of Statistics [CBS], 2014). In the study area, around 21 Indigenous Peoples and Local Communities (IPLCs) are found. Agriculture is the major source of livelihood, supporting around 72.4% of population draw their livelihood in the region. Agriculture is supplemented by animal husbandry and fish farming in the rural and lake areas (https://lgcdp.gov.np/gandakiinfo).

This study was undertaken to document indigenous and local knowledge as well as assess the status and trends, and practices concerning the availability, utilization and conservation of wetland-based plant resources in three major lakes (Phewa, Begnas, and Rupa) of the Pokhara Valley. The finding are expected to inform efforts to conserve plant resources and to prevent the further loss of biodiversity and associated ILK necessary for the protection and sustainable use and management of aquatic and lake basin area-based plant resources.

Materials and Methods

Study area

The study was carried out in and around the three major lakes (Phewa, Rupa and Begnas) of Pokhara Valley, Gandaki province, Central Nepal (Figure 1). The climate of the study area is characterized by monsoon in summer and westerlies[1] in winter. Summer months are wet, humid and hot while winter months are cold and mostly dry (Khadka et al., 2023; Sigdel et al., 2022). The study area receives highest rainfall between June to September.

Phewa Lake: Phewa Lake, the second-largest lake in Nepal, is located in the Pokhara Valley of Kaski District. It lies at an altitude of 742 m above sea level and covers an area of approximately 4.43 km² (Dahal, 2018). The areas surrounding Phewa Lake, is home to diverse ethnic groups, including the Gurung, Magar, Brahmin, Chhetri, and Newar communities (Gautam, 2019). The lake supports various livelihoods, particularly through agriculture, tourism, fisheries, and local handicrafts. A study by Paudel (2021) found that 65% of households in the vicinity of Phewa Lake are directly or indirectly dependent on tourism-related business in the area. The introduction of non-native plants into the Phewa wetland, the removal of buffering vegetation, are the major threats to lake upland forest deterioration and unplanned urbanization (Dixitet al., 2017; Pathak et al., 2021a).

Begnas Lake: Begnas Lake, the third-largest lake in Nepal, is situated in the southeastern part of the Pokhara Valley in Kaski District. It lies at an altitude of 650 m above sea level and covers an area of approximately 3 km² with maximum depth of 12.5 m (Thakuri et al., 2021) Begnas Lake is a natural freshwater lake fed by rainwater and streams from the surrounding hills (Gurung, 2021). The Begnas Lake region is home to various ethnic communities, including the Gurung, Magar, and Dalit groups (Khadka, 2019). The lake supports diverse economic activities, primarily tourism, fishing, and agriculture. A study by Bhandari (2022) revealed that around 55% of households in the vicinity depend on lake-related occupations for their livelihoods.

Rupa Lake: Situated at an altitude of approximately 600 m above sea level, Rupa Lake covers an area of 1.35 km² (Gurung, 2021). Rupa Lake is a natural freshwater lake fed by streams originating from the surrounding hills and rainwater. The Rupa Lake region is home to diverse ethnic communities, including Gurung, Magar and Dalit groups (Khadka, 2020). The lake supports various economic activities, particularly fisheries, agriculture, and ecotourism. A study by Bhandari (2022) indicated that approximately 50% of households in the vicinity depend on lake-related occupations for their livelihoods. The wetland of Rupa Lake is facing a lot of threats including invasive alien plant species,

[1]The westerlies refer to mid-latitude winds that blow from the west to east, typically between 30° and 60° latitude. In South Asia, they play a crucial role during winter and spring.

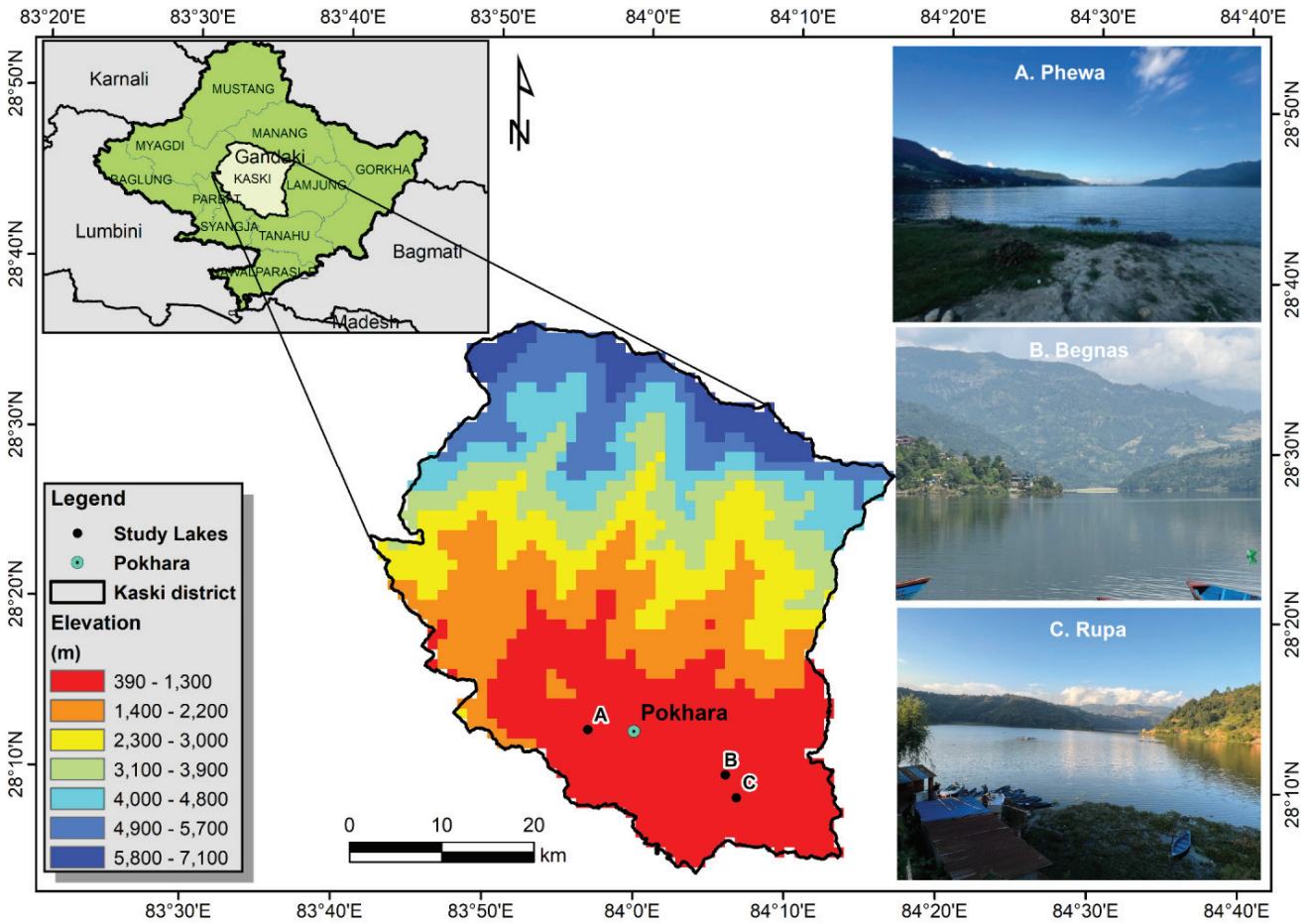

Figure 1: Overview of the study area and three lakes, **A.** Phewa Lake, **B.** Begnas Lake, **C.** Rupa Lake. The photos of the three lakes in side panel capture the visual images which are the key focus of this research.

eutrophication, siltation, encroachment, settlement area expansion habitat destruction, depletion of species abundance and diversity, loss of economic integrity (Gautam et al., 2019; Pokhrel et al., 2019).

Field visit, data collection and analysis

The study sites were visited twice in 2023, covering two distinct seasons corresponding to the peak flowering periods of wetland flora: the monsoon season (June-August) and the autumn season (September-November). During these field visits, specimens and photographs of key plant species were collected. Voucher specimens of flowering plants were gathered from along the lakeshores, within the lakes, and surrounding areas. Free-floating and submerged species located within the lakeshore zones were collected following the methodology of Haynes (1984).

The collected specimens were pressed and dried using newspapers and herbarium presses. Identification was carried out with reference to regional and national floras, including Grierson & Long (1983-2001), Wu et al. (1994-2008), and Watson et al. (2011). Additionally, the samples were cross-verified with collections housed at the National Herbarium and Plant Laboratories (KATH) and the Tribhuvan University Central Herbarium (TUCH). Expert opinions were sought for species with uncertain identification. Plant family names were assigned according to the APG (Angiosperm Phylogeny Group)-IV system (Chase et al., 2016), while Roskov et al. (2020) was used for genus and species nomenclature.

After the identification of plant species, their use, status and availability in three lakes were discussed through KII and FGD. Status of plants availability was also derived from people's perception.

Key Informants' Interview (KII): KII was used to target representatives from among the community leaders, representatives from the IPLC groups, women's networks and local government representatives. A total of 91 individuals were selected for conducting KII. A snowball sampling technique was used to purposively select individuals who are assumed to have traditional knowledge on the utilization of plant resources. Aged and experienced person having more than 30 years' of experience (especially local healers or elderly people) were selected as key informants. A checklist and semi-structured questionnaire were employed as tools to conduct Key Informant Interviews (KIIs), facilitating the collection of relevant quantitative data.

Focus Group Discussion (FGD): Three Focused Group Discussions (FGDs) were organized with Lake Conservation and Management Committees of Phewa, Rupa, Begnas lake basins. A total of 30 representatives from major stakeholder groups - Lake Management Committees, Community Forest User Groups, Lake Conservation Committee, Boater's Association, Fishing Cooperatives, Mother Groups, Local Youth Club and others participated in the FGDs. Mostly elder persons living at the nearby settlements of the lake clusters especially belonging to Water User Group, Informal Irrigation User Group, Fishermen Group, Lake Dependent Communities (Jalahari) participated in the focused group discussion. Checklists were used as a dialogue tool for conducting FGD ensuring that all the issues related to the utilization of the floral biodiversity in the lake basins.

Results and Discussion

Floral diversity and use categories

A total of 81wetland-plant species belonging to 72 genera, and 42 families generally used by indigenous communities were recorded in the lake basins of Phewa, Begnas, and Rupa. Asteraceae family recorded highest number (9) followed by Fabaceae (6) and Poaceae (5) in study area (Figure 2, Appendix 1).

The local communities of the study areas have a long tradition of using the plant resources of wetlands

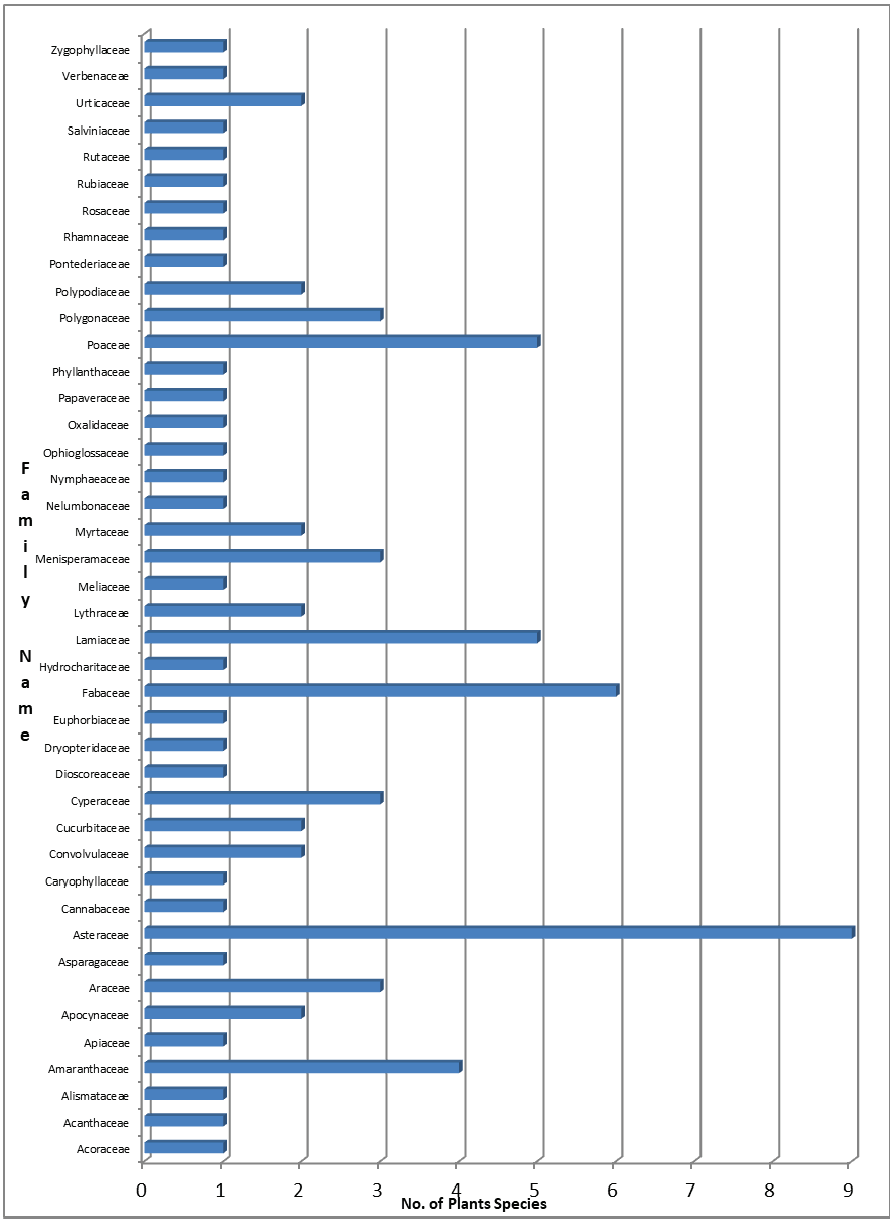

Figure 2: Family categorization of plants species in Phewa, Begnas and Rupa lakes

to meet their various basic needs such as food, medicine, fodder, firewood and other miscellaneous uses. Out of the total 81 species documented, 39 plant species are used for medicinal purposes, while 6 plants species are used for food and 4 plants species used for fodder purposes in all three lakes basin area. Likewise,10 plants species are used for both medicine and food purposes and 5 plants species used for medicine and fodder while only 2 plants species used for firewood purpose in all three-lake basin area of Phewa, Begnas and Rupa lake (Table1).

Growth form of the plants

Recorded plant species from the study area also categorized according to their growth form. It was found that 88.9% percent of plants species are in emergent form, 7.4% are in free floating form, 2.5% are in floating leaved rooted form and only one plant species was available in submerged condition (Figure 3).

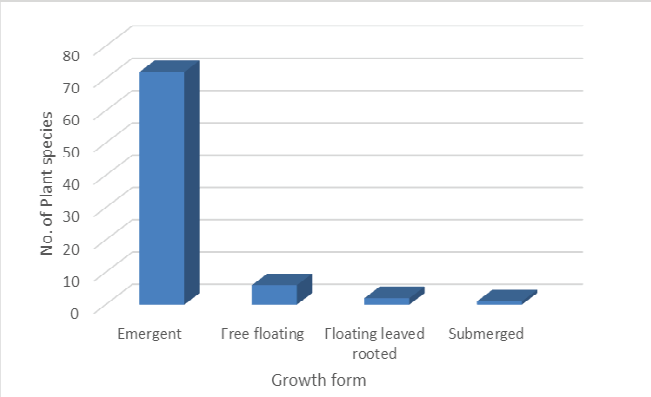

Figure 3: The growth form of the species

The status of the recorded plant species was discussed in KII and FGD with local people. Based on their perceptions, 18 plant species were reported to be in decline, while 6 species were noted to be increasing. The remaining 57 species were considered stable, out of a total of 81 plant species documented in the study lakes (Figure 4, Appendix 1).

South Asian wetlands are facing severe stress from human activities that are resulting habitat degradation and biodiversity decline (Trisal, 2023). These unsustainable anthropogenic activities are disrupting impacting structure and functions especially impacting aquatic and surrounding species leading to overall decline in wetland ecosystem health characterized by ecosystem conversion and degradation. Change in land and water use, water discharge, ecosystem structure and function can all have profound effects on the functioning of a lake (Olubode et al., 2011). Rapid invasion by exotic species are threatening the native species and affecting the status of a lake flora (Palmik et al., 2013).

Most of these invasive species have appeared in the last 20 years of period and are heavily increasing in recent years reinforcing the role of anthropogenic factors exacerbated by climate change. Pathak et al. (2021b) also described the invasiveness as major threats for declining the native species.

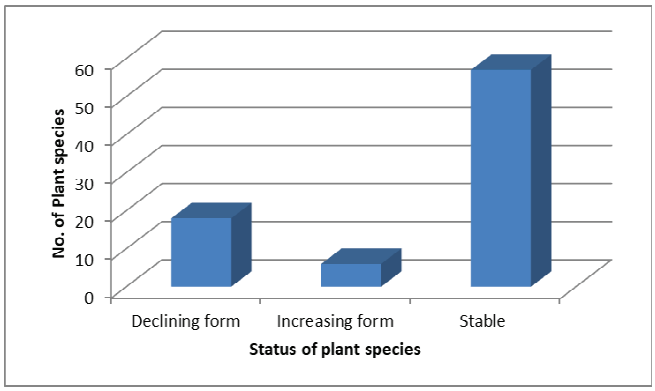

Figure 4: Status of plant species in three lake basin area of Phewa, Begnas and Rupa lake

Table 1: Plants used category in Phewa, Begnas and Rupa lakes

S.N.	Uses	Total used	Phewa Lake	Begnas Lake	Rupa Lake
1.	Medicine	39	34	30	38
2.	Food	6	5	6	6
3.	Fodder	4	3	3	4
4.	Firewood	2	2	2	2
5.	Medicine and Food	10	9	8	9
6.	Medicine and Fodder	5	5	4	4

Ageratina adenophora (Spreng.) R.M.King&H. Rob., *Chromolaena odorata* (L.) R.M.King&H. Rob., *Lantana camara* L., *Mikania micrantha* Kunth, *Pontederia crassipes* Mart. and *Ipomoea carnea* subsp. *fistulosa* (Mart. ex Choisy) D.F.Austin are considered as alien species with high threat to native species and ecosystems. Similarly, species like among these the *Pontederia crassipes* Mart., *Ipomoea carnea* subsp. *fistulosa* (Mart. ex Choisy) D.F.Austin, *Mikania micrantha* Kunth, *Alternanthera philoxeroides*(Mart.) Griseb., *Pistia stratiotes* L. are major IAPS seriously invaded in wetlands of Nepal (Ministry of Forest and Soil Conservation/Conservation and Sustainable Use of Wetlands Nepal [MoFSC/CSUWN], 2011). Lakes in Pokhara are already severely invaded by water hyacinth (Gautam et al., 2019). This study found that invasive alien species like *Pontederia crassipes* Mart. are impacting all the three lakes although their impact is relatively high in Phewa Lake as compared to other lakes (Pathak et al., 2021a). It was also found that rapid rate of human encroachment, increased eutrophication, invasive species, water diversion, toxic contamination, acidification, unregulated fishing, sedimentation, sewage water pollution from rapidly mushrooming hotels and the effects of extreme weather occurrences are some of the major threats to Phewa Lake (Rai, 2000).

Invasive species are actively invading, creating a danger to increasing agricultural operations, forest, culture, transportation, trade, power production, recreation, and fisheries by eradicating and substituting native biodiversity. Due to sedimentation caused by soil erosion, landslides, and significant water hyacinth invasion, the lake and its watershed are found to be under intense and exhausting pressure for the last several decades confirming the finding of similar study (Rai, 2000). Likewise, this study also aligns with the finding by Lama et al. (2018) who recorded impact of invasive alien species impact in Begnas lake. The loss of aquatic biodiversity has been exacerbated by the serious challenges posed by the invasion of foreign species such as water hyacinth which is especially difficult to control. Similarly, Pathak et al. (2021a) also describe terrestrial invasive plants such as *A. adenophora, P. stratiotes,* and *I. carnea* species are posing similar challenges.

Conclusion

The study has found a rich diversity of plant species used by Indigenous Peoples and Local Communities (IPLCs) in the three major lake basins of Pokhara valley. The study particularly highlights the utilization status of wetland basin flora of the study area. The IPLCs living around the three major lakes of Pokhara Valley have a long history of high dependency on the lake basin's rich floral diversity to meet their diverse livelihood needs, cultural preservation pursuits, and traditional medicinal practices. These lakes and their surrounding basin are found to harbor a variety of plant species used for food, fodder, fuelwood, and herbal medicines. Local communities, including the ethnic communities especially, Gurung, Magar and Jalarib peoples have developed extensive knowledge on utilization of plants.

However, spreading invasive alien species are threatening the sustainability of these plant resources ultimately having impacts on Indigenous Peoples and Local Communities (IPLC)'s livelihood and culture. Efforts to document and preserve traditional botanical knowledge, alongside locally-led conservation initiatives, are crucial for maintaining the ecological balance between wetlands and dependent communities thereby sustaining local livelihoods and bio-cultural heritage. Integrating indigenous knowledge with modern knowledge and community-led conservation strategies can help protect these valuable aquatic and terrestrial plant resources while promoting sustainable use of wetland biodiversity and ecosystem resources.

Author Contributions

K P Sigdel contributed in data collection, analysis and manuscript preparation and the co-authors- N P Ghimire and M B Karki significantly contributed in conceptualization, editing, framework development and analysis. P Shrestha contributed in data collection and tabulation.

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Appendix 1: Status of plants in Phewa, Begnas and Rupa Lake basin area having ethnobotanical uses

S.N.	Scientific name	Family	Local Name	Availability			Used value	Growth form	Plant Status	Specimen No.
				Phewa	Begnas	Rupa				
1	*Acorus calamus* L.	Acoraceae	Bojho	√	√	√	Me	E	D	PL 10
2	*Ageratina adenophora* (Spreng.) R.M.King & H.Rob.	Asteraceae	Banmara	√	√	√		E	I	PL 56
3	*Ageratum conyzoides* L.	Asteraceae	Ganmane Ghans	√	√	√		E	I	BL 11
4	*Ageratum houstonianum* Mill.	Asteraceae	Nilo Gandhe	√		√		E	S	PL 23
5	*Alstoniascholaris* (L.) R.Br.	Apocynaceae	Chatiwan	√	√		Me	E	D	PL 27
6	*Alternanthera philoxeroides* (Mart.) Griseb.	Amaranthaceae		√	√	√		E	I	PL 16
7	*Alternanthera sessilis* (L.) DC.	Amaranthaceae	Bhringijhar			√	Me	E	S	BL 40
8	*Amaranthus spinosus* L.	Amaranthaceae	Kande Lude	√	√	√	Me	E	S	BL 30
9	*Argemone mexicana* L.	Papaveraceae	Kandejhar	√	√	√		E	S	BL 55
10	*Artemisia indica* Willd.	Asteraceae	Titepati	√	√	√	Me	E	S	PL 09
11	*Arundo donax* L.	Poaceae	Narkat	√	√	√	Fdr	E	S	BL 32
12	*Asparagus racemosus*Willd.	Asparagaceae	Kurilo	√		√	Me, Fd	E	D	BL 48
13	*Azolla imbricata* (Roxb.) Nakai	Salviniaceae	Pani uneu	√	√	√	Me	FF	D	PL 18
14	*Berchemia edgeworthii* M.A. Lawson	Rhamnaceae	Angeri	√	√	√	Fd	E	S	BL 60
15	*Botrychium lanuginosum* Wall. ex Hook & Grev.	Ophioglossaceae	Jaluko	√	√	√	Me	E	S	RL 55
16	*Callicarpa macrophylla* Vahl	Lamiaceae	Daikamli	√	√	√	Me, Fd	E	S	RL 46
17	*Cannabis sativa* L.	Cannabaceae	Gaanja, Bhang	√		√	Me	E	S	PL 31
18	*Castanopsis indica* (Roxb. ex Lindl.) A.DC.	Fagaceae	Katus	√	√	√	Fd	E	S	RL 60
19	*Centella asiatica* (L.) Urb.	Apiaceae	Ghodtapre	√	√	√	Me	E	D	PL 51
20	*Chenopodium album* L.	Amaranthaceae	Bethe; Batuwa	√	√	√	Me, Fd	E	S	PL 13
21	*Chromolaena odorata* (L.) R.M.King & H.Rob.	Asteraceae	Banmara	√	√	√	Fr	E	S	PL 14
22	*Citrus medica* L.	Rutaceae	Bimiro		√	√	Fd	E	D	PL 15
23	*Cissampelos pareira* L.	Menispermiaceae	Batulpate	√		√	Me	E	S	RL 78
24	*Colebrookea oppositifolia* Sm.	Lamiaceae	Dhurseli	√	√	√	Me	E	S	RL 37
25	*Cyperus esculentus* L.	Cyperaceae	Mothe	√	√	√		E	S	PL 19
26	*Cyperus rotundus* L.	Cyperaceae	Mothe	√	√	√	Fdr	E	S	PL 11
27	*Desmostachyabipinnata* (L.) Stapf	Poaceae	Kush	√	√	√	Me, Fdr	E	S	PL 74

S.N.	Scientific name	Family	Local Name	Availability			Used value	Growth form	Plant Status	Specimen No.
				Phewa	Begnas	Rupa				
28	*Dioscorea bulbifera* L.	Dioscoreaceae	Bhyakur	√	√	√	Me	E	S	PL 71
29	*Drymaria cordata* (L.) Willd. ex Schult.	Caryophyllaceae	Abhijalo	√		√	Me	E	D	RL 72
30	*Dryopteris* spp	Polypodiaceae	Pani Neuro	√	√	√	Fd	E	S	PL 45
31	*Dryopteris cochleata* (D.Don) C.Chr.	Polypodiaceae	Kalo Neuro	√	√	√	Me, Fd	E	S	RL 73
32	*Ecliptaprostrata* (L.) L.	Asteraceae	Bhringiraj	√	√	√	Me	E	S	PL 78
33	*Gerardianadiversifolia*	Urticaceae	Chalnesisnu	√	√	√	Me	E	S	BL 20
34	*Hydrilla verticillata* (L.f.) Royle	Hydrocharitaceae	Panijhyau, Sewar,	√		√	Me	S	D	BL 65
35	*Ipomoea aquatica* Forssk.	Convolvulaceae	Kalami sag	√	√	√		FF	S	BL 26
36	*Ipomoea carnea* subsp. *fistulosa* (Mart. ex Choisy) D.F.Austin	Convolvulaceae	Besaram	√	√	√		FF	S	PL 18
37	*Justicia adhatoda* L.	Acanthaceae	Asuro	√	√	√	Me	E	S	RL 58
38	*Leersiahexandra* Sw.	Poaceae	*KarauteJhar*	√	√	√	Me	E	S	RL 57
39	*Lemna minor* L.	Araceae	Leu	√	√	√	Me	FF	S	PL 42
40	*Lantana camara* L.	Verbenaceae		√	√	√	Fr	E	I	BL 25
41	*Melia azedarach* L.	Meliaceae	Bakaino	√	√	√	Me, Fdr	E	S	RL 79
42	*Mikania micrantha* Kunth	Asteraceae	Aalupate	√	√	√	Fr	E	I	BL 28
43	*Millettia extensa* (Benth.) Benth. ex Baker	Fabaceae	Gaujo		√	√	Me	E	S	PL 81
44	*Mimosa pudica* L.	Fabaceae	Lajjabati	√	√	√	Me	E	S	BL 72
45	*Nelumbo nucifera* Gaertn.	Nelumbonaceae	Seto Kamal	√		√	Me	FF	D	PL 08
46	*Nephrolepis cordifolia* (L.) C.Presl	Polypodiaceae	Pani amala	√	√	√	Me, Fd	E	S	BL 73
47	*Nymphaea rubra Roxb. ex Salisb.*	Nymphaeaceae		√		√	Fdr	E	S	PL 78
48	*Oryza rufipogon* Griff.	Poaceae	Nabo Dhan			√	Me	E	D	BL 31
49	*Oxalis corniculata* L.	Oxalidaceae	Chariamilo	√	√	√	Me	E	S	RL 71
50	*Parthenium hysterophorus* L.	Asteraceae	Pati	√	√	√		E	S	PL 46
51	*Periploca calophylla* (Wight) Falc.	Apocynaceae	Sikari Lahara	√	√	√	Me	E	D	RL 44
52	*Phyllanthus emblica* L.	Phyllanthaceae	Amala	√	√	√	Me, Fd	E	D	RL 48
53	*Persicariabarbata* (L.) H.Hara	Polygonaceae	Pirre jhar	√	√	√	Me	E	S	BL 30
54	*Persicaria hydropiper* (L.) Delarbre	Polygonaceae	Pirre jhar	√	√	√	Me	E	S	RL 49
55	*Pistia stratiotes* L.	Araceae	Banda ghass	√	√	√		E	S	PL 62
56	*Pogostemon benghalensis (Brum.f.) Kuntze*	Lamiaceae	Gudheli	√	√	√	Me	E	S	BL 46

S.N.	Scientific name	Family	Local Name	Availability			Used value	Growth form	Plant Status	Specimen No.
				Phewa	Begnas	Rupa				
57	*Pontederia crassipes* Mart.	Pontederiaceae	Jalakumbhi	√	√	√		FF	I	PL 49
58	*Premna barbata* Wall. ex Schauer	Lamiaceae	Gidari	√	√	√	Me, Fdr	E	S	BL 68
59	*Rhaphidophora glauca* (Wall.) Schott	Araceae	Haddijor	√		√	Me	E	D	PL 06
60	*Rubus ellipticus* Sm.	Rosaceae	Ainselu	√	√	√	Me, Fd	E	S	BL 18
61	*Rumex nepalensis* Spreng.	Polygonaceae	Halhale		√	√	Me	E	S	BL 37
62	*Sagittariaguayanensis* subsp. *guayanensis*	Alismataceae	Karkalejhar	√	√	√	Me	E	S	PL 20
63	*Falconeria insignis* Royle	Euphorbiaceae	Khirro	√	√		Me	E	S	BL 35
64	*Schoenoplectiellamucronata* (L.) J.Jung & H.K.Choi	Cyperaceae	Gud mothe	√	√	√		E	S	RL 45
65	*Senna occidentalis* (L.) Link	Fabaceae	Taprejhar	√	√	√		E	S	PL 67
66	*Senna tora* (L.) Roxb.	Fabaceae	Taprejhar	√	√	√		E	S	BL 05
67	*Solena amplexicaulis* (Lam.) Gandhi	Cucurbitaceae	Golkakri	√			Me, Fd	E	S	RL 38
68	*Solena heterophylla* Lour.	Cucurbitaceae	Golkarki		√	√	Me, Fd	E	S	BL 59
69	*Spermacoce alata* Aubl.	Rubiaceae		√	√	√	Me	E	S	BL 39
70	*Stephania glandulifera* Miers	Menispermaceae	Gujargano	√	√	√	Me	E	D	BL 57
71	*Syzygiumcumini* (L.) Skeels	Myrtaceae	Jamun	√			Me, Fdr	E	S	PL 07
72	*Syzygium nervosum* DC.	Myrtaceae	Kyamun	√	√	√	Me, Fdr	E	D	PL 67
73	*Tinospora cordifolia* (Willd.) Hook.f. & Thomson	Menispermaceae	Gurjo	√	√	√	Me	E	D	BL 49
74	*Trapa natans* var. *bispinosa* (Roxb.) Makino	Lythraceae	Simalkade	√	√	√	Fd	FLR	D	BL 03
75	*Trapa natans* var. *quadrispinosa* (Roxb.) Makino	Lythraceae	Bhaisikade	√	√	√	Fd	FLR	D	PL 77
76	*Tribulus terrestris* L.	Zygophyllaceae	Gaikhure	√	√	√	Me	E	S	BL 02
77	*Trifolium repens* L.	Fabaceae	Beuli, Pyauli,	√	√	√	Me	E	S	BL 34
78	*Urtica dioica* L.	Urticaceae	Sisnoo	√	√	√	Me, Fd	E	S	BL 50
79	*Vetiveriazizznioides*	Poaceae	Usir		√	√	Fdr	E	S	PL 05
80	*Vitex negundo* L.	Lamiaceae	Simali Ghas		√	√	Me	E	S	BL 74
81	*Xanthium strumarium* L.	Asteraceae	Bhaise Kada	√	√	√	Me	E	S	BL 33

Note: Growth form (E= Emergent; FF= Free floating; FLR= Floating leaved rooted aquatics; Sub = submerged), Used Value (Me- Medicine, Fd- Food, Fdr- Fodder, Fr- Fire wood, I= Increasing, D= Decreasing, S= Stable)