

Prospective role of a tropical rural lake on preservation of distinct populations

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Abstract

Freshwater lakes are sole habitat for wide range of biota. Especially the tropical freshwater lakes are unique ecosystem supports very sensitive biotic communities. The components of various trophic levels of tropical freshwater are easily altered by various factors. These factors may be anthropogenic or natural. Study area Vellode Lake (11°8'04.04" N and 77°37'52.42" E) is a typical South Indian tropical freshwater lakes supports wide range of biodiversity. To find the potential importance of the lake ecosystem, present investigation exclusively eyed on diversity of economically useful medicinal plants and aesthetic avifaunal communities. In the present investigation 63 medicinal plants including 3 grasses, 26 herbs, 6 twinks, 7 shrubs and 21 trees. The attractive avifaunal components of the lake is comprised of 9 migratory including one vulnerable *Pelecanus crispus*, two near threatened *Mycteria leucocephala* and *Threskiornis melanocephalus*, 28 local migratory and 61 resident birds including near threatened *Anhinga melanogaster*. Factors associated with the management of Vellode lake were identified and required implementations are highlighted.

Keywords: Vellode lake, Medicinal plants, Avifaunal diversity.

Introduction

Freshwater lakes provide vital resources and are the sole habitat for an extraordinarily rich, endemic and sensitive biota. The biota of freshwater lakes is very much larger than expected from the area covered by these freshwater habitats¹. The values of freshwater lake biodiversity are directly contribute to economic productivity, purification of water, store house of genetic information, recycling of nutrients, ground water recharge, pollution remediation and also provides food, fodder, fuel resources, medicinal plants, living resources, timber and wood and also provides cultural, aesthetic, scientific and educational values²⁻⁴. Inland water bodies like lakes of India support a large diversity of biota representing almost all taxonomic groups⁵. Therefore maintenance of this lake water quality is important for the protection of diverse group of freshwater biota. Constant monitoring and better understanding about the conditions of the lakes and provides base for developing effective management practices. A South Indian tropical lake at Vellode, Erode district of Tamilnadu is a study area and it lies between 11°8'04.04" N and 77°37'52.42" E with the elevation of 764 ft. Lower Bhavani Project canal (LBP canal) which runs near the lake has no separate sluice to this tank and the tank is fully depending upon the seepage water from the channel and the monsoon. The tank has two outlets for irrigation purpose. In the total area of 75.935 ha, only 35 ha has water throughout the year i.e., the eastern region of the lake. Remaining area has moist deciduous forest with *Acacia nilotica indica* trees as main vegetation inter-spread with other trees like *Palmyra*, *Prosobis juliflora* and *Euclyptus* etc. The lake ecosystem supports wide range of taxonomic

groups including planktons, aquatic plants, terrestrial plants, fishes, amphibians, reptiles, birds and mammals. Among the local community, diversity of medicinal plants of the lake plays a crucial role as an economically useful and with wide range of medicinal values. Similarly the avifaunal diversity of the lake ecosystem is another attractive and ecologically valuable component among researchers, students and common people. Therefore, the present study exclusively focused on the diversity of terrestrial plants and birds.

Materials and methods

Recording of medicinal plants: In the present study, whole or plant portions (leaves, flowers and fruits) of terrestrial plant species were collected and preserved by pressing and drying method. Collected plant species of the lake were identified by the assistance of Botanical Survey of India (BSI), Southern Zone, Coimbatore. From the identified plant species, plants with medicinal quality were separately categorized by using standard references.

Recording of avifaunal diversity: For conducting the present bird survey binocular with magnification 8x50 was used. Note book, pencil and sound recorder were also used. The available effort for counting the birds was limited but may be adequate for the study, accurate censuses are often very difficult to obtain. To reduce the difficulties birds can be counted by wide range of methods. In the present study 'Bird counting methods' by Bibby et al. were employed⁶. The methods followed for the bird counting were point counting, direct counting method, look

down method, line transects method, nest searching method, interview with locals, sky watching method, canopy watching method, attraction methods and sound recording methods etc. The morning and evening time were been ideal time to record maximum of the bird populations, while day time recording was applied to only few species. With forest official's great support birds of the lake were identified by the help of standard field guides of Ali and Ali and Ripley^{7,8}. Few species were identified with help internet sources.

Results and discussion

In present investigation sixty three plants were recorded including 3 grasses, 26 herbs, 6 creepers, 7 shrubs and 21 trees (Table-1 and Figure-1). Even though the lake supports wide range of floral diversity, identified medicinally valuable plants alone recorded. The most attractive avifaunal components includes 9 migratory, 28 local migratory and 61 resident species were recorded (Table-2 and Figure-2). They were classified and 16 orders including passeriformes (32), peleciformes (11), anseriformes (8), coraciiformes (9), charadiiformes (6), ciconiiformes (6), gruiformes (5), cuculiformes (4), falconiformes (4), columbiformes (3), strigiformes (3), apodiformes (2), galliformes (2), piciformes (1), psittaciformes (1) and podiciformes (1). In the bird survey, among the recorded 98 bird species. The present study revealed that 9 migratory birds including vulnerable *Pelecanus crispus* (Dalmatian pelican), near threatened *Mycteria leucocephala* (Painted stork) and *Threskiornis melanocephalus* (Oriental white ibis), least concern species including *Phalacrocorax carbo* (Great cormorant), *Anastomus oscitans* (Asian open bill stork), *Ciconia ciconia* (European white stork), *Pelecanus onocrotalus* (Great white pelican), *Anas Penelope* (Eurasian wigeon) and *Tringa nebularia* (Common green shank). In the present bird survey 28 least concern birds were recorded. Resident birds of the lake ecosystem includes near threatened *Anhinga melanogaster* (Darter or snake bird) and 60 least concern species.

Many of the early concerns about impacts on freshwater ecosystems at least implicitly concerned biodiversity. And attempts to restore or protected selected freshwater species by regulating harvest, controlling pollution or restoring habitat have a long history^{9,10}. In folk and herbal medicine wide range of plants were utilized. Thus these medicinal plants are globally inevitable in treating diseases. More or less world's major population depends on traditional medicine¹¹. Para-limnetic zone of tropical lakes are home of many special biotic communities with sensitive ecological process including wide range of plants, insects and etc. Vellode Lake is not an exceptional. Even though lake harbors more number of terrestrial plants, present study identifies 63 medicinal plants which are useful to curing more than hundred diseases among the local community people. It includes highly medicinal valuable species like *Acacia nilotica indica*, *Azadirachta indica*, *Clitoria ternatea*, *Aloe barbadensis*, *Cassia auriculata* and *Ocimum sanctum* etc. These floral species provides basic components for isolation drugs and pharmacological

components. Ahmed *et al.* and Natarajan and Udhayakumar expressed that documentation of medicinal plant species can be a useful tool to study the relationship between the human beings and nature^{12,13}. By their ethno-botanical survey in south Indian district, Murugeswaran *et al.* found that more than 1000 herbal species are under threat¹⁴. Competition from exotic weeds like *Prosopis juliflora*, over exploitation of forest resources and less attention from young generation were observed as the main cause for extinction of medicinal plants^{15,16}.

In another side, the lake is also acted as an avifaunal resort. It supports wide range residential birds throughout year. Local migratory birds visited from near-by districts and states during post monsoon and stay up to late winter. Where, in winter lake is fully captured by migratory birds from Siberia, Germany and Newzland, etc. Thus, the lake ecosystem is very busy and open hearted to national and international avifaunal components. Fortunately, the lake supports vulnerable *Pelecanus crispus* (Dalmatian pelican), near threatened *Mycteria leucocephala* (Painted stork), *Threskiornis melanocephalus* (Oriental white ibis) and *Anhinga melanogaster* (Darter or snake bird).

Padmavathy *et al.* highlighted the impact of habitat loss by habitat degradation, cultivation of crops and collection of plant materials for various domestic purposes¹⁷. Chilke reported that avifaunal components are admirable indicators of ecological health¹⁸. Nevertheless like many authors, he also addressed that the future of this avian fauna is in danger due to advancement of industrialization and urbanization in his study area. Impact of excess use of pesticides and chemical fertilizers and their effect on bird population in Pollachi area of Tamilnadu was reported by Mariappan *et al.*¹⁹. Well known governmental and non-governmental organization have a greater role to play in training and educating amateur bird watchers^{20,21}.

Conclusion

Regarding the present study area, obtained observations revealed that the lake ecosystem is healthy to supports wide range medicinal plants and avifaunal diversity. Even though limited anthropogenic activities and no industrial effects were recorded, the lake still under stress due to seasonal variations in particularly fluctuations in water level and abundant volume of bottom sediment. In addition, interview with local community people clued that the lake ecosystem also have following difficulties. Which are no separate sluice, improper management of inlets and outlets, acquisition by farmers, construction of new residential areas and reduction of water holding capacity. Thus the present study proposed that the health of the lake ecosystem is not in critical or alarming, where present way of management and care continues the future of the lake should be in dangerous. If the highlighted hitches took into considerations by lake managers and policy makers the lake should be a continuous attractive resort for avifaunal components and place of germination for diverse medicinal plants.

Table-1: Diversity of Medicinal Plants in Vellode Lake

S. N.	Species Name	Common Name	Family
1	<i>Acacia leucophloea</i> (Roxb.) Wild.	White bark acacia	Mimosaceae
2	<i>Acacia nilotica indica</i> (L.)	Gum arabic tree	Mimosaceae
3	<i>Acalypha indica</i> (L.)	Indian nettle	Euphorbiaceae
4	<i>Acer platanoides</i> (L.)	Norway maple	Sapindaceae
5	<i>Achyranthus aspera</i> (L.)	Devil's horse whip	Amaranthaceae
6	<i>Aegle marmelos</i> (L.) Correa	Stone apple	Rutaceae
7	<i>Aerva lanata</i> (L.) Juss.	-	Amaranthaceae
8	<i>Aloe barbadensis</i> (L.) Mill.	Indian Aloe	Xanthorrhoeaceae
9	<i>Alternanthera sessilis</i> (L.) R. Br.	Sessile joy weed	Amaranthaceae
10	<i>Amaranthus viridis</i> (L.)	Green amaranth	Amaranthaceae
11	<i>Andrographis paniculata</i> (Burm.f.)	King of bitters	Acanthaceae
12	<i>Annona squamosa</i> (L.)	Sugar apple	Annonaceae
13	<i>Argemone mexicana</i> (L.)	Maxican poppy	Papaveraceae
14	<i>Artabotrys hexapetalus</i> (L.) Bhandari	Tail grape	Annonaceae
15	<i>Azadirachta indica</i> (A. Juss, 1830)	Neem	Meliaceae
16	<i>Barleria prionitis</i> (L.)	Porcupine flower	Acanthaceae
17	<i>Boerhavia erecta</i> (L.)	Hogweeds	Nyctaginaceae
18	<i>Borassus flabellifer</i> (L.)	Asian palmyra palm	Palmales
19	<i>Cassia auriculata</i> (L.)	Cassia	Fabaceae
20	<i>Caesalpinia pulcherrima</i> (L.) Sw.	Red bird of paradise	Caespiaceae
21	<i>Calotropis gigantea</i> (L.) W.T. Aiton	Crown flower	Asclepiadaceae
22	<i>Calotropis procera</i> (W.T. Aiton)	Sodom apple	Asclepiadaceae
23	<i>Cardiospermum halicacabum</i> (L.)	Ballon plant	Sapindaceae
24	<i>Carica papaya</i> (L.)	Pappaya	Caricaceae
25	<i>Ciccus quadrangularis</i> (L.)	Devil's backbone	Vitaceae
26	<i>Clitoria ternatea</i> (L.)	Butterfly pea	Fabaceae
27	<i>Coccinia indica</i> (L.)	Baby water melon	Cucurbitaceae
28	<i>Crotalaria verrucosa</i> (L.)	-	Cucurbitaceae
29	<i>Cynodon dactylon</i> (L.) Pers.	Dog's tooth grass	Poaceae
30	<i>Cyperus rotundas</i> (L.)	Purple nut sedge	Cyperaceae
31	<i>Dactyloctenium aegyptium</i> (L.) Wild	Crow foot grass	Poaceae

S. N.	Species Name	Common Name	Family
32	<i>Datura metal</i> (L.)	Devill's trumpet	Solanaceae
33	<i>Eucalyptus citridora</i> (L.)	Gully ash	Myrtaceae
34	<i>Euphorbia heterophylla</i> (L.)	Painted Euphorbia	Euphorbiaceae
35	<i>Euphorbia hirta</i> (L.)	Cat's hair	Euphorbiaceae
36	<i>Ficus bengalensis</i> (L.)	Indian panayan	Moraceae
37	<i>Ficus religiosa</i> (L.)	Sacred fig	Moraceae
38	<i>Glinus lotoides</i> (L.)	Hairy carpet weed	Molluginaceae
39	<i>Jatropha curcas</i> (L.)	Barbodus nut	Euphorbiaceae
40	<i>Justica adhatoda</i>	Malabar nut	Acanthaceae
41	<i>Leucas aspera</i> (L.)	Leucas	Lamiaceae
42	<i>Ocimum sanctum</i> (L.)	Holy basil	Lamiaceae
43	<i>Ocimum americanum</i> (L.)	Lime hairy	Lamiaceae
44	<i>Phyllanthus niruri</i> (L.)	Seed under leaf	Euphorbiaceae
45	<i>Phyllanthus reticulatus</i> (L.)	Black honey shrub	Phyllanthaceae
46	<i>Pithecellobium dulce</i> (Roxb.)	Manila tamarind	Mimosaceae
47	<i>Polyalthia longifolia</i> (Sohn.)	Devadharu	Annonaceae
48	<i>Polygala chinensis</i> (L.)	Indian milk wort	Polygalaceae
49	<i>Pongamia pinnata</i> (Vernat.)	Indian beech tree	Fabaceae
50	<i>Passiflora foetida</i> (L.)	Wild water lemon	Passifloraceae
51	<i>Purpurea</i> (L.)	Temple tree	Apocynaceae
52	<i>Ricinus communis</i> (L.)	Caster oil plant	Euphorbiaceae
53	<i>Solanum nigrum</i> (L.)	Black night shade	Solanaceae
54	<i>Syzygium cumini</i> (L.) Skeels	Black plum	Myrtaceae
55	<i>Tamarindus indica</i> (L.)	Indian date	Fabaceae
56	<i>Tephrosia purpurea</i> (L.) Pers.	Wild indigo	Fabaceae
57	<i>Thespesia populnea</i> (L.) Sol.	Portia tree	Malvaceae
58	<i>Tinospora cardifolia</i> (Thunb.)	Guduchi	Menispermaceae
59	<i>Tribulus terrestris</i> (L.)	Bull head	Zygophyllaceae
60	<i>Tridax procumbens</i> (L.)	Coat buttons	Asteraceae
61	<i>Vinca rosea</i> (L.)	Rosey periwinkle	Apocynaceae
62	<i>Vitex negundo</i> (L.)	Five leaved chaster tree	Lamiaceae
63	<i>Ziziphus jujuba</i> (Mill.)	Indian jujub	Rhamnaceae

Table-2: Avifaunal Diversity of the Lake

S.N.	Scientific name (Common Name)	Catg.	Order
Migratory			
1	<i>Pelecanus crispus</i> (Dalmatian pelican)	VL	Pelecaniformes
2	<i>Phalacrocorax carbo</i> (Great cormorant)	LC	Charadiiformes
3	<i>Mycteria leucocephala</i> (Painted stork)	NT	Ciconiiformes
4	<i>Anastomus oscitans</i> (Asian open bill stork)	LC	Ciconiiformes
5	<i>Ciconia ciconia</i> (European white stork)	LC	Ciconiiformes
6	<i>Threskiornis melanocephalus</i> (Oriental white ibis)	NT	Passeriformes
7	<i>Pelecanus onocrotalus</i> (Great white pelican)	LC	Pelecaniformes
8	<i>Anas Penelope</i> (Eurasian wigeon)	LC	Pelecaniformes
9	<i>Tringa nebularia</i> (Common green shank)	LC	Pelecaniformes
Local Migratory			
1	<i>Casmerodius albus</i> (Large egret)	LC	Ciconiiformes
2	<i>Ardeola grayii</i> (Indian pond heron)	LC	Pelecaniformes
3	<i>Bubulcus ibis</i> (Cattle egret)	LC	Pelecaniformes
4	<i>Mesophoyx intermedia</i> (Median egret)	LC	Pelecaniformes
5	<i>Egretta garzetta</i> (Little egret)	LC	Ciconiiformes
6	<i>Lonchura kelaarti</i> (Black throated munia)	LC	Passeriformes
7	<i>Nettapus coromandelianus</i> (Cotton teal)	LC	Anseriformes
8	<i>Milvus migrans</i> (Black kite)	LC	Falconiformes
9	<i>Haliastur indus</i> (Brahminy kite)	LC	Falconiformes
10	<i>Accipiter badius</i> (Shikra)	LC	Falconiformes
11	<i>Circaetus gallicus</i> (Short toed snake eagle)	LC	Falconiformes
12	<i>Hydrophasianus chirurgus</i> (Pheasant tailed jacana)	LC	Charadriiformes
13	<i>Psittacula krameri</i> (Rose ringed parakeet)	LC	Psittaciformes
14	<i>Alcedo atthis</i> (Small blue king fisher)	LC	Coraciiformes
15	<i>Merops persicus</i> (Blue cheeked bee eater)	LC	Coraciiformes
16	<i>Merops philipinus</i> (Blue tailed bee eater)	LC	Coraciiformes
17	<i>Apus nipapalensis</i> (House swift)	LC	Apodiformes
18	<i>Coracias benghalensis</i> (Indian roller)	LC	Coraciiformes
19	<i>Oriolus oriolus</i> (Eurasian golden oriole)	LC	Passeriformes
20	<i>Sturnus pagodarum</i> (Brahminy starling)	LC	Passeriformes
21	<i>Cyornis tickellae</i> (Tickell's blue fly catcher)	LC	Passeriformes
22	<i>Tersiphone paradisi</i> (Asian Paradise fly catcher)	LC	Passeriformes
23	<i>Petronia xanthocollis</i> (Yellow throated sparrow)	LC	Passeriformes

S.N.	Scientific name (Common Name)	Catg.	Order
24	<i>Anas crecca</i> (Common teal)	LC	Anseriformes
25	<i>Anas ferina</i> (Common pochard)	LC	Anseriformes
26	<i>Anas acuta</i> (Northern pintail)	LC	Anseriformes
27	<i>Anas clypeata</i> (Northern shoveler)	LC	Anseriformes
28	<i>Anas gibberifrons</i> (Sunda teal)	LC	Anseriformes
Resident			
1	<i>Tachybaptus ruficollis</i> (Little grebe)	LC	Podiciformes
2	<i>Microcarbo niger</i> (Little cormorant)	LC	Pelecaniformes
3	<i>Anhinga melanogaster</i> (Darter or Snake bird)	NT	Anseriformes
4	<i>Ardea cinerea</i> (Gray heron)	LC	Pelecaniformes
5	<i>Ardea purpurea</i> (Purple heron)	LC	Pelecaniformes
6	<i>Butorides striatus</i> (Little green heron)	LC	Ciconiiformes
7	<i>Nycticorax nycticorax</i> (Black crowned night heron)	LC	Pelecaniformes
8	<i>Anas poecilorhyncha</i> (Spot billed duck)	LC	Anseriformes
9	<i>Francolinus pondicerianus</i> (Grey francolin)	LC	Galliformes
10	<i>Pavo cristatus</i> (Indian peafowl)	LC	Galliformes
11	<i>Amournis phoenicurus</i> (White breasted water hen)	LC	Gruiformes
12	<i>Gallicrex cinerea</i> (Water cock)	LC	Gruiformes
13	<i>Gallinula chloropus</i> (Common moorhen)	LC	Gruiformes
14	<i>Porphyrio porphyrio</i> (Purple moorhen)	LC	Gruiformes
15	<i>Fulica atra</i> (Common coot)	LC	Gruiformes
16	<i>Vanellus indicus</i> (Red wattled lapwing)	LC	Charadriiformes
17	<i>Vanellus malabaricus</i> (Yellow wattled lapwing)	LC	Charadriiformes
18	<i>Himantopus himantopus</i> (Black winged stilt)	LC	Charadriiformes
19	<i>Sterna aurantia</i> (River tern)	LC	Charadriiformes
20	<i>Sterptopelia decaocto</i> (Eurasian collared dove)	LC	Columbiformes
21	<i>Spilopelia chinensis</i> (Spotted dove)	LC	Columbiformes
22	<i>Spilopelia senegalensis</i> (Little brown dove)	LC	Columbiformes
23	<i>Clamator jacobinus</i> (Pied crested cuckoo)	LC	Cuculiformes
24	<i>Endynamys scolopaceus</i> (Asian koel)	LC	Cuculiformes
25	<i>Phaeenicophaeus viridirostris</i> (Small green billed malkoha)	LC	Cuculiformes
26	<i>Centropus sinensis</i> (Greater coucal)	LC	Cuculiformes
27	<i>Tyto alaba</i> (Barn owl)	LC	Strigiformes
28	<i>Athene brama</i> (Spotted owlet)	LC	Strigiformes

S.N.	Scientific name (Common Name)	Catg.	Order
29	<i>Cypsiurus balasiensis</i> (Asian palm swift)	LC	Apodiiformes
30	<i>Ceryle rudis</i> (Lesser pied king fisher)	LC	Coraciiformes
31	<i>Halcyon capensis</i> (Stork billed kingfisher)	LC	Coraciiformes
32	<i>Halcyon smyrnensis</i> (Whitebreasted kingfisher)	LC	Coraciiformes
33	<i>Merops orientalis</i> (Small bee eater)	LC	Coraciiformes
34	<i>Upipa epops</i> (Common hoopoe)	LC	Coraciiformes
35	<i>Dinopium javanense</i> (Common golden backed woodpecker)	LC	Piciformes
36	<i>Eremopterix griseus</i> (Ashy crowned sparrow lark)	LC	Passeriformes
37	<i>Hirundo tahitica</i> (House swallow)	LC	Passeriformes
38	<i>Dicrurus macrocerus</i> (Black drongo)	LC	Passeriformes
39	<i>Acridotheres tristis</i> (Common myna)	LC	Passeriformes
40	<i>Dendrocitta vagabunda</i> (Indian treepie)	LC	Passeriformes
41	<i>Corvus splendens</i> (House crow)	LC	Passeriformes
42	<i>Corvus corax</i> (Common raven)	LC	Passeriformes
43	<i>Pycnonotus cafer</i> (Red vented bulbul)	LC	Passeriformes
44	<i>Timolia pileata</i> (Red capped babbler)	LC	Passeriformes
45	<i>Turdoides caudatus</i> (Common babbler)	LC	Passeriformes
46	<i>Orthotomus sutorius</i> (Common tailor bird)	LC	Passeriformes
47	<i>Saxicoloides caprata</i> (Pied bushchat)	LC	Passeriformes
48	<i>Soxicolodea fulicatus</i> (Indian robin)	LC	Passeriformes
49	<i>Anthus rufulus</i> (Paddy field pipit)	LC	Passeriformes
50	<i>Motacilla maderaspatensis</i> (Large pied wagtail)	LC	Passeriformes
51	<i>Dicaeum erythrorhynchos</i> (Tickell's flower pecker)	LC	Passeriformes
52	<i>Cinnyris lotenius</i> (Loten's sunbird)	LC	Passeriformes
53	<i>Nectarinia asiatica</i> (Purple sunbird)	LC	Passeriformes
54	<i>Passer domesticus</i> (House sparrow)	LC	Passeriformes
55	<i>Ploceus philippinus</i> (Baya weaver)	LC	Passeriformes
56	<i>Lonchura punctulata</i> (Spotted munia)	LC	Passeriformes
57	<i>Lonchura Malacca</i> (Black headed munia)	LC	Passeriformes
58	<i>Euodice malabarica</i> (White throated munia)	LC	Passeriformes
59	<i>Lanius schach</i> (Rufous backed shrike)	LC	Passeriformes
60	<i>Ninox scutulata</i> (Brown hawk owl)	LC	Strigiformes
61	<i>Motacilla alba</i> (White wag tail)	LC	Passeriformes

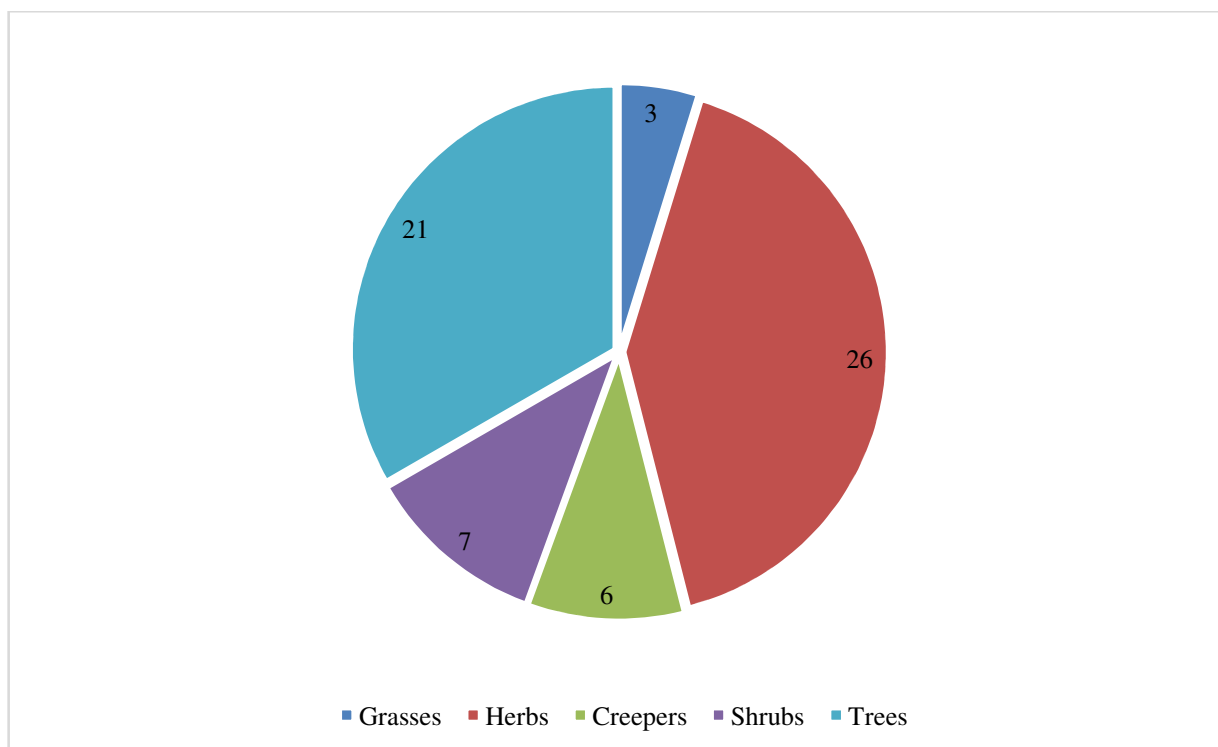


Figure-1: Number of plants observed in the Lake

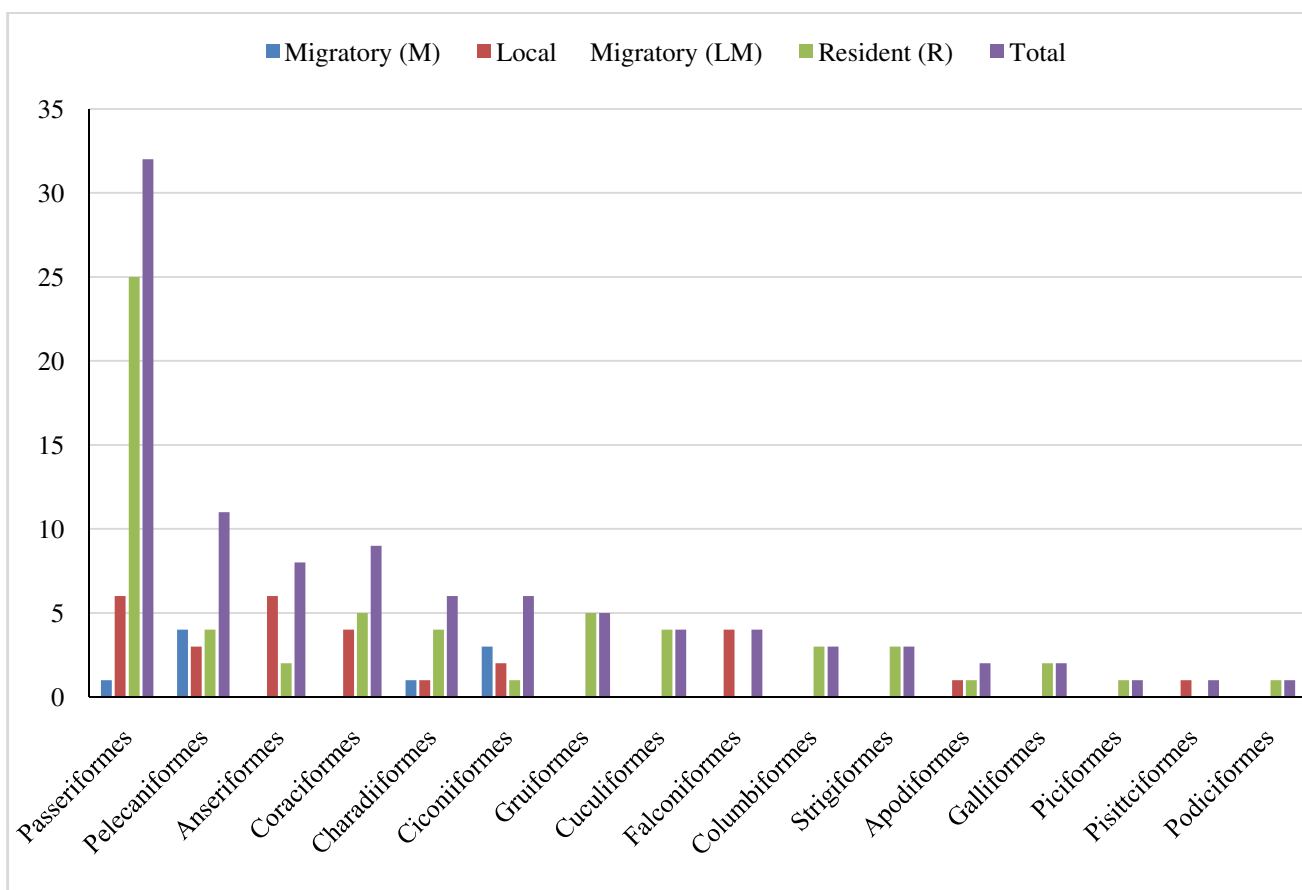


Figure-2: Recorded migratory (M), local migratory (LM) and resident (R) bird species of Vellode lake

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