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ABSTRACT

The biodiversity in Anawilundawa wetland sanctuary was assessed during the period September 2003 to January 2004. 43 line-transects and 13 point counts, located in 7 representative sampling sites, were sampled thrice during the survey period, which covered both the dry and northeast monsoon seasons, and also the migratory season for birds. A night transect and random nocturnal visits were done to record nocturnal animals. The survey was carried out using standard sampling techniques specified in Sutherland (1996) and the flora was documented in 20 m x 20 m quadrats.

The Sanctuary comprised of three major ecosystems, viz.,the freshwater wetland, saltwater wetland and terrestrial ecosystems. Eleven natural and man-made habitat types, nine in the wetland and two in the terrestrial ecosystems, were recognised and documented. The vegetation found in the seasonally inundated habitat on tank fringes (locally referred to as 'Wew thaawulla' forests) which is a mosaic of forest patches, scrublands, short grasslands and marshes was high in biodiversity. The tank system supported a high variety of migratory and native waterfowl.

A total of 290 plant species, representing 95 families, were recorded from Anawilundawa, including one endemic (*Vernonia zeylanica*) and two nationally threatened species (*Aponogeton natans* and *Diospyros ebenum*). Among the 60 introduced species recorded were nine invasive alien plants, two of which, (*Eichhornia crassipes* and *Salvinia molesta*) were found to vigorously invade aquatic habitats. In all, 24 aquatic plant species, 120 woody tree species, 61 shrub species, 49 herbaceous species, 34 species of climbers and 2 species of epiphytes were recorded. A rare mangrove plant *Xylocarpus granatum* was also recorded from Anawilundawa.

A total of 240 native inland vertebrate species, amounting to 34% of the recorded species in Sri Lanka, were observed in Anawilundawa. It was supplemented by 37 species of migrant birds and four introduced fish species bringing the total checklist to 281 vertebrate species belonging to 116 families. Ten species are endemic to Sri Lanka, while 21 species are nationally threatened (IUCN Sri Lanka, 2000). The vertebrates consist of 47 species of fish, 11 species of amphibians, 34 species of reptiles, 168 species of birds, and 21 species of mammals.

Invertebrates recorded at Anawilundawa were 78 species of butterflies, belonging to five families with one endemic species (*Troides darsius*) and 13 nationally threatened species; 13 species of dragonflies and damselflies belonging to four families; and six species of aquatic molluscs representing six families.

Major threats to biodiversity in Anawilundawa have been documented under habitat loss, degradation and modification, direct use and over-exploitation of species, spread of invasive alien species and natural factors, and a qualitative evaluation of site-specific threats was done.

Based on the findings the sanctity was zoned into a core area and a buffer zone and some areas to expand the sanctuary were also identified. Recommendations were made including measures to enhance management of the sanctuary, mechanism to manage water in the wetland, establish a biodiversity monitoring programme, implement awareness raising activities and to promote regulated eco-tourism in the area in close collaboration with local communities.

1. INTRODUCTION

The Anawilundawa wetland sanctuary (7°42'N, 79°49'E), 1400 ha in extent, is located between the coast and the Negombo-Puttalam railway, in Puttalam District of the North Western Province of Sri Lanka. Chilaw, 10 km to the south, and Puttalam, 35 km to the north, are the nearest main towns (Figure 1.1). The wetland consists of an ancient group of shallow cascading tanks, ranging from 12-50 ha in extent, built around 1140 AD by King Parakramabahu. The system consists of seven small irrigation tanks, namely, Pinkattiya, Wellawala, Maradansole, Irakka-wela/Ihala Wewa, Anawilundawa, Suruwila and Maiyawa, aligned from north to south. The surface area of the tanks total to about 188 ha, with none exceeding a depth of 4 m at its deepest point, generally near the bund, at full storage level. They are separated from each other by low earthen bunds, which now are largely overgrown. To the west of the reservoirs is a large area of paddy fields (412 ha) interspersed with islets of natural vegetation. Further west is a canal, constructed by the Dutch, joining the Mundel Lake in the north, and the Deduru Oya and Sengal Oya (*oya is the local term for stream*) estuaries in the south (CEA, 1994).

Anawilundawa is a rainfed tank system. Its main sources are surface run-off water from Rathambala Oya basin with a catchment of 215 km^2, and spill water from the Katupotha tank located upstream. Water levels are highest when the rainfall peaks during the northeast monsoon, from October to November. Any excess water is released through an outlet in the bund of Maiyawa tank, into the Sengal Oya connected to the Dutch canal, which flows into the sea (CEA, 1994). Usually the tanks are completely dry by next mid-September.

The Anawilundawa sanctuary is in the dry zone of the western lowlands of Sri Lanka, and has a moderately hot and dry climate. The mean annual temperature recorded at the Puttalam observatory is 26°C. The average relative humidity is 75% and is highest in December. The annual rainfall for the area is about 1000 - 1500 mm. Geologically the Sanctuary area is largely quaternary deposits including sand dunes, clay, silt and red earths, on underlying Precambrian crystalline rocks. The wetland complex borders an ancient lagoon that was formed behind a barrier beach (CEA, 1994).

On account of the rich bird diversity associated with the Anawilundawa wetland, the Department of Wildlife Conservation (DWC) declared it as a Sanctuary in June 1997, under the provisions of the Fauna and Flora Protection Ordinance. According to the Government Gazette No. 979/15 of 11th June 1997, the boundaries of the sanctuary are demarcated by the Udappuwa – Battuluoya road in the north, the Chilaw – Puttalam railway in the east, the Sengal Oya in the south, and the Dutch canal in the west. Based on its unique biodiversity, cultural heritage, functional value as a feeding ground for migratory waterfowl and its contribution towards the sustenance of local livelihoods, the Anawilundawa Sanctuary was recognized as a Wetland of International Importance under the Ramsar Convention in August 2001, following a joint request made by DWC and IUCN – The World Conservation Union.

A number of local communities continue to live within Anawilundawa Sanctuary and directly depend on it for their livelihoods and food security. Approximately 90% of the estimated 2,500 families in and around the sanctuary area depend on agriculture, primarily paddy cultivation, based on irrigation water from the tanks. Local people are also engaged in subsistence fishery in the tanks. Other commercial activities include coconut cultivation, coastal fishing, and prawn farming, while a number of local and foreign eco-tourists visit the sanctuary, mainly to observe birds.

The Ramsar Convention requires contracting parties to assess the biodiversity status of sites declared as Ramsar wetlands, followed by subsequent monitoring at regular intervals. It has been observed that this wetland of global significance is deteriorating due to several anthropogenic factors. Therefore establishing a baseline of biodiversity status of the sanctuary is of utmost importance. With a view to contributing

towards the future conservation and participatory management of the Anawilundawa Sanctuary and Ramsar Wetland, IUCN – The World Conservation Union undertook a biodiversity assessment during the latter part of the year 2003. It was intended to document the current status of biodiversity in the sanctuary and the various threats it faces, to support and facilitate informed management decisions.

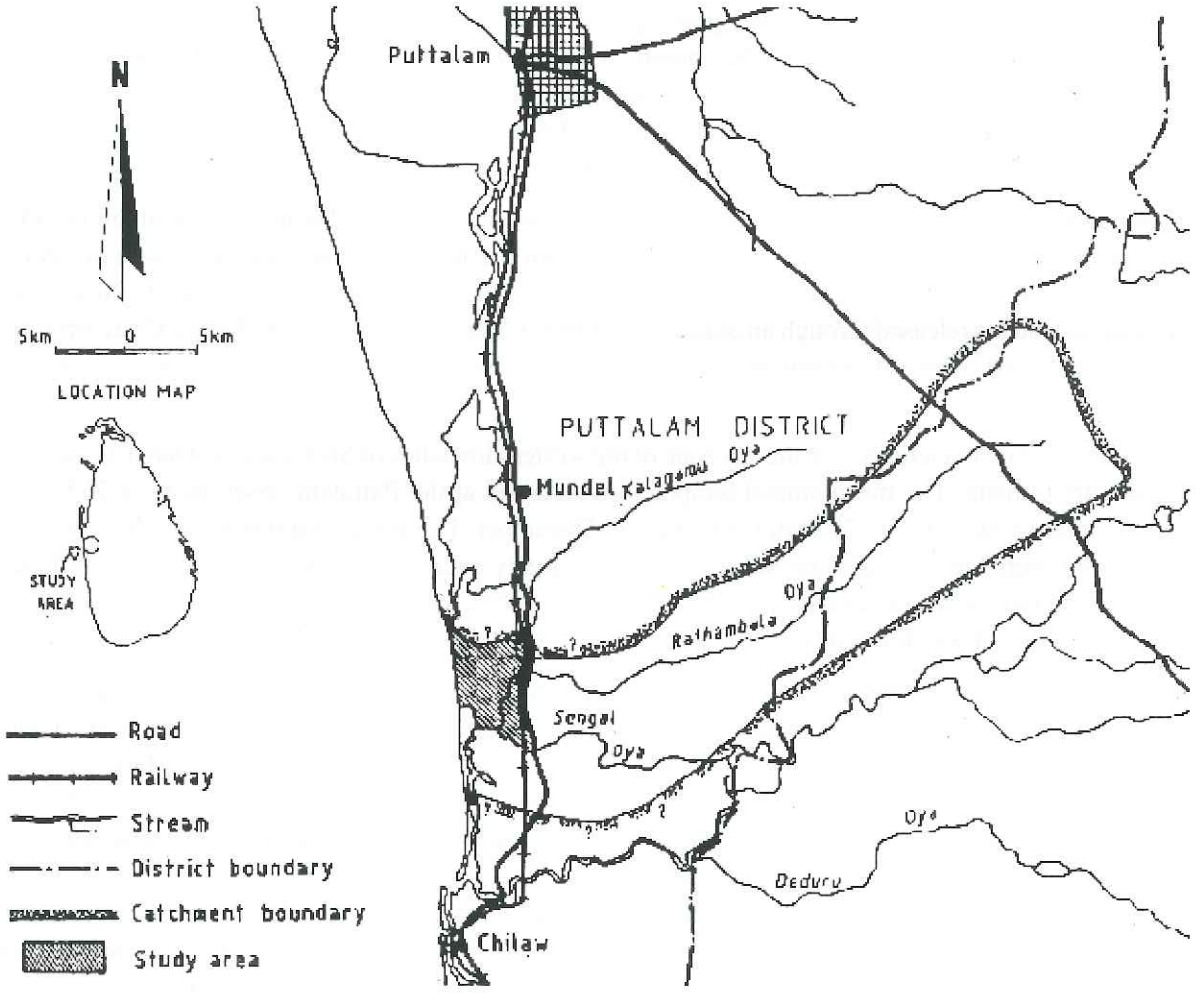

Figure 1.1: Location of Anawilundawa wetland sanctuary (Study Area)
Source: CEA/Euroconsult (1994)

2. RESEARCH METHODOLOGY

The main elements of the study to assess the biodiversity of the Anawilundawa sanctuary were:

- A review of existing secondary information on the study area.
- An initial reconnaissance survey of the study area to identify different habitats and vegetation types associated with them, select representative sampling sites, plan out sampling schedules and verify the pre-planned sampling methods.
- Inventorying the fauna and flora at each sampling site, using standard scientific techniques.
- Assessment of the threats to biodiversity at each sampling site.

2.1 Selection of sampling sites

The sanctuary was the focus of the study and was generally conducted within its boundaries. However, the Dutch canal and Nagul-eliya island to the west of the sanctuary, and the stretch of beach south of Muthupanthiya were also surveyed, in view of the ecological importance of these sites. The selection of sampling sites, based on their accessibility, representative nature and spatial distribution in the sanctuary, was facilitated by a reconnaissance survey using the base maps on vegetation and land-use types of the Anawilundawa Sanctuary prepared by the Central Environmental Authority (CEA) in 1994.

In categorizing the habitats the structure and composition of their vegetation, level of human disturbance and their hydrological and edaphic features were considered. Five sampling sites were identified in the freshwater wetland system and associated terrestrial landscape, namely, Pinkattiya, Wellawala-Maradansole complex, Anawilundawa, Suruwila and Maiyawa. The brackish water wetland system and associated terrestrial habitats were surveyed at two sites, namely, Muthupanthiya and Nagul-eliya. At each of these sites, all the main habitat types were surveyed for flora, vertebrate fauna and selected invertebrate taxa.

2.2 Period, frequency and time of sampling

The field survey commenced in September 2003 and was completed in January 2004. Over these 5 months, field sampling was carried out at fortnightly intervals. The duration of each sampling session was six consecutive days and each site was surveyed thrice, at different times of the day, to avoid any time bias. The 5-month survey period spanned both the dry season and the wet northeast monsoon season, and also included the migratory season for birds. A 5 km transect was also surveyed regularly, at night, and random nocturnal visits were made to representative sampling sites to record nocturnal animals.

2.3 Sampling techniques

A rapid reconnaissance survey of the entire project area was done to identify major habitat types and their distribution. Checklists of flowering plant species in these habitats were prepared to estimate their conservation importance in terms of their floristic richness, sensitive species and ecological services. Structure and composition of non-forest vegetation types were studied qualitatively by recording descriptive characters and visual features. Forests were studied qualitatively as well as quantitatively. Trees with stem girth of at least 10 cm at breast height, were enumerated in 20 m x 20 m forest plots (three per habitat) to calculate the Important Value Index (IVI). The IVI for individual species was calculated as the sum of relative frequency, relative density and relative basal area dominance (Curtis, 1959).

The fauna were surveyed employing standard sampling techniques specified in Sutherland (1996), with slight modifications to suit the existing field conditions. All major vertebrate taxa (fish, amphibians,

reptiles, birds and mammals) were studied qualitatively and quantitatively. The invertebrate survey focused on few selected taxa, namely butterflies, dragonflies and aquatic snails.

Fish were sampled by random cast netting and drag netting and also by examining subsistence and commercial catches. Herpetofauna were documented along 100 m x 10 m transects in representative habitats and supplemented with day and night opportunistic visual encounters. Wetland birds were documented by 20-minute point counts (100 m radius; 3 sites per wetland), while forest and scrubland birds were documented along 100 m x 40 m transects. Mammals were documented in a qualitative manner, using direct observations and indirect clues, mainly defecation and tracks. Butterflies were documented along 100 m x 10 m transects, using a sweep net.

2.4 Identification and nomenclature of fauna and flora

The inland flora of the Anawilundawa Sanctuary were identified and classified using Dassanayake, M. D. & Fosberg, F. R. (eds.) (1980 - 1991), Dassanayake, M. D., Fosberg, F. R. & Clayton, W. D. (eds.) (1994 - 1995), and Dassanayake, M. D., & Clayton, W. D. (eds.) (1996-1999). The fresh and brackish water fish were identified using Pethiyagoda (1990); De Bruin et al. (1994). Among the herpetofauna, the amphibians were identified using Dutta & Manamendra-Aarachchi (1996), while the reptiles were identified using Deraniyagala (1953), De Silva (1980), and De Silva (1990). The birds and mammals were identified and classified using Harrison & Worfolk (1999) and Phillips (1980) respectively. Among the inland invertebrates, the butterflies and dragonflies were identified using D'Abrera (1998) and De Fonseka T.(1998) respectively, while the fresh water molluscs were identified using Rao (1989) and Nagg F. (1996).

2.5 Preparation of digitized maps of the distribution of habitat types

Recent aerial photographs and land-use maps obtained from the Survey Department were subjected to a ground-truthing exercise and geo-referencing using a GPS meter. Digital maps of the habitat types associated with the Anawilundawa ancient tank system were then prepared using GIS and remote sensing techniques.

2.6 Zonation of the sanctuary and assessment of threats to biodiversity

Based on the observations on biodiversity (ecosystems, habitats and species) and land-use (human settlements and agriculture), a core area and a buffer zone were identified for the Anawilundawa sanctuary. To facilitate the management of this protected area the severity of threats posed to the biodiversity of each study site was identified using specific indicators. Adjacent areas that are best incorporated into the existing sanctuary were also identified and mapped.

3. RESULTS

The Anawilundawa wetland harbours a rich aquatic faunal and floral diversity that is further enriched by the seasonal migration of waterfowl. Eleven major habitat types were documented from the sanctuary including nine aquatic habitats and two terrestrial habitats depicting the high level of habitat diversity, which in turn contributes to increase the species diversity as well. The eastern border of the tank system is fringed by a unique habitat type, which is locally known as 'Wew Thaawulla' consisting of a mosaic of secondary dry zone forest and riparian forest patches, scrubland patches, seasonally inundated short grasslands, and marshy waterholes. This special type of habitat is found in the flood receding zone of many ancient irrigation tanks in the dry zone of Sri Lanka. It is a natural vegetation assemblage that has evolved around man-made reservoirs. This habitat sustains a high biodiversity and has many functional values. A total of 290 plant species including many with food and medicinal value were recorded within this array of different habitats in Anawilundawa.

In terms of the faunal diversity, the present survey has recorded many new species which were not documented in the past surveys done in Anawilundawa (CEA/Euroconsult, 1994; Ceylon Bird Club, 1992). In addition to the higher number of species recorded i.e 281 vertebrate species and 97 invertebrate species, the sanctuary provides habitats to large aggregations of birds especially migrants such as the Garganey *(Anas querquedula)* and Pintail *(Anas acuta)* which use the tank system as their main feeding grounds. The butterfly species such as Common Crow *(Euploea core)*, Plain Tiger *(Danaus chrysippus)* Common Tiger *(Danaus genutia)*, and Blue Tiger *(Tirumala limniace)* uses the 'Wew Thaawulla' in large numbers as a refuge during the dry season. It also provides habitat for a healthy population of the Grey Slender Loris *(Loris lydekkerianus)*.

3.1 Habitat types and their characteristic vegetation

3.1.1 Habitat diversity in Anawilundawa

Several wetland and terrestrial habitat types were located in Anawilundawa sanctuary and its periphery, and they can be classified in the following manner.

1. Wetland habitats.

1.1. Freshwater wetland habitats
- 1.1.1. Cascading tanks
- 1.1.2. Waterways (canals, streams) and associated riparian vegetation
- 1.1.3. Marshes including seasonally flooded grasslands and reed beds.
- 1.1.4. Paddy lands (managed)
- 1.1.5. Seasonally inundated mosaic of vegetation on the fringe of the tanks

1.2. Saltwater wetland habitats
- 1.2.1. Mangroves
- 1.2.2. Salt marsh and maritime grasslands
- 1.2.3. Brackish water canals
- 1.2.4. Beach and gentle sea shore vegetation

2. Terrestrial habitats
- 2.1.1. Tank bund vegetation
- 2.1.2. Homegardens and road-side forblands

Figure 3.1 shows the distribution of some major habitat types within the Anawilundawa sanctuary

3.1.2 Characteristics of different habitat types

1. Wetland habitats.

1.1. Freshwater wetland habitats

1.1.1. Cascading tanks

A series of distinctive plant assemblages occur in the wetland mosaic of tanks influenced by salinity level, biological impacts, water level fluctuations, depth and other ecological parameters.

The lentic zone of a tank could be categorised, on the basis of its surface vegetation, as open areas, areas covered with native floating macrophytes (*Nelumbo nucifera* and *Nymphaea pubescens*) and areas with invasive alien plants such as Water hyacinth (*Eichhornia crassipes*), and Salvinia (*Salvinia molesta*). The areas with mixed submerged, rooted and floating vegetation consist of *Nymphaea pubescens*, *Utricularia* sp., *Ceratophyllum demersum*, *Polygonum* spp., *Ludwigia adscendens* and planktonic algae. The peripheral belt of the tanks consists of seasonally flooded grassland with short grasses and sedge species with *Cynodon dactylon*, *Cyperus* spp. and *Fimbristylis* spp. being common.

These different types of habitat sub units, such as assemblages of free floating, sub merged, rooted and sedge plants, have a role in maintaining vital habitat conditions for breeding, feeding, hiding and resting of many faunal species.

1.1.2. Waterways (canals, streams) and associated riparian vegetation

These are open waterways created either naturally or artificially, which periodically or continuously maintain a flow of water between two stagnant water bodies. The structure and composition of vegetation in running water bodies are highly dynamic and are influenced by many factors such as flow conditions, organic accumulation, decomposition, pollution, surface run off, flooding, sediment trapping, shading, land configuration, physical disturbance etc. Hence, abiotic factors influence the type of vegetation. Generally, the vegetation associated with canals and rivers are herbaceous formations consisting of emergents, rooted, floating and submerged plants. Among the low growing emergent species *Cyperus* spp., *Fimbristylis* spp. and *Cynodon dactylon* are common. The most frequently encountered rooted hydrophyte is *Typha angustifolia*. Species such as *Eichhornia crassipes, Pistia stratiotes* and *Salvinia molesta* float on moving water. Few submerged species, e.g. *Ceretophyllu dummersum*, *Hydrilla verticillate, Cabomba* sp. and *Naja* sp. occur in certain locations. *Eichornia crassipes*, an invasive floating macrophyte, can be considered as the dominant species in most parts of canals and the Sengal Oya.

Riparian vegetation can be observed along Sengal Oya, the canal feeding Anawilundawa tank from Pahini-emba and other minor irrigation canals. Generally the vegetation is degraded and patches of riverine shrub communities are intermixed. *Terminalia arjuna* (Kumbuk) is the commonest tree species while *Barringtonia acutangula* (Ela medilla) and *Vitex leucoxylon* (Nabada) are also observed in riparian scrub forests.

Terminalia arjuna as the largest tree component occupies the canopy (up to 20 m). The understorey (15 m and below) which includes treelets/shrubs and herbaceous species like *Azadirachta indica, Lantana camara, Eupatorium odoratuum, Croton lacifer, Streblus asper* and *Salacia chinensis* forms an impenetrable thicket. The adjacent slow moving waters of the streams abound with herbaceous species like *Pistia stratiotes* (Diya paradel), *Lemna* sp., and *Nymphaea pubescens* (Olu).

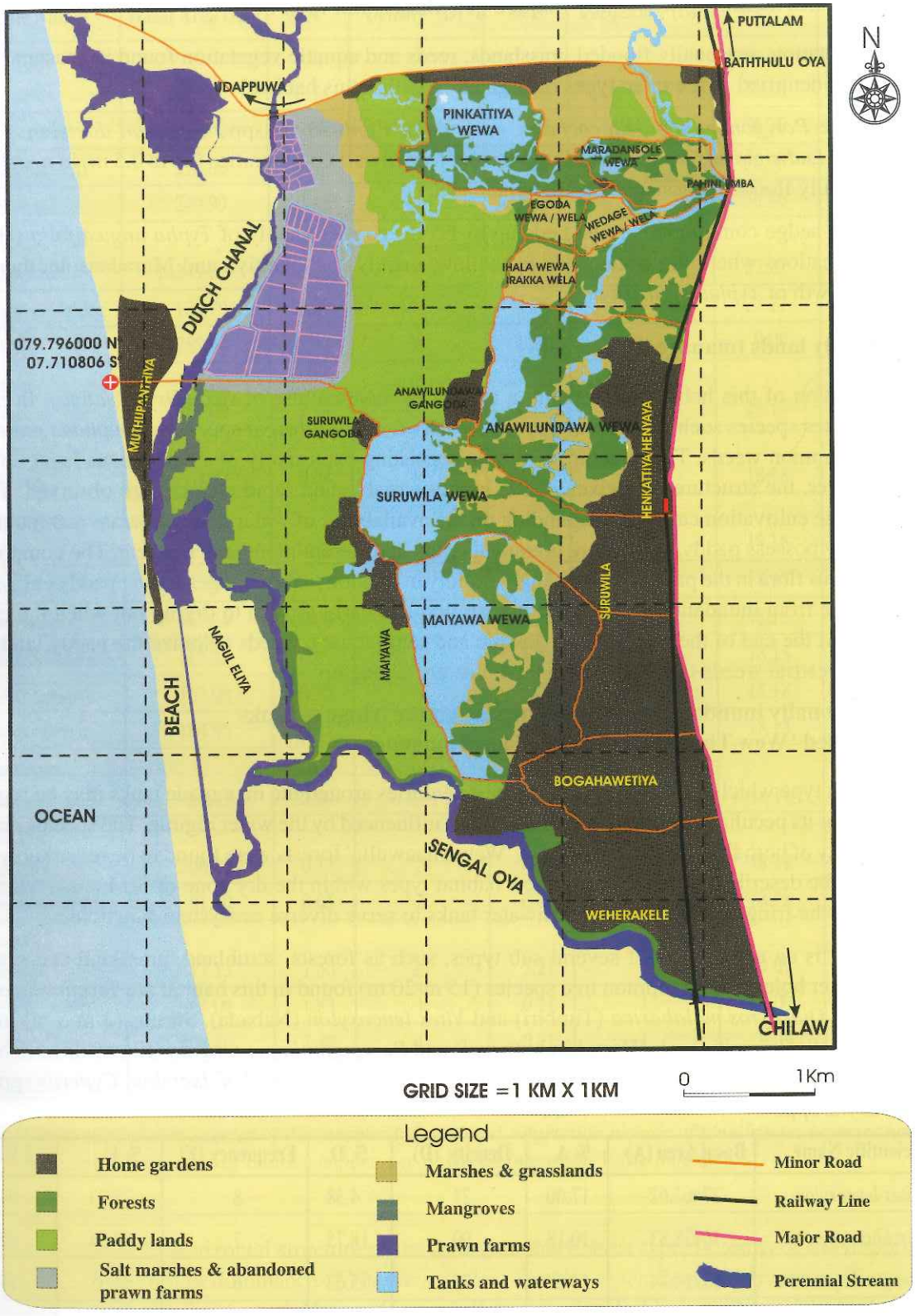

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Figure 3.1: Some major habitat types within the Anaivilundawa sanctuary

1.1.3. Marshes including seasonally flooded grasslands and reed beds

Marsh vegetation, seasonally flooded grasslands, reeds and aquatic vegetation found in seasonal water holes were identified as the main types of vegetation within this habitat.

Species like *Polygonum* spp., *Elaeocharis geniculata, Fimbristylis* spp., *Cynodon dactylon, Ottelia alismoides, Ludwigia adscendens* and *Cyperus* spp. form dwarf communities (up to 0.5 m) in marshlands and seasonally flooded grasslands of Anawilundawa.

Marshy tall sedge communities (reed beds up to 1.5 m) consist mainly of *Typha angustifolia* (Hambu pan). At locations where the water body is shallow, mainly at Pinkattiya and Maradansole, there is a profuse growth of *Typha angustifolia.*

1.1.4. Paddy lands (managed)

The vegetation of this habitat was mainly a cultivated monoculture of rice *(Oryza sativa).* In poorly managed sites species such as *Cyperus* spp., *Fimbristylis* spp. *Ludwigia* spp. and *Nymphaea pubescens* occur as common weeds. The structure is simple consisting exclusively of a herbaceous layer up to 75 cm. However, the structure of a given site is highly variable and rapid changes are observed. This is related to the cultivation calendar. Depending on the availability of water and deliberate manipulations, the site may possess paddy, weed flora or annual crops in different months of the year. The composition of herbaceous flora in the paddy fields changes rapidly in relation to the changes during paddy cultivation, which range from inundation during land preparation and early growth to drying out when the crop is maturing. At the end of the rainy season aquatic and semi-aquatic weeds colonize the paddy lands, and later on terrestrial weeds take over when the fields are drying up.

1.1.5. Seasonally inundated, vegetation mosaic on the fringe of tanks (Called 'Wew Thaawulla' forests in local language)

This habitat type which has evolved over the past centuries around the man made tanks may be regarded as unique for its peculiar bio-physical characteristics influenced by the water regime. The species richness and diversity of both flora and fauna in these 'Wew Thaawulla' forests were found to be remarkably high. This could be described as one of the richest habitat types within the dry zone of Sri Lanka, which has evolved on the fringes of man-made freshwater tanks to serve diverse ecosystem functions.

The habitat is an assemblage of several sub types, such as forests, scrubland, grassland and seasonal marshy water holes. Most common tree species (15 m-20 m) found in this habitat are *Terminalia arjuna* (Kumbuk), *Diospyros malabarica* (Timbiri) and *Vitex leucoxylon* (Nabada). Shrubs (2 m-5 m) include *Premna* sp., *Salacia chinensis* (Heen himbutu wel) and *Barringtonia acutangula* (Ela medilla). The low growing herbaceous plant species are grasses and sedges such as *Cynodon dactylon, Cyperus* spp., and *Fimbristylis* spp.

Scientific Name	Basal Area (A)	% A	Density (D)	% D	Frequency (F)	% F	*I V I*
Vitex leucoxylon	27462.62	17.00	21	4.38	8	72.73	94.10
Streblus asper	16438.83	10.18	90	18.75	7	63.64	92.56
Pongamia pinnata	23714.44	14.68	75	15.63	6	54.55	84.85
Diospyros malabarica	5436.46	3.37	21	4.38	5	45.45	53.20
Terminalia arjuna	31321.14	19.39	30	6.25	3	27.27	52.91

Scientific Name	Basal Area (A)	% A	Density (D)	% D	Frequency (F)	% F	*IVI*
Memecylon umbellatum	1197.92	0.74	68	14.17	4	36.36	51.27
Ixora coccinea	629.00	0.39	26	5.42	4	36.36	42.17
Salacia chinensis	518.00	0.32	25	5.21	4	36.36	41.89
Premna spp.	249.99	0.15	11	2.29	4	36.36	38.81
Lannea coromandelica	14349.02	8.88	8	1.67	3	27.27	37.82
Atalantia ceylanica	108.79	0.07	6	1.25	3	27.27	28.59
Ficus spp.	24768.44	15.33	1	0.21	1	9.09	24.63
Strychnos nux-vomica	3448.09	2.13	3	0.63	2	18.18	20.94
Glycosmis mauritiana	64.47	0.04	8	1.67	2	18.18	19.89
Pleiopermium alatum	1264.34	0.78	4	0.83	2	18.18	19.80
Walsura trifoliolate	433.99	0.27	6	1.25	2	18.18	19.70
Croton lacifer	151.64	0.09	6	1.25	2	18.18	19.53
Ziziphus oenoplia	117.15	0.07	6	1.25	2	18.18	19.50
Drypetes sepiaria	167.09	0.10	5	1.04	2	18.18	19.33
Diospyros ferrea	184.95	0.11	4	0.83	2	18.18	19.13
Barringtonia acutangula	66.43	0.04	3	0.63	2	18.18	18.85
Phyllanthus polyphyllus	206.13	0.13	2	0.42	2	18.18	18.73
Berrya cordifolia	81.40	0.05	2	0.42	2	18.18	18.65
Lepisanthes tetraphylla	2417.13	1.50	25	5.21	1	9.09	15.80
Syzygium cumini	2963.09	1.83	1	0.21	1	9.09	11.13
Schleichera oleosa	2408.40	1.49	1	0.21	1	9.09	10.79
Crateva adansonii	845.76	0.52	5	1.04	1	9.09	10.66

Table 3.1: Important woody species of the seasonally inundated, vegetation mosaic of tank fringes (species have been listed in descending order of relative importance based on Important Value Index).

Quantitative studies on horizontal structure of the forests in this habitat type, in terms of the Important Value Index (IVI) shows the dominance of *Vitex leucoxylon, Streblus asper, Pongamia pinnata, Diospyros malabarica, Terminalia arjuna* and *Memecylon umbellatum* having IVI values above 50 (Table 3.1). Among them *Vitex leucoxylon, Pongamia pinnata* and *Terminalia arjuna* are typical water loving tree species, naturally found in association with riverine forests of the drier areas of Sri Lanka. *Vitex leucoxylon* is the most widespread woody plant recorded in eight study plots.

Species such as *Streblus asper, Diospyros malabarica* and *Memecylon umbellatum* are usually found in well-drained high ground in the dry zone. But they can extend in to moist pockets of the same landscape, though they are not characteristic riverine elements. However, the prominence of such plants indicates drier conditions at least in upper soil layers of this habitat for most of the year. Their growth is shrubby with a large number of individuals. *Streblus asper* is the densest woody species recorded, with a density value of 90.

Terminalia arjuna grows to a massive size when adequate ground water is available and often is the most prominent tree. It scored the highest basal cover of 31321 cm^2. Although quantitatively less prominent, several other plants favouring riverine habitats i.e. *Ixora coccinea, Barringtonia acutangula* and *Syzygium cumini* were also encountered. Generally, judging by the quantitative abundance of the different plant species, this habitat appears to be a drier system than the riverine forests. The seasonal nature of the water sources has greatly influenced the floristic composition of this habitat.

1.2. Saltwater wetland habitats

1.2.1. Mangroves

Mangrove vegetation was found mainly on the banks of the Dutch canal, and composed of common mangrove plants such as *Avicennia marina* (Kanna), *Avicennia officinalis* (Kanna), *Excoecaria agallocha* (Tela kiriya), *Rhizophora mucronata* (Kadol), and *Acanthus ilicifolius* (Katu ikili). Well-developed mangroves in Anawilundawa usually reach up to 5 m to 6 m.

The *Xylocarpus granatum* (Mutti kadol), which is a rare plant found only in few mangrove stands in Sri Lanka was also found in the Anawilundawa sanctuary. It was also found in Nagul-eliya located outside the boundary of the sanctuary. This study proposes its incorporation in the sanctuary.

1.2.2. Salt marsh and maritime grasslands

Salt marshes show a patchy distribution intermixed with grasslands influenced by salt water. Salt marsh vegetation consists of clumps of succulents, 5 cm-10 cm high, in a mat formation, in certain open areas with highly saline soil and exposed to the scoching sun. Salt tolerant species such as *Suaeda maritima, Suaeda monoica, Suaeda vermiculata,* and *Salicornia brachiata* are commonly found in salt marsh vegetation within and adjacent to Anawilundawa sanctuary. Usually,50% of the ground is devoid of vegetation and species like *Cynodon dactylon and Cyperus* spp. occur intermittently. Environmentally extreme conditions such as atmospheric dryness, soil salinity, desiccating salt spray, perennially high temperature, excessive evaporation do not attract other plant species to such locations. Several patches of healthy salt marshes are found outside the present sanctuary boundary on the western side, mainly between the Dutch canal and the coastline in Nagul-eliya area, which are presently being threatened by expanding prawn farms. It is proposed that these areas are also incorporated in the sanctuary.

The maritime grasslands consisting of short stature grasses (5 cm-10 cm high) are found as patches in the landscape. The structure and floristic composition of the grassland system is highly influenced by the level of moisture stress. The main species of grasses include *Cynodon dactylon, Panicum repens, Eragrostis* spp., and *Cyperus rotandus.* However, the site-specific moisture levels influence the species dominance and composition.

1.2.3. Brackish water canals

Densely growing beds of sea grass is the vegetation type found in the brackish water canal system. It consists of a single species *(Halophila* spp.*)*, a lentic macrophytic plant growing fully submerged, attached to the canal bed.

1.2.4. Beach and gentle seashore vegetation

Beach and the gentle seashore vegetation were found outside the boundary of the sanctuary. However, this system interacts biologically with the sanctuary and therefore proposed to be incorporated into the sanctuary. Few patches of young mobile sand dunes found in the coastline adjacent to the Anawilundawa sanctuary are frequented by herbaceous species (up to 25 cm high) such as *Spinifex littoreus* (Maha ravana ravula), *Ipomoea pescapre* (Bin tamburu) and *Canavalia rosea* (Mudu awara), with occasional clumps of Pandanus trees. They can withstand strong winds and desiccation.

2. Terrestrial habitats

2.1.1. Tank bund vegetation

Tank bund vegetation is a minor vegetation type composed of tree species such as *Terminalia arjuna* (Kumbuk), *Azadirachta indica* (Kohomba), *Madhuca longifolia* (Mee), *Azima tetracantha, Mitragyna tubulosi* (Helamba), *Ziziphus oenoplia* (Heen eraminiya) and *Thespesia populnea* (Gansuriya) which are common in occurrence. The trees of varying heights, ranging from 10 m-25 m, are scattered forming an open type vegetation. The common shrubs and herbs, below 2 m include *Lantana camara, Panicum maximum, Eupatorium odoratum* and *Sida* spp.

2.1.2. Homegardens and road-side forblands

Home gardens are managed systems and mainly composed of cultivated perennial crops of various height classes: trees 10 m-25 m, shrubs 2 m-5 m and herbs below 2 m. Several tree species, which are of commercial importance such as *Cocos nucifera* (Coconut), *Artocarpus heterophyllus* (Kos), *Artocarpus incisus* (Rata del), and *Swietenia mahagoni* (Mahogany) can be found in home-gardens. Home-gardens in Anawilundawa are dominated by Coconut. Roadside vegetation and unmanaged areas of home gardens, which has been subjected to continuous human disturbances over a long period have developed in to forb-lands. A mixture of shrubs (2 m-4 m) and herbaceous plants (below 2 m) consisting of *Abutilon indicum, Lantana camara* (Gandapana), *Eupatorium odoratum* (Podisinghomarang) and *Mimosa pudica* (Nidikumba) are found in these forblands, of which *L. camara* and *E. odoratum*, are alien invasive species.

3.2 Flora and their life forms

3.2.1 Species composition of flora and their life forms

A total of 290 plant species, representing 95 families, were recorded from habitat types recognised in Anawilundawa (and described above) (Annex 1). Among these was one endemic species *(Vernonia zeylanica)* and two nationally threatened species *(Aponogeton natans and Diospyros ebenum)*. Of the 60 introduced species recorded, nine were invasive alien plant species. Two alien species *(Eichhornia crassipes* and *Salvinia molesta)* had vigorously invaded aquatic habitats. Among the exotic plant species 14 were recorded exclusively from home gardens. There were 24 aquatic plant species, 120 woody tree species, 61 shrub species, 49 herbaceous species, 34 species of climbers and two species of epiphytes among the plant species documented. Shrubs (woody multi-stemmed plants) and herbs (plants with non-woody stems) are the predominant plant life forms in the terrestrial habitats of Anawilundawa.

There were marked differences in the species richness of the plant habitat types. The highest number of plant species was found among the tank bund vegetation (176 species), followed by the seasonally

inundated vegetation of tank fringes (167 species). The lowest number of plant species was documented from the brackish-water canal. Even though the vegetation associated with tank bunds and roadsides harbours a large number of plant species, many are weeds and exotic plants, including invasive alien species that establish in cleared and disturbed areas. In contrast, the vegetation of the seasonally inundated fringe areas of tanks was very rich in indigenous flora. The unique structure and species composition of this habitat is also noteworthy.

The most abundant plant species found in the different habitat types are presented in Table 3.1. The number of plant species recorded in each habitat in Anawilundawa is shown in Figure 3.2.

Habitat type	Scientific Name	Family	Local name
Cascading tank system	*Nelumbo nucifera*	Nelumbonaceae	Nelum
	Eichhornia crassipes	Pontederiaceae	Japan jabara
	Nymphaea pubescens	Nymphaeaceae	Olu
	Neptunia oleracea	Fabaceae	Diya nidikumba
	Utricularia aurea	Lentibulariaceae	Diya pasi
Waterways (canals, streams) and associated riparian vegetation	*Pongamia pinnata*	Fabaceae	Magul Karanda
	Terminalia arjuna	Combretaceae	Kumbuk
	Ceretophyllu dummersum	Ceratophyllaceae	
	Eichhornia crassipes	Pontederiaceae	Japan jabara
	Pistia stratiotes	Araceae	Diya Paradel
	Salvinia molesta	Salviniaceae	Salvinia
Marshes including seasonally flooded grasslands & reed beds	*Cyperus spp.*	Cyperaceae	
	Fimbristylis spp.	Cyperaceae	
	Cynodon dactylon	Poaceae	
	Typha angustifolia	Typhaceae	Hambu pan
Paddy fields	*Oryza sativa*	Poaceae	Goyan
	Cyperus spp.	Cyperaceae	
	Fimbristylis spp.	Cyperaceae	
Seasonally inundated, mosaic of vegetation on tank fringes	*Streblus asper*	Verbenaceae	Nabada
	Pongamia pinnata	Fabaceae	Magul karanda
	Vitex leucoxylon	Verbenaceae	Nabada
	Terminalia arjuna	Combretaceae	Kumbuk
	Salacia chinensis	Hippocrateaceae	Heen himbutu
Mangroves	*Excoecaria agallocha*	Euphorbiaceae	Tel kiriya
	Avicennia marina	Avicenniaceae	Kanna
	Lumnitzera racemosa	Combretaceae	Beriya
	Rhizophora mucronata	Rhizophoraceae	Kadol
	Dolichandrone spathacea	Bignoniaceae	Diya danga
Salt marsh and maritime grasslands	*Suaeda maritima*	Chenopodiaceae	
	Suaeda monoica	Chenopodiaceae	
	Suaeda vermiculata	Chenopodiaceae	
	Salicornia brachiata	Chenopodiaceae	

Habitat type	Scientific Name	Family	Local name
Brackish water canal	*Halophyla ovalis.*	Hydrocharitaceae	
Beach and gentle sea shore vegetation	*Spinifex littoreus*	Poaceae	Maha Rawana
	Ipomoea pescapre	Convolvulaceae	Bin Thamburu
	Pandanus kaida	Pandanaceae	Weta-keiya
Tank bund vegetation	*Azadirachta indica*	Meliaceae	Kohomba
	Madhuca longifolia	Sapotaceae	Mee
	Terminalia arjuna	Combretaceae	Kumbuk
	Lantana camara	Verbenaceae	Gandapana
	Eupatorium odoratuum	Asteraceae	Podisinghomarang
	Croton lacifer	Euphorbiaceae	Keppetiya
Home gardens & Road-side forblands	*Cocos nucifera*	Arecaceae	Pol
	Limonia acidissima	Rutaceae	Divul
	Mangifera indica	Anacardiacea	Amba
	Abutilon indicum	Malvaceae	Atha
	Lantana camara	Verbenaceae	Gandapana
	Eupatorium odoratum	Asteraceae	Podisinghomarang
	Mimosa pudica	Fabaceae	Nidikumba

Table 3.2: Dominant plant species in different habitat types in Anawilundawa wetland sanctuary.

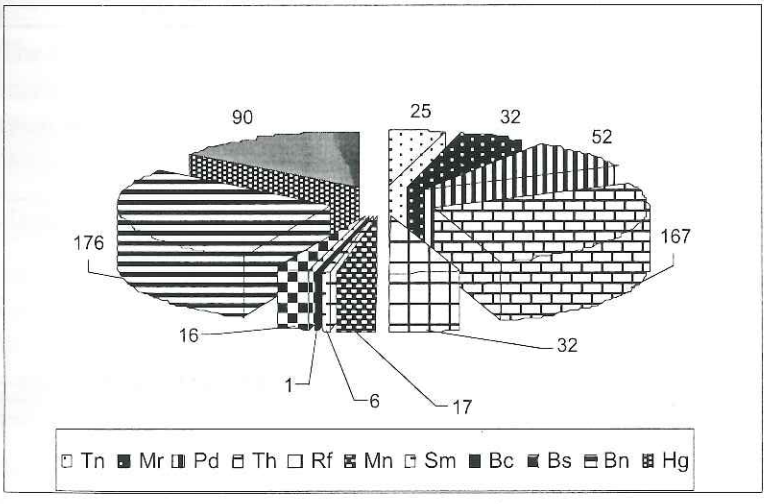


Figure 3.2: Number of plant species recorded in different habitat types

Tn - Cascading tanks, irrigation canals and streams.

Mr - Marsh including seaonally flooded grassland & reed bed

Pd - Paddy land

Th - Tank fringes (Wew thaawulla)

Rf - Riparian forest

Mn - Mangrove

Sm - Saltmarsh & martitie grassland

Bc - Brackishwater canal

Bs - Beach & seashore vegetation

Bn - Tank bund vegetation and roadside forbland

Hg - Homegardens & road-side forblands

3.3 Fauna in Anawilundawa

3.3.1 Vertebrate fauna

A total of 281 vertebrate species, belonging to 116 families, were recorded from Anawilundawa, of which, 10 (4%) were endemic species and 21 (8%) nationally threatened species (IUCN Sri Lanka, 2000). The vertebrates are comprised of 47 species of fish, 11 species of amphibians, 34 species of reptiles, 168 species of birds, and 21 species of mammals, and amount to 34% of the total native inland vertebrate species recorded from Sri Lanka (Table 4.1).

Group	No of species recorded in Anawilundawa	No. of Endemic species	No. of Nationally threatened species
Freshwater fish	30 (includes 4 exotics)	3	2
Brackish water fish	17		
Amphibians	11	1	1
Inland reptiles	34	3	6
Birds	168 (includes 37 winter migrants)	2	8
Mammals	21	1	4
Total	**281**	**10**	**21**

Table 3.3: A Summary of inland vertebrate fauna recorded in the Anawilundawa Sanctuary

Fish

A total of 30 species of freshwater fish, belonging to 12 families, were recorded from the tanks, canals and other freshwater habitats, out of which 3 species are also found in brackish water habitats.

Seventeen species of brackish water fish, belonging to 16 families, were recorded in the Dutch canal and associated brackish water habitats (Annex 02). These include salt-water dispersants eg. Level-finned/ Short-finned eel – *Anguilla bicolor*), marine forms eg. Common Glassfish/Naked-head Glass Perchlet – *Ambassis commersoni*; brackish water forms eg. Dwarf panchax - *Aplocheilus parvus*; and freshwater forms eg. Murrel – *Channa striata*.

The endemics recorded from the freshwater habitats of the sanctuary include the Flying Barb (*Esomus thermoicos*), Filamented Barb (*Puntius sinhala*) and Walking Catfish (*Clarius brachysoma*). Amongst them, the Flying Barb and Walking Catfish are nationally threatened. The introduced species, four in all, were dominated by Tilapia (*Oreochromis mossambicus*).

The Murrel (*Channa striata*), Stinging Catfish (*Heteropneustus fossilis*), Pearl Spot (*Etropus suratensis*), Tilapia (*Oreochromis mossambicus*) and Snakeskin Gourami (*Trichogaster pectoralis*) are the species that are abundant in the tank system, while Dwarf Panchax (*Aplocheilus parvus*) and the Silver Beddy (*Gerres abbreviatus*) are common species in the Dutch canal.

Amphibians

Anawilundawa wetland Sanctuary harbours eleven species of amphibians belonging to 5 families (Annex 03). Of these, one species, Sri Lankan Wood Frog – *Rana gracilis*, is endemic and threatened as well. The common amphibians in Anawilundawa include toads eg. Common Toad – *Bufo melanostictus*, frogs eg. Six-toed Green Frog – *Euphlyctis hexadactylus*, Skipper Frog – *E. cyanophlyctis* and tree frogs eg. Chunam Tree-Frog – *Polypedates maculatus*. Most of these species could be observed after a short spell of rain, in tanks and riparian areas, roadside habitats, tank bunds and water holes, mainly at dusk. The Six-toed Green Frog (*Euphlyctis hexadactylus*) and the Common Paddy Field Frog (*Limnonectes limnocharis*) are the commonest amphibian species in Anawilundawa.

Reptiles

The reptiles recorded from Anawilundawa amount to 34 species belonging to 13 families (Annex 04), and include three endemic species and six species that are nationally threatened. The reptilian fauna of Anawilundawa occupies a wide range of ecological niches, such as freshwater eg. Flapshell Turtle – *Lissemys punctata*, terrestrial eg. Star Tortoise – *Geochelone elegans,* Cobra – *Naja naja*, fossorial eg. Commom Lanka Skink - *Lankascincus fallax,* and Red Throat Little Skink *Sphenomorphus rufogulus*, and arboreal eg. Geckoes- *Hemidactylus frenatus*, *H.brookii*, Green Vine Snake – *Ahaetulla nasutus*, habitats. A fairly high population of the nationally threatened Star Tortoise was observed in seasonally flooded grasslands. The serpents of Anawilundawa include three highly venomous species in Sri Lanka: the Cobra, Russell's Viper (*Daboia russelii*) and the Common Indian Krait (*Bungarus caeruleus*). The endemic reptile species recorded from Anawilundawa wetland sanctuary are Commom Lanka Skink and Red Throat Little Skink.

Avifauna

The mosaic of wetland and terrestrial habitats in Anawilundawa has made it a paradise for birds, including many migratory species. More than half Sri Lanka's native bird species, i.e. 131 species were recorded from the sanctuary (Annex 05) including two endemic species, and eight nationally threatened species. With 37 species of winter migrants Anawilundawa harbours a total of 168 bird species belonging to 56 families. The birds of Anawilundawa can be categorized into several groups based on their habitat preference: Wetland birds (Waders, Gulls, Terns, Ducks, Herons, Egrets, Storks, Cormorants, Kingfishers, etc.), Forest birds (Woodpeckers, Barbets, Pigeons, Raptors), Scrubland birds (Bulbuls, Doves) and Grassland birds (Munias, Prinias, Pipits, Larks and Raptors).

The tanks and associated wetlands such as marshes and seasonally flooded grasslands provide ideal resting and feeding habitats for numerous species of winter migrants, especially the wading birds and waterfowl. The latter consists of large aggregations of Ducks such as Garganeys (*Anas querquedule*) and Pintails (*A. acuta*). The vast numbers of migratory Stints, Sandpipers, Plovers, Terns, Gulls and especially Ducks share the wetlands with resident wetland birds such as Herons, Egrets, Pelicans, Cormorants, Teals, Storks and Stilts. The migratory bird species begin to arrive in Anawilundawa by mid-August, with the commencement of the harsh winter season in the northern hemisphere, and continue to stay till late April. Anawilundawa provides one of the first feeding grounds for the migratory birds that come through the western coastal migratory route and enter Sri Lanka from the Mannar area. The most common native aquatic bird species observed in the Anawilundawa tanks were the Purple Coot (*Porphyrio porphyrio)* and the Pheasant-tailed Jacana (*Hydrophasianus chirurgus*), which are well adapted to live among the floating vegetation.

The presence of dry zone mixed species feeding flocks of birds is another interesting phenomenon in Anawilundawa, especially in the riparian forests in between Anawilundawa tank and the Pahini-emba. The White-vented Drongo (*Dicrurus caerulescens*) often leads these mixed species bird flocks comprised of 10-20 individuals from about eight different speciescontaining. The commonest member of mixed flocks in Anawilundawa is the Purple-rumped Sunbird *(Nectarinia zeylonica).*

Mammals

A total of 21 species of mammals, belonging to 14 families, were recorded in Anawilundawa (Annex 06), including one endemic (Toque monkey – *Macaca sinica*) and four threatened species. The mammals have diverse food habits, and could be caregorised as: granivorous (rats and mice), frugivorous (bats, Toque monkey), small herbivores (black-naped hare, mouse deer), carnivores (fishing cat, rusty-spotted cat, mongoose), insectivores (micro-chiroptera) and scavengers (jackal). Although several species of micro-chiropterans and small mammals (rats and shrews) were observed, most of them could not be captured for identification. A small herd of three to four Elephants have occasionally visited the sanctuary during the dry season in the recent past. The highlight was the presence of a considerably high population of the threatened slender loris (*Loris lydekkerianus*). The tank riparian habitat harbours two species of threatened wild cats: the rusty spotted cat (*Prionailurus rubiginosus*) and the fishing cat (*P. viverrinus*). The tanks and the adjoining undisturbed habitats serve as an important refuge for the threatened Indian otter (*Lutra lutra*) as well.

3.3.2 Invertebrate fauna

The rich array of butterflies recorded in Anawilundawa includes 78 species, belonging to 5 families (Annex 07). Amongst them is the largest butterfly in Sri Lanka – the Ceylon Birdwing (*Troides darsius*), which is endemic to the island and threatened as well. A total of 13 nationally threatened species of butterflies were recorded. The most common species in Anawilundawa include species of the Family Pieridae (Mottled Immigrant - *Catopsilia pyranthe* and Small Grass Yellow - *Eurema brigitta*), Family Nymphalidae (Blue tiger - *Tirumala limniace*, Common Tiger - *Danaus genutia* and Plain Tiger - *Danaus chrysippus)* and Family Lyceanidae (Lesser Grass Blue - *Zizina otis*).

In addition to butterflies, a total of 13 species of dragonflies and damselflies, representing 4 families (Annex 08), were recorded in Anawilundawa. Six species of aquatic molluscs belonging to 6 families were also recorded from aquatic habitats in the sanctuary (Annex 09).

3.4 Threats

The major threats to biodiversity observed in Anawilundawa could be broadly categorized as follows:

a. Habitat loss, degradation and modification ;
b. Direct use and over-exploitation of species ;
c. Spread of invasive alien species and
d. Natural factors.

The contributory factors and issues related to these threats are discussed below.

3.4.1. Habitat loss, degradation and modification

A combination of several factors has contributed to the qualitative and quantitative degradation and even the loss of wetland and terrestrial habitats in Anawilundawa sanctuary. These include issues related to the supply and persistence of water in the tank system and to harmful anthropogenic activities.

a. Water supply, retention and extraction

The tanks receive water mainly from the Deduru Oya through a canal system. This supply is severely impaired due to heavy upstream sand and clay mining for housing and the brick and tile industries. Excavations have deepened the Deduru Oya riverbed by several feet, preventing the flow of water into the diversion canal, during the dry season. The inadequacy of water in the dry season has reduced the number of freshwater habitats in Anawilundawa, thus affecting the feeding and breeding cycles of aquatic species. Siltation of the tanks has reduced their capacity to retain sufficient freshwater. The dilapidated state of most sluice gates regulating water flow between the cascading tanks and the paddy fields, and the unregulated extraction by paddy cultivators has further aggravated the situation.

b. Reclamation of land for settlements, agriculture and shrimp farms

The growing human population in and around the sanctuary has resulted in illegal reclamation of land for the expansion of village settlements and cultivation. Parts of some tank beds have been reclaimed for homesteads and coconut plantations, viz in the upper catchments of the Wellawa tank area and the Maradansole area. The issue is further complicated due to lack of information on the extent of private land within the sanctuary, and many people living outside claim ownership of land inside the sanctuary.

The establishment and expansion of shrimp farming between the paddy fields and the beach has led to the loss of healthy mangrove stands along the banks of the Dutch Canal. Consequently, there is a loss of habitat for fish that used these stands as breeding and nursery grounds, as well as the birds that used them for resting, roosting and nesting and used mudflats and associated habitats for feeding. Other valuable habitats such as salt marshes have also been destroyed due to shrimp farm expansion.

c. Man-made (deliberate) fires

Setting fire to the vegetation in the fringe of the tanks or '*Wew thaawulla*' forest, during the dry season, is a harmful practice carried out by poachers, who hunt terrapins and other animals. Villagers report that this practice has increased during the recent past. A recent man-made fire has destroyed approximately 10 acres of the fringe of Anawilundawa tank, and damaged the root bases of more than 152 *Terminalia arjuna* 'Kumbuk' trees.

d. Extraction of clay from the tank bed

The extraction of clay from the tank beds under the pretext of de-silting, has been carried out for quite some time, by brick makers. This is now a regular practice in the dry season, facilitated by prolonged droughts. Recurrent mining and deep extraction of clay has damaged the hard-pan of the tankbed thus increasing the losses due to seepage. Clay mining was observed in the Maiyawa, Suruwila and Anawilundawa tanks. Maiyawa seems to be the most affected.

e. Unregulated cattle grazing

The natural vegetation of the tank bunds and fringe areas are being degraded due to unregulated grazing by cattle, whose population within the sanctuary is about 1600 individuals. The seasonally flooded

grasslands surrounding tanks, in particular, are severely damaged due to trampling by buffalo and cattle. Those grasslands play an indispensable ecological role in sustaining the herbivore population in the area. Also at stake, is the regeneration of grasslands due to livestock damage, and many patches of expanding bare ground were observed.

f. Direct use and over-exploitation of species

Felling of trees, poaching, unsustainable harvesting of fish and other wetland biological resources, unsustainable extraction of non-timber forest products (NTFPs), and accidental animal mortality are some of the ways in which species are directly exploited.

g. Timber felling

Signs of timber felling were observed mostly in the fringe areas of tanks (especially in the Suruwila and Anawilundawa *wew thaawulla*) and on tank bunds. Local people reported that most of the valuable trees in the wew thaawulla have been felled during the past two decades. Stumps of large 'Kumbuk' trees were observed in the riparian areas of Anawilundawa and Suruwila tanks.

h. Poaching

Villagers provided information about the poachers who visit the sanctuary frequently, especially during weekends and holidays. Poachers supply soft-shelled terrapins, hard-shelled terrapins, land monitor and waterfowl to meet the demand of the hotels in the area. Hunting for domestic consumption by some traditional hunters is also a regular occurrence.

i. Unsustainable harvesting of fish and other wetland biological resources

Harvesting of fish from the tank system is a traditional livelihood activity. The traditional fishing devise used is the *'Karak gediya'*. However, the over-collection of fish trapped in pockets of water during the dry season is a serious issue when water holes are emptied using motorised water pumps. This results in the indiscriminate capture of both juveniles and adults, which is a serious impediment to the regeneration of fish populations. Another cause for concern is the use of mechanical fishing devices by outsiders, violating the traditional user rights of people living within the sanctuary.

When the tank beds are exposed during drought periods, locals and non-residents extract the lotus yams for both domestic and commercial purposes. Non-residents from as far away as Puttalam and Anuradhapura, regularly collect lotus flowers and water lilies in large quantities for commercial purposes.

Unsustainable extraction of bivalves takes place in the Dutch canal in the Nagul-eliya area, to be used in the preparation of prawn feed.

j. Unsustainable extraction of Non-Timber Forest Products (NTFPs)

The collection of firewood for domestic purposes is an established practice in most villages, and is considered as a traditional right. Currently, this extraction in limited quantities does not appear to threaten the site's ecological character. However, the ongoing large-scale collection of firewood for industries (brick making and pottery), many of which operate within a few kilometres of the Sanctuary, is a serious issue. Certain medicinal plants such as 'Heen Himbutu' (*Salacia chinensis*) have also been extracted in an unsustainable manner during the recent past.

k. Accidental mortality of animals

Many species of reptiles and amphibians were recorded to be victims of road-kills along the Chilaw-Puttalam main road and the other minor roads. Few species of mammals and birds were also amongst the road-kills. Electrocution of three Slender Lorises and many Flying Foxes, on the power lines running through and along the boundaries of the sanctuary, were recorded during the survey period.

l. Spread of invasive alien species

The spread of invasive alien species and unmanaged domestic animals pose serious threats to the biodiversity of Anawilundawa. The invasive animals recorded include domestic/feral cats and dogs, which attack and prey on small wild animals. There were nine species of invasive alien plants of which two viz Water hyacinth (*Eichhornia crassipes)* and Salvinia (*Salvinia molesta)*, are spreading vigorously, displacing native aquatic plants and wildlife habitats. They have negatively affected the illumination level of water bodies, nutrition budget, oxygen level, space availability, etc of this life supporting system. A recent study in Anawilundawa shows that the spread of water hyacinth affects the habitat of the Pheasant-tailed Jacana (*Hydrophasianus chirurgus*), which generally avoids occupying areas infested with water hyacinth (Abeygunawardane, 2004). A gradual establishment and spread of Mesquite (*Prosopis juliflora*) is prevalent in the Nagul-eliya area, which could be further facilitated by the clearance of vegetation in the area.

3.4.2. Natural factors

Records for Puttalam area show a continuous reduction in rainfall during the recent past. As a result, the tank system has suffered considerably during the last few years, especially during the August–October period. Most of the water holes and tanks dry up completely during the prolonged drought period, causing severe stress to wild animals.

Area	Ana	Suru	Mai	Well	Pink	Muth	Nag
Non-availability of water (volume and seasonality*)	M	M	H	H	H	0	0
Clearing of mangroves for prawn farm expansion (area cleared**)	0	0	M	0	0	M	H
Reclamation of land for settlements/agriculture (area reclaimed**)	0	0	0	H	0	0	0
Man-made fires (area destroyed**)	H	0	0	0	0	0	0
Extraction of clay (area subjected to extraction**)	M	M	H	0	L	0	0
Poaching (frequency of occurrence***)	H	M	0	0	H	0	0
Unsustainable harvesting of fish (field observations on harvesting methods)	M	M	H	M	0	0	0
Timber felling (stumps of trees****)	M	M	M	M	L	H	H
Spread of invasive alien plants (percentage cover of plants*****)	H	H	M	H	H	0	L
Human population density (number of families)	M	H	M	L	M	M	L

Table 4.1: Qualitative evaluation of site-specific threats in different areas of Anawilundawa sanctuary (the indicator used to assess the threat is in parenthesis)

Site: Ana – Anawilundawa; Suru – Suruwila; Mai – Maiyawa; Well – Wellawa; Pink – Pinkatiya; Muth – Muthupanthiya; Nag – Nagul-eliya

Scale: 0 = Absent/unknown, L = Low, M = Moderate, H= High

* L = dry for < 2 months per year; M = 2-3 months; H = > 3 months

** L = Area < 5ha; M = Area 5-15 ha; H = Area > 30 ha

*** L = Frequency < once a month; M = once a month; H = > once a month

**** L = Number of stumps < 5; M = 5-10; H = > 10

***** L = Area of cover < 10%; M = 10-20 %; H = > 50%

5. RECOMMENDATIONS

The present survey has clearly revealed that the Anawilundawa wetland sanctuary harbours a rich biodiversity, including several endemic as well as threatened species of plants and animals. However, the study revealed that this wetland is now being threatened by various anthropogenic activities. An objective that received much attention during this study was to explore ways and means of ensuring the sustenance of this ancient man-made wetland ecosystem. Two key proposals in this regard which, stem from the findings of this study, are the development of a conservation management plan with the active participation of all local communities, and the demarcation of zones in the Anawilundawa wetland sanctuary to facilitate its conservation and proper management.

A core area and buffer zone areas were identified and are shown in Figure 5.1. The areas inhabited by humans were identified as buffer zones surrounding the core area of the sanctuary.

The following areas of the sanctuary were identified as biodiversity hotspots, and included in the core area;

- ✯ Riparian area (locally referred to as 'Wew Thaawulla') of Maiyawa, Suruwila and Anawilundawa tanks.
- ✯ The forest patch situated east of the waterway from 'Pahini-emba' to Anawilundawa tank.

The identification of the above hotspots was based on the findings of the Biodiversity Survey and by application of the following criteria:

i. Diversity of habitat types and species (eg. exceptionally high bird and butterfly diversity and butterfly roosting sites in the riparian areas of Suruwila and Maiyawa tanks).

ii. Uniqueness of habitat (Pahini-emba forest patch)

iii. Occurrence of rare species (eg. white-naped woodpecker in Pahini-emba)

iv. Serious threats observed (eg. felling of trees in riparian areas of all tanks, especially in Pahini-emba forest patch).

v. Feeding and roosting sites for birds (Anawilundawa and Suruwila mainly)

The zonation exercise was done within the existing sanctuary boundaries. However, some areas to be included in an expanded sanctuary were also identified. These areas were found to have a significant biological interaction with the habitats in the sanctuary

In addition to the zoning exercise the survey team identified two potential nature trails, which could be used for educational and recreational purposes. The recreational nature trail designed along the stream from Pahini-emba to Anawilundawa tank covers a variety of habitats and rich vegetation. It will provide visitors with the opportunity to observe many kinds of birds, butterflies and plant species. Another nature trail was designed especially for educational purposes in the riparian area of Suruwila tank. This trail which starts from the proposed visitor information centre and DWC Beat Office, traverses the scrub forests and seasonally flooded grasslands.

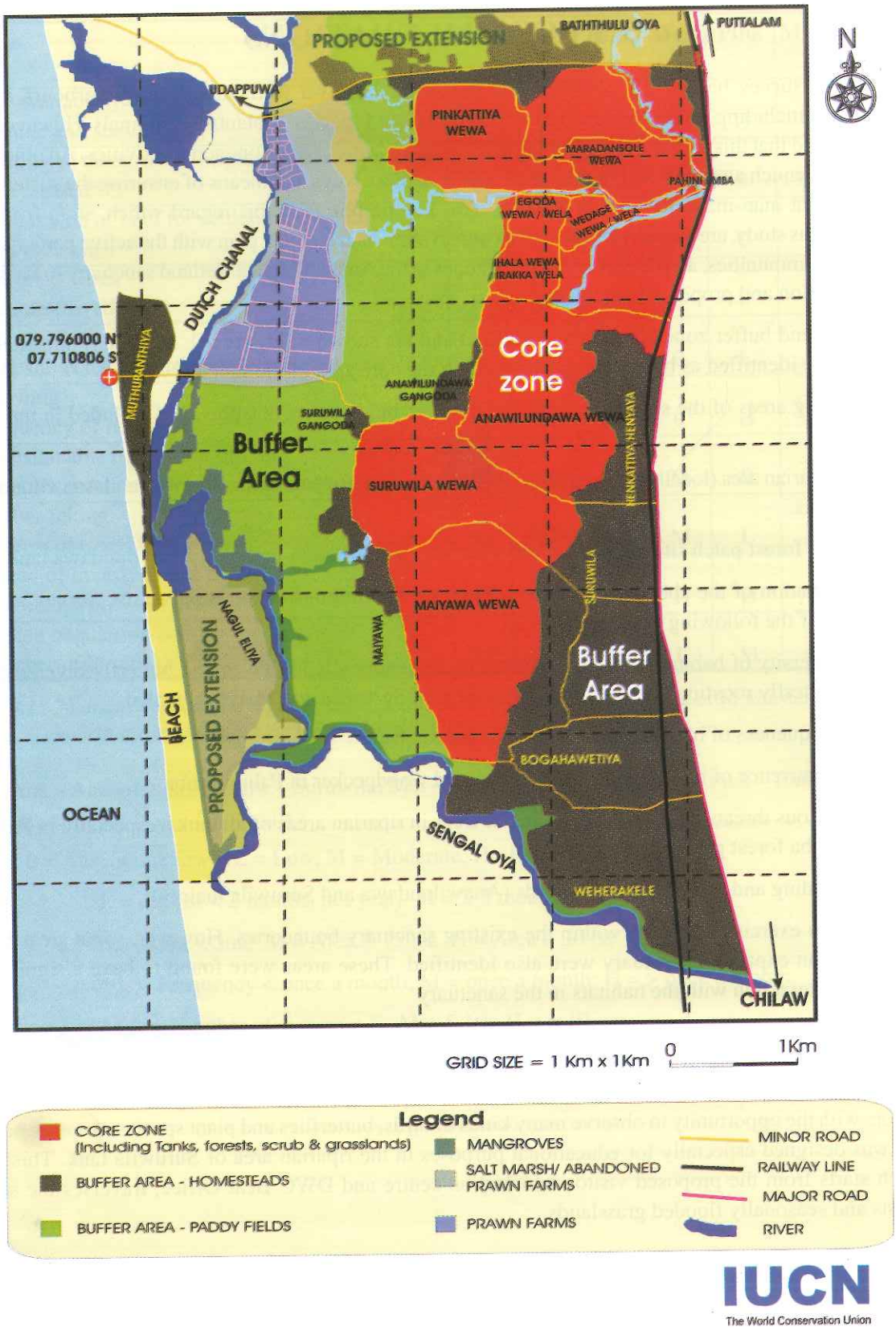


Figure 5.1. Proposed Management zones and extensions for Anawilundawa wetland sanctuary

Recommendations of the IUCN survey team for the conservation and management of the Anawilundawa Wetland Sanctuary are summarised as follows:

5.1 Immediate measures to enhance management of the Anawilundawa sanctuary

- Establish a Beat Office of the Department of Wildlife Conservation (DWC), and station permanent staff.
- Re-demarcate the boundary of the Anawilundawa protected area, designating the core area and the buffer zone, and extending the boundary to cover the Nagul-eliya island, coastal areas south of Muthupanthiya and west of Nagul-eliya including a part of the lagoon, salt marshes, sand dunes and mangroves, and Baththulu Oya area in the North.
- Upgrade the protection status of the core area of the sanctuary, identified during this biodiversity & habitat assessment, to a National Park under the provisions of Fauna and Flora Protection Ordinance. This will ensure its protection while the use of resources is permitted as per regulations.
- Document the extent of private and state lands within the Sanctuary by verifiying the deeds of ownership. Incorporate this information into a digitised map to facilitate long term monitoring.
- Introduce a permit system to ensure the traditional user rights in core areas.
- Enforce strictly the prohibition of land alienation within the Anawilundawa Sanctuary, and enforce the existing laws against timber extraction, poaching and other harmful practices.
- Relocate the few families living near Maradansole tank, which is in the core area of the sanctuary.
- Prepare and gradually implement an Ecosystem Management and Community Development Plan with the participation of all stakeholders, local communities and the DWC.

5.2 Establishment of a mechanism to manage water in the wetland

- Establish a community-based organization (CBO) to regulate the allocation of water for agriculture during the drought and the use of other resources so as to minimse the impact on the wetland.
- Ensure that, the CBO implements regular maintenance of irrigation canals and tanks, through the establishment of a 'Tank Maintenance Fund', in collaboration with the Irrigation Department (ID), and Provincial Irrigation authorities.

5.3 Establishment of a biodiversity conservation and monitoring programme

- The above mentioned CBO to establish a task force to monitor the biodiversity of Anawilundawa and maintain a biodiversity registry, and combat harmful activities, in close collaboration with the DWC.
- Prepare a community-based invasive alien species management strategy, especially for aquatic invasive plants like Water hyacinth, identify control measures for each IAS and train members of the local communities to implement such measures.
- Initiate community-based eco-restoration activities to restore degraded sites, in collaboration with the DWC, IUCN and other interested local conservation NGOs.

5.4 Promote regulated eco-tourism in the area in close collaboration with local communities

- Establish basic infrastructure (an entry point and a ticket counter, public toilets, designated parking areas) within the buffer zone of sanctuary
- Establish designated nature trails.
- Train and establish a group of local guides attached to the CBO, under the supervision of DWC, to accompany the visitors

5.5 Implement awareness raising activities

- Install information boards explaining the Sanctuary's status as a Ramsar Site and its significance in Sinhala, Tamil and English. The boards should be placed at the DWC Beat Office and the points of entry to the Sanctuary.
- Prepare leaflets and awareness material on the biodiversity and conservation value of Anawilundawa Wetland Sanctuary, followed by the conduct of awareness and capacity building programmes on biodiversity conservation for school children, teachers and the local community.
- Establish a Visitor Information Centre and Research Centre with the required infrastructure facilities compatible with the eco-lodge concept. These centres will provide for recreational, educational and research activities, and serve as a site for teaching biodiversity and conservation concepts.
- Establish watch huts for bird watching

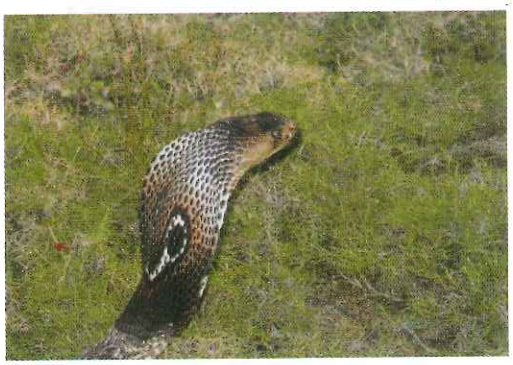
Fauna in Anawilundawa

Black-tailed Godwit
Photograph : Sanjiv de Silva

Common tiger
Photograph : Naalin Perera

Grey Pancy
Photograph : Naalin Perera

Orange breasted green pigeon
Photograph : Sandun Perera



Cobra
Photograph : Sandun Perera

Garaganeys
Photograph : Sanjiv de Silva

Grey headed fish eagle
Photograph : Sanjiv de Silva

Hemidactylus freanatus
Photograph : Sandun Perera

Puntius spp.
Photograph : Naalin Perera

Purple heron
Photograph : Sanjiv de Siva

Skipper spp.
Photograph : Naalin Perera

Star tortoise
Photograph : Roshan Rodrigo

Dragonfly spp.
Photograph : Naalin Perera

Habitats in Anawilundawa

Lentic zones of tank with native floating macrophytes
Photograph by: Sandun Perera

Kumudu
Photograph by: Sandun Perera

Mangroves
Photograph by: IUCN Photo Collection

Mossaic of habitats in tank fringe
Photograph by: Sandun Perera

Salicornia brachiata
Photograph by: IUCN photo collection

Marshes and grasslands
Photograph by: IUCN photo collection

Salt marshes and maritime grasslands
Photograph by: Sandun Perera

Riparian forests
Photograph by:Roshan Rodrigo

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Annex 01
Checklist of plants recorded from Anawilundawa wetland sanctuary

Habitat

Tn - Cascading tanks, irrigation canals and streams; Mr - Marsh including seaonally flooded grassland & reed bed

Pd - Paddy land; Th - Fringing vegetation mossaic of tanks (Wew thaawulla); Rf - Riparian forest

Mn - Mangrove; Sm - Saltmarsh & maritime grassland; Bc - Brackishwater canal; Bs - Beach & seashore vegetation

Bn - Tank bund vegetation and roadside forbland; Hg - Homegarden

Habit:

T - Tree; C - Climber or Creeper; Ep - Epiphyte; H - Herbaceous; S - Shrub; AqH - Aquatic Herb.

TS - Taxonomic status: N - Native, I - Introduced, E - Endemic.

CS - Conservation status: TR - Nationally threatened

Family	Species	Local Name	Habit	TS	CS	Habitat										
						Tn	Mr	Pd	Th	Rf	Mn	Sm	Bc	Bs	Bn	Hg
Acanthaceae	*Acanthus ilicifolius*	katu ikili	S	N	-						x					
	Barleria prionitis	katu karanda	S	N	-				x							
	Hygrophila schulli	niramulli	S	N	-		x	x	x							
	Justicia betonica	sudu puruk	S	N	-				x	x					x	
Agavaceae	*Agave vera-cruz*	hana	H	I	-										x	x
Alismataceae	*Limnophyton obtusifolium*		AqH	N	-	x	x	x								
Amaranthaceae	*Achyranthes aspera*	gas karal heba	H	N	-										x	x
	Aerva lanata	polpala	H	N	-										x	x
	Alternanthera sessilis	mukunu wenna	H	N	-		x	x	x						x	x
	Amaranthus viridis	kura thampala	S	N	-			x							x	x
	Gomphrena celosioides		H	I	-										x	x
Amaryllidaceae	*Crinum asiaticum*	tolabo	H	N	-	x	x	x	x							
	Crinum latifolium	goda manel	H	N	-		x	x	x	x						
Anacardiaceae	*Anacardium occidentale*	cadju	T	I	-										x	x
	Lannea coromandelica	hik	T	N	-				x	x					x	x
	Mangifera indica	amba	T	I	-				x	x					x	x
Apocynaceae	*Allamanda cathartica*	wel ruk attana	S	I	-											x
	Alstonia scholaris	ruk attana	T	N	-				x							
	Carissa spinarum	heen karamba	S	N	-				x	x					x	
	Cerbera odollam	gon kaduru	T	N	-			x	x							
	Ichnocarpus frutescens	grandi wel, priyawarna	C	N	-				x	x					x	
	Nerium oleander	kaneru	T	I	-											x
	Tabernaemontana divaricata	watu sudda, nada wata	S	I	-											x
	Thevetia peruviana		T	I	-										x	x
Aponogetonaceae	*Aponogeton natans*	kekatiya	AqH	N	TR	x		x								
Araceae	*Lasia spinosa*	kohila, engili kohila	H	N	-				x							x
	Pistia stratiotes	diya parandel	AqH	N	-	x	x	x								
Arecaceae	*Areca catechu*	puwak	T	N	-				x						x	x
	Borassus flabellifer	thal	T	I	-			x	x						x	x
	Caryota urens	kitul	T	N	-										x	x
	Cocos nucifera	pol, thanbili, wewara	T	N	-			x	x							x
	Phoenix pusilla	indi	T	N	-			x	x						x	
Asclepiadaceae	*Calotropis gigantea*	wara hele wara	S	N	-			x							x	x

Family	Species	Local Name	Habit	TS	CS	Habitat										
						Tn	Mr	Pd	Th	Rf	Mn	Sm	Bc	Bs	Bn	Hg
	Pergularia daemia	maha medahangu	C	N	-				x						x	x
	Wattakaka volubilis	aguna, kiri anguna	C	N	-										x	x
Asparagaceae	*Asparagus racemosus*	hathawariya	C	N	-				x						x	
Asteraceae	*Eclipta prostrata*	kikirindi	H	N	-		x	x	x	x						
	Eupatorium odoratum		S	I	-			x	x	x					x	x
	Mikania cordata	wathu palu, gam palu	C	N	-			x	x	x					x	x
	Sphaeranthus indicus	mudumahana	H	N	-		x	x	x							
	Tridax procumbens		H	I	-										x	x
	Vernonia cinerea	monarakudumbiya	H	N	-			x	x						x	x
	Vernonia zeylanica	pupula, heen botiya	C	E	-				x						x	
	Wedelia chinensis	ranwan kikiridi	H	N	-			x							x	
	Xanthium indicum	urukossa, wal rambutang	S	I	-			x	x						x	
Avicenniaceae	*Avicennia marina*	kanna	T	N	-						x					
	Avicennia officinalis	kanna	T	N	-						x					
Bignoniaceae	*Dolichandrone spathacea*	diya danga	T	N	-						x					
Bombacaceae	*Ceiba pentandra*	pulun imbul, imbul	T	I	-										x	x
Boraginaceae	*Carmona retusa*	heen thambala	S	N	-				x	x					x	
	Cordia monoica		T	N	-				x						x	
	Heliotropium indicum	ath-honda, dimi biya	H	N	-				x							
Cactaceae	*Opuntia dillenii*	katu pathok	S	I	-										x	
Capparaceae	*Capparis sepiaria*		S	N	-				x	x					x	
	Capparis zeylanica	welangiriya	S	N	-				x						x	
	Cleome viscosa	wal aba	H	N	-			x		x					x	x
	Crateva adansonii	lunuwarana	T	N	-				x						x	
Caricaceae	*Carica papaya*	gas labu, papol	T	I	-										x	x
Casuarinaceae	*Casuarina equisetifolia*	kasa	T	I	-											x
Celastraceae	*Maytenus emarginata*		S	N	-				x	x					x	
Ceratophyllaceae	*Ceratophyllum demersum*		AqH	N	-	x		x								
Chenopodiaceae	*Salicornia brachiata*		H	N	-							x				
	Suaeda maritima		H	N	-							x				
	Suaeda monoica		S	N	-							x				
	Suaeda vermiculata		H	N	-							x				
Clusiaceae	*Calophyllum inophyllum*	domba, tel domba	T	N	-				x						x	x
Colchicaceae	*Gloriosa superba*	niyangala	C	N	-				x					x	x	
Combretaceae	*Lumnitzera racemosa*	beriya	T	N	-						x					
	Terminalia arjuna	kumbuk	T	N	-				x						x	
	Terminalia catappa	kottan, kottamba	T	I	-										x	x
Commelinaceae	*Commelina sp.*		H	N	-		x	x	x	x					x	
Convolvulaceae	*Evolvulus alsinoides*	visnu kranti	H	N	-									x		
	Ipomoea aquatica	kankung	AqH	N	-	x	x	x	x							
	Ipomoea obscura	tel kola	C	N	-			x	x						x	x
	Ipomoea pes-caprae	mudu bin tamburu	C	N	-									x		
	Ipomoea pes-tigridis	divi adiya, divi pahuru	C	N	-				x						x	
Crassulaceae	*Kalanchoe pinnata*	akkapana	H	I	-				x							
Cucurbitaceae	*Coccinia grandis*	kowakka	C	N	-				x	x					x	x
Cyperaceae	*Cyperus arenarius*	mudu kalanduru	H	N	-									x		
	Cyperus pilosus		H	N	-		x	x							x	
	Cyperus sp.1		H	N	-		x	x								
	Cyperus sp.2		H	N	-		x									
	Fimbristylis sp.		H	N	-		x	x								
	Schoenoplectus articulatus	maha geta pan	AqH	N	-	x	x		x							
	Actinoscirpus grossus		H	N	-		x		x							
Dracaenaceae	*Sansevieria zeylanica*	niyanda	H	N	-				x						x	x
Ebenaceae	*Diospyros ebenum*	kaluwara	T	N	TR										x	
	Maba buxifolia		T	N	-				x						x	
	Diospyros malabarica	timbiri	T	N	-				x	x					x	
	Diospyros ovalifolia	kunumella, habara	T	N	-				x							
Erythroxylaceae	*Erythroxylum monogynum*	devadaram	T	N	-				x							
Euphorbiaceae	*Acalypha indica*	kuppameniya	H	N	-			x	x						x	x
	Bridelia retusa	ketakala	T	N	-				x							
	Croton aromaticus	wel keppetiya	S	N	-				x						x	
	Croton bonplandianus		H	I	-			x	x						x	x
	Croton hirtus	val tippili, gan veda	H	I	-			x	x						x	x
	Croton laccifer	keppetiya, gas keppetiya	S	N	-				x						x	
	Drypetes sepiaria	wira	T	N	-				x							
	Euphorbia antiquorum	daluk	T	N	-				x						x	
	Euphorbia heterophylla		H	I	-										x	

Family	Species	Local Name	Habit	TS	CS	Habitat										
						Tn	Mr	Pd	Th	Rf	Mn	Sm	Bc	Bs	Bn	Hg
	Excoecaria agallocha	tela kiriya, tala kiriya	T	N	-						x					
	Flueggea leucopyrus	heen katupila	S	N	-				x						x	
	Jatropha curcas	weta endaru, rata endaru	T	I	-										x	x
	Jatropha gossypiifolia		T	I	-										x	
	Mallotus rhamnifolius	molabe	T	N	-				x						x	
	Manihot esculenta	maiokka	S	I	-										x	x
	Mischodon zeylanicus	tammanna	T	N	-				x							
	Phyllanthus acidus	nelli	T	I	-											x
	Margaritaria indicus	karaw	T	N	-				x						x	
	Phyllanthus polyphyllus	kuratiya	S	N	-				x						x	
	Phyllanthus reticulatus	gas dummala, kaila	S	N	-			x	x						x	
	Ricinus communis	beheth endaru	S	I	-										x	x
	Tragia plukenetii	wel kahabiliya	H	N	-		x	x	x						x	
Fabaceae	*Abrus precatorius*	olinda	C	N	-										x	x
	Acacia caesia	hinguru wel	C	N	-				x	x					x	
	Acacia eburnea		S	N	-				x							
	Acacia leucophloea	katu andara, maha andara	T	N	-										x	
	Acacia melanoxylon		T	I	-										x	x
	Acacia planifrons		S	N	-			x							x	
	Adenanthera pavonina	madatiya	T	I	-										x	x
	Samanea saman	para mara	T	I	-				x						x	x
	Bauhinia racemosa	maila	T	N	-				x	x					x	
	Bauhinia tomentosa	petan, kaha petan	T	N	-				x						x	
	Caesalpinia bonduc	kumburu wel, kalu vavulatiya	C	N	-				x	x					x	
	Canavalia rosea	mudu awara	C	N	-									x		
	Cassia auriculata	ranawara	T	N	-				x	x					x	
	Cassia fistula	ehela	T	I	-									x		x
	Cassia occidentalis	peni tora	S	N	-				x	x					x	x
	Cassia spectabilis	kaha kona	T	I	-											x
	Cassia tora	pethi tora	S	N	-				x	x					x	x
	Clitoria ternatea	katurodu	C	N	-				x						x	x
	Crotalaria laburnifolia	yak beriya	S	N	-		x	x	x						x	
	Crotalaria verrucosa	nil andanahiriya	S	N	-		x	x	x						x	
	Dalbergia candenatensis		C	N	-						x					
	Derris scandens	kala wel, ala wel	C	N	-				x	x					x	
	Derris trifoliata	kala wel	C	N	-									x		
	Desmodium triflorum	heen undupiyaliya	H	N	-		x	x	x	x					x	x
	Dichrostachys cinerea	andara	S	N	-				x						x	
	Erythrina variegata	erabadu	T	N	-										x	
	Gliricidia septum	kona	T	I	-										x	x
	Leucaena leucocephala	ipil ipil	T	I	-										x	x
	Mimosa pudica	nidikumba	H	I	-			x	x	x					x	x
	Neptunia oleracea	diya nidikumba	AqH	N	-	x										
	Parkinsonia aculeata		T	I	-										x	x
	Pithecellobium dulce		T	I	-										x	x
	Pongamia pinnata	gal/magul karanda, karada	T	N	-				x	x					x	
	Prosopis juliflora	kalapu andara	T	I	-									x		
	Tamarindus indica	siyambala	T	I	-				x						x	x
	Tephrosia purpurea	gam pila, pila	H	N	-			x	x						x	x
Goodeniaceae	*Scaevola plumieri*	heen takkada	S	N	-									x		
	Scaevola taccada	takkada	S	N	-									x		
Hippocrateaceae	*Salacia chinensis*	heen himbutu	C	N	-				x							
Hydrocharitaceae	*Halophila* sp.		AqH	N	-								x			
	Ottelia alismoides		AqH	N	-	x	x	x								
Lamiaceae	*Leucas zeylanica*	geta thumba, thumba	H	N	-										x	
	Ocimum americanum	heen tala	H	N	-										x	x
Lauraceae	*Litsea glutinosa*	bo mee, bombee	T	N	-				x						x	
	Persea americana	ali-pera	T	I	-											x
Lecythidaceae	*Barringtonia acutangula*	ela midella	T	N	-				x						x	
Lemnaceae	*Lemna* sp.		AqH	N	-	x		x	x							
Lentibulariaceae	*Utricularia aurea*	diya pasi	AqH	N	-	x										
Limnocharitaceae	*Limnocharis flava*		AqH	I	-	x		x								
Linaceae	*Hugonia mystax*	bugetiya, watti weti	S	N	-				x						x	
Loganiaceae	*Strychnos nux-vomica*	goda kaduru	T	N	-				x						x	
	Strychnos potatotum	ingini	T	N	-				x						x	
Loranthaceae	*Dendrophthoe falcata*	pilila	Ep	N	-				x	x					x	x
Lythraceae	*Pemphis acidula*	kiri maram	S	N	-									x		
Malvaceae	*Abutilon indicum*	anoda	S	N	-				x						x	x

Family	Species	Local Name	Habit	TS	CS	Habitat										
						Tn	Mr	Pd	Th	Rf	Mn	Sm	Bc	Bs	Bn	Hg
	Hibiscus rosa-sinensis	wada, sapaththumal	S	I	-											x
	Hibiscus tiliaceus	beli patta	T	N	-			x	x		x				x	
	Hibiscus vitifolius	maha epala	S	N	-										x	
	Sida acuta	gas bevila	S	N	-				x						x	x
	Sida sp.		S	N	-										x	
	Thespesia populnea	suriya	T	N	-		x								x	x
Marsileaceae	*Marsilea quadrifolia*		AqH	N	-	x	x	x	x							
Martyniaceae	*Martynia annua*	naga darana	S	I	-										x	
Melastomataceae	*Memecylon umbellatum*	korakaha	S	N	-				x						x	
Meliaceae	*Azadirachta indica*	kohomba	T	N	-				x	x					x	x
	Walsura trifoliolata	kirikon, mal petta	T	N	-				x							
	Xylocarpus granatum	mutti kadol	T	N	-						x					
Menyanthaceae	*Nymphoides hydrophylla*	kumudu,	AqH	N	-	x										
Moraceae	*Artocarpus heterophyllus*	kos	T	I	-											x
	Ficus benghalensis	nuga, maha nuga	T	N	-				x						x	
	Ficus exasperata	bu thediya	T	N	-				x						x	
	Ficus hispida	kota dimbula	T	N	-				x						x	
	Ficus racemosa	attikka	T	N	-				x						x	
	Ficus religiosa	bo	T	I	-				x						x	x
	Ficus tinctoria	Gas anguna/netul wal ehetu	T	N	-				x						x	
	Ficus sp.1		T	N	-										x	
	Ficus sp.2		T	N	-				x							
	Streblus asper	geta netul	T	N	-				x							
	Streblus taxoides	gongotu	T	N	-				x							
Moringaceae	*Moringa oleifera*	murunga	T	I	-										x	x
Musaceae	*Musa x paradisiaca*	kehel	T	I	-											x
Myrsinaceae	*Aegiceras corniculata*	heen kadol	T	N	-						x					
Myrtaceae	*Syzygium cumini*	madan, maha dan	T	N	-				x						x	x
Myrtaceae	*Psidium guajava*	pera	T	I	-										x	x
Nelumbonaceae	*Nelumbo nucifera*	nelum	AqH	N	-	x										
Nymphaeaceae	*Nymphaea nouchali*	manel	AqH	N	-	x										
	Nymphaea pubescens	olu	AqH	N	-	x	x									
Oleaceae	*Jasminum angustifolium*	wal pichcha	C	N	-				x						x	
	Jasminum auriculatum		C	N	-				x						x	
Onagraceae	*Ludwigia adscendens*	beru diyanilla	AqH	N	-	x										
Orchidaceae	*Vanda tessellata*		Ep	N	-										x	
Pandanaceae	*Pandanus odoratissimus*	wetakeyiya	S	N	-									x		
Passifloraceae	*Passiflora foetida*		C	I	-				x						x	x
Periplocaceae	*Hemidesmus indicus*	iramusu, heen iramusu	C	N	-				x						x	
Poaceae	*Bambusa vulgaris*	kaha una	T	N	-										x	x
	Cymbopogon nardus	mana, heen pengiri	H	N	-										x	
	Cynodon dactylon	ruha	H	N	-		x	x	x	x					x	x
	Imperata cylindrica	iluk	H	N	-		x	x							x	
	Panicum maximum	rata tana	H	I	-				x						x	
	Phragmites karka	nala gas	S	N	-				x						x	
	Spinifex littoreus	maha ravana ravula	C	N	-									x		
Polygonaceae	*Antigonon leptopus*		C	I	-										x	x
	Persicaria attenuata	Sudu-kimbul-wenna	AqH	N	-	x			x							
	Persicaria glabrum		AqH	N	-	x			x							
Pontederiaceae	*Eichhornia crassipes*	japan jabara	AqH	I	-	x		x	x							
	Monochoria vaginalis	diya habarala	AqH	N	-	x		x								
Pteridaceae	*Acrostichum aureum*	karen koku	H	N	-			x			x					
Punicaceae	*Punica granatum*	delum	T	I	-											x
Rhamnaceae	*Ziziphus mauritiana*	masan, maha debara, dabara	T	N	-				x						x	
	Ziziphus oenoplia	heen-eraminiya	S	N	-				x						x	
Rhizophoraceae	*Bruguiera cylindrica*	mal kadol	T	N	-						x					
	Rhizophora mucronata	kadol	T	N	-						x					
Rubiaceae	*Benkara malabarica*	pudan	S	N	-				x							
	Canthium coromandelicum	kara	T	N	-				x							
	Catunaregam spinosa	kukurumanna	T	N	-				x						x	
	Hydrophylax maritima	mudu geta kola	H	N	-									x		
	Ixora coccinea	rathmbala	S	N	-				x						x	
	Ixora pavetta	maha ratambala	T	N	-				x							
	Mitragyna tubulosa	helamba	T	N	-				x						x	
	Morinda coreia	ahu	T	N	-										x	
	Psydrax dicoccos	gal karanda, panduru	T	N	-										x	
	Tarenna asiatica	tarana	S	N	-				x						x	
Rutaceae	*Aegle marmelos*	beli	T	I	-				x							x

Family	Species	Local Name	Habit	TS	CS	Habitat										
						Tn	Mr	Pd	Th	Rf	Mn	Sm	Bc	Bs	Bn	Hg
	Atalantia ceylanica	yakinaran	S	N	-				x						x	
	Clausena indica	migon karapincha	S	N	-				x							
	Glycosmis mauritiana		S	N	-				x						x	
	Glycosmis pentaphylla	dpodan pana	S	N	-				x						x	
	Limonia acidissima	divul	T	N	-				x						x	x
	Murraya koenigii	karapincha	S	N	-				x							
	Pamburus missionis	pamburu	T	N	-				x							
	Pleiospermium alatum	tumpat kurudu	T	N	-				x						x	
	Toddalia asiatica	kudumiris	C	N	-				x						x	
Salvadoraceae	*Azima tetracantha*		S	N	-				x						x	
Salvedoraceae	*Salvadora persica*	maliththan	T	N	-				x						x	
Salviniaceae	*Salvinia molesta*	salvinia	AqH	I	-	x	x	x	x							
Sapindaceae	*Allophylus cobbe*	bu kobbe	S	N	-				x						x	
	Cardiospermum halicacabum	penela wel	C	N	-				x						x	x
	Lepisanthes senegalensis	galkuma	T	N	-				x							
	Lepisanthes tetraphylla		T	N	-				x						x	x
	Schleichera oleosa	kon	T	N	-				x						x	
Sapotaceae	*Madhuca longifolia*	mi	T	N	-				x						x	
	Manilkara hexandra	palu	T	N	-				x						x	
	Mimusops elengi	munamal	T	N	-				x							
	Pouteria campechiana	rata lawulu	T	I	-											x
Scrophulariaceae	*Bacopa monnieri*	lunu wila	H	N	-	x	x		x							
	Limnophila aquatica		AqH	N	-	x										
Solanaceae	*Datura metel*	attana, kalu attana	S	N	-										x	
	Physalis micrantha	mottu, nalal batu	H	N	-		x		x						x	
	Solanum trilobatum	wel tibbatu	C	N	-										x	
Sonneratiaceae	*Sonneratia caseolaris*	kirala	T	N	-						x					
Sterculiaceae	*Heritiera littoralis*	etuna	T	N	-						x					
	Pterospermum suberifolium	welan, valangu	T	N	-				x							
	Waltheria indica		S	N	-			x							x	
Tamaricaceae	*Tamarix indica*	kiri	T	N	-		x					x				
Tiliaceae	*Berrya cordifolia*	halmilla	T	N	-				x	x					x	x
	Grewia damine	deminiya	T	N	-					x					x	
	Grewia orientalis	wel keliya	T	N	-				x						x	x
	Muntingia calabura	jam	T	I	-										x	x
Typhaceae	*Typha angustifolia*	hambupan	H	N	-		x	x	x							
Ulmaceae	*Holoptelea integrifolia*	godakirilla	T	N	-				x	x					x	x
Ulmaceae	*Trema orientalis*	gadumba	T	N	-										x	
Verbenaceae	*Clerodendrum inerme*	burenda, gulinda	S	N	-						x	x				
	Clerodendrum paniculatum		S	I	-										x	
	Gmelina asiatica	demata	S	N	-				x						x	
	Lantana camara	gandapana, katu hinguru	S	I	-				x					x	x	x
	Phyla nodiflora	hiramanadetta	H	N	-		x		x							
	Premna tomentosa	seru	T	N	-				x						x	
	Premna sp.		C	N	-				x							
	Stachytarpheta jamaicensis	balu nakuta	H	I	-				x						x	x
	Tectona grandis	Tekka	T	I	-											x
	Vitex altissima	milla	T	N	-				x							
	Vitex leucoxylon	nabada	T	N	-				x						x	x
	Vitex negundo	nika, helarika	T	N	-				x							
Vitaceae	*Cayratia pedata*	gerandi dul wel	C	N	-										x	
	Cayratia trifolia	wal rath diya labu	C	N	-				x		x					
	Cissus quadrangularis	heeressa, sirassa	C	N	-				x					x	x	
	Cissus vitiginea	wal niviti	C	N	-				x						x	
						25	32	52	167	32	17	6	1	16	176	90
95	290															

SUMMARY

Total number of species 290
No. of families represented 95
Endemic species 1
Nationaly threatened species 2

120 T - Tree
34C - Climber or Creeper
2Ep - Epiphyte
49H - Herbaceous
61S - Shrub
24AqH - Aquatic Herb.

229N - Native
60I - Introduced
1E - Endemic

Annex 02
Checklist of fish recorded from Anawilundawa wetland sanctuary

Habit:

F - Freshwater, B - Brackish water

Relative Abundance: VC - Very Common; C - Common; UC - Uncommon; R - Rare; VR - Very Rare

Status: [E] Endemic, [T] Nationally Threatened, [I] Introduced

Family	Species	Commom Name	Habit	Relative Abundance
Anguillidae	*Anguillar bicolor*	Level finned Eel	F, B	UC
Moringuidae	*Moringua sp*	Worm eel	B	R
Clupidae	*Nematolosa nasus*	Bloch's gizzard shad	B	UC
Engraulidae	*Thryssa purava*	Obliquejaw thryssa	B	UC
	Encrasicholina spp.	Anchovy	B	R
Cyprinidae	*Amblypharingodon meletinus*	Green Carplet	F	C
	Chela laubuca	Blue Laubuca	F	UC
	Danio malabaricus	Gaint Danio	F	C
	Esomus thermoicus [E,T]	Flying Barb	F	UC
	Horadandia atukorali	Horadandiya	F	C
	Puntius amphibius	Scarlet banded Barb	F	C
	Puntius bimaculatus	Red-side Barb	F	UC
	Puntius chola	Swamp Barb	F	C
	Puntius sinhala [E]	Filamented Barb	F	C
	Puntius vittatus	Silver Barb	F	C
	Rasbora carverii	Common Rasbora	F	C
Cobitidae	*Lepidocephalicthes thermalis*	Common spiny loach	F	UC
Ariidae	*Arius sp.*	Sea Catfish	B	R
Bagridae	*Mystes gulio*	Long-whiskered Catfish	F	C
	Mystes keletius	Yellow Catfish	F	C
Clariidae	*Clarias brachysoma* [E,T]	Walking Catfish	F	UC
Heteropneustidae	*Heteropneustus fossilis*	Stinging Catfish	F	C
Belonidae	*Strongular strongular*	Spot-tail needle fish	B	UC
Hemiramphidae	*Hemiramphus sp.*	Halfbeak	B	R
Oryziidae	*Oryzias melastigma*	Blue eyes	B	C
Aplocheilidae	*Aplocheilus parvus*	Dwarf Panchax	F, B	C
Ambassidae	*Ambassis commersoni*	Common Glassfish	B	C
Terapontidae	*Terapon jarbua*	Jarbua terapon	B	C
Charangidae	*Caranx sexfasiatus*	Bigeye trevally	B	UC
Liognathidae	*Liognathus sp*	Ponyfish	B	C
Lutjanidae	*Lutjanus argentimaculatus*	Red snapper	B	R
Gerridae	*Gerrus abreatus*	Deep body silverbiddy	B	C
Monodactylidae	*Monodactylus argentius*	Mono	B	UC
Chiclidae	*Oriochromis mossambicus* [I]	Tilapia	F	VC
	Oriochromis niloticus [I]	Nile Tilapia	F	C
	Etropus suratensis	Pearl Spot	F, B	C
	Etropus maculatus	Orange chromide	F	UC
Mugilidae	*Liza macrolepis*	Larger Scale Mullet	B	UC
Gobiidae	*Glossogobius giuris*	Bar-eyed Goby	F	C
Anabantidae	*Anabas testudinus*	Climbing perch	F	UC
Belontidae	*Pseudopremonus cupanus*	Spiketailed paradisefish	F	R
	Trichogaster pectoralis [I]	Snakesking gourami	F	VC
Osphronemidae	*Osphronemus goramy* [I]	Gaint gourami	F	UC
Channidae	*Channa striata*	Murrel	F	C
	Channa puntata	Spotted snakehed	F	UC
	Mystus vittatus	Striped dwarf Catfish	F	UC
Solidae	*Euryglossa sp.*	Sole	B	R

SUMMARY

Total number of species	47	No. of families represented	28
Endemic species	3	Nationaly threatened species	2
Intorduced species	4		

Annex 03

Checklist of amphibians recorded from Anawilundawa wetland sanctuary

Habitat:

Tn - Cascading tank; Rv - Canal & Stream; Mr - Marsh including seaonally flooded grassland & reed bed

Pd - Paddy land; Th - Fringing vegetation mossaic of tanks (Wew thaawulla); Rf - Riparian forest

Mn - Mangrove; Sm - Saltmarsh & maritime grassland; Bc - Brackishwater canal; Bs - Beach & seashore vegetation

Bn - Tank bund vegetation; Hg - Homegarden

Relative Abundance: VC - Very Common; C - Common; UC - Uncommon; R - Rare; VR - Very Rare

Status: ^{E} Endemic, ^{T} Nationally Threatened

Family	Species	Commom Name	Relative Abundance	Habitat											
				Tn	Rv	Mr	Mn	Sm	Bc	Th	Bn	Rf	Pd	Hg	Bs
Bufonidae	*Bufo melanostictus*	Common Toad	C					x			x	x	x	x	
	Bufo fergusonii	Ferguson's Dwarf Toad	UC								x	x		x	
Microhylidae	*Uperodon systoma*	Baloon Frog	UC		x						x			x	
	Kaloula taprobanica	Common Bull Frog	R			x					x			x	
Ranidae	*Limnonectes limnocharis*	Common Paddy Field Frog	VC	x	x	x		x	x	x	x	x	x	x	
	Hoplobatrachus crassus	Indian Bull Frog	VC	x	x	x		x	x	x	x	x	x	x	
	Rana gracilis^{E,T}	Sri Lankan Wood Frog	VR								x				
	Euphlyctis cyanophlyctic	Skipper Frog	VC	x	x	x		x	x	x	x	x	x	x	
	Euphlyctis hexadactyla	Six-toed Green Frog	VC	x	x	x		x	x	x	x	x	x	x	
Microhylidae	*Rmanella variegata*	White-bellied Pugsnout Frog	C		x						x	x		x	
Rhacophoridae	*Polypedates maculatus*	Chunam Tree-Frog	C							x	x	x	x	x	

SUMMARY

Total number of species	11
No. of families represented	5
Endemic species	1
Nationaly threatened species	1

Annex 04

Checklist of reptiles recorded from Anawilundawa wetland sanctuary

Habitat:

Tn - Cascading tank; Rv - Canal & Stream; Mr - Marsh including seaonally flooded grassland & reed bed

Pd - Paddy land; Th - Fringing vegetation mossaic of tanks (Wew thaawulla); Rf - Riparian forest

Mn - Mangrove; Sm - Saltmarsh & martitie grassland; Bc - Brackishwater canal; Bs - Beach & seashore vegetation

Bn - Tank bund vegetation; Hg - Homegarden

Relative Abundance: VC - Very Common; C - Common; UC - Uncommon; R - Rare; VR - Very Rare

Status: ^{E} Endemic, ^{T} Nationally Threatened

Family	Species	Commom Name	Relative Abundance	Habitat											
				Tn	Rv	Mr	Mn	Sm	Bc	Th	Bn	Rf	Pd	Hg	Bs
Trionychidae	*Lissemys punctata*^{T}	Flapshell Turtle	UC	x	x				x			x	x		
Bataguridae	*Melanochelys trijuga*^{T}	Parker's Black Turtle	C	x	x	x			x	x	x	x	x		
Testudinidae	*Geochelone elegans*^{T}	Star Tortoise	R			x		x		x				x	
Crocodylidae	*Crocodylus porosus*^{T}	Marsh Crocodyle	R		x						x			x	
Varanidae	*Varanus salvator*	Water Monitor	VC	x	x	x	x	x	x	x	x	x	x	x	
	Varanus bengalensis	Land Monitor	VC		x	x		x	x	x	x	x	x	x	x
Agamidae	*Calotes calotes*	Green Garden Lizard	UC				x	x		x	x	x		x	
	Calotes versicolor	Commom Garden Lizard	VC			x	x	x	x	x	x	x	x	x	x
Gekkonidae	*Hemidactylus frenatus*	Common House Gecko	VC				x		x	x	x	x	x	x	x
	Hemidactylus brookii	Spotted House Gecko	VC				x		x	x	x	x	x	x	x
	Hemidactylus triedrus	Termitehill Gecko	UC			x		x			x			x	
	Hemidactylus depressus^{E,T}	Kandyan Gecko	UC									x		x	
Scincidae	*Mabuya carinata*	Common Skink	VC			x		x	x	x	x	x	x	x	x
	Mabuya macularia	Bronzgreen Little Skink	UC							x	x			x	x
	Lankascincus fallax^{E}	Commom Lanka Skink	R		x					x		x		x	
	Lygosoma punctata	Dotted Garden Skink	C			x				x	x	x		x	
	Sphenomorphus rufogulus^{E}	Red Throat Little Skink	R		x					x		x		x	
Typhlopidae	*Typhlops sp.*	Blind Snake Species	C											x	
	Ramphotyphlops braminus	Commom Blind Snake	C												
Boidae	*Python molurus*^{T}	Indian Rock Python	VR							x					
Colubridae	*Ahaetulla nasuta*	Green Vine Snake	C				x			x	x	x	x	x	
	Amphiesma stolata	Buff-Striped Keelback	C		x	x		x		x	x	x	x	x	
	Atretium schistosum	The Olive Keelback	UC	x	x					x			x	x	
	Boiga forsteni	Forsten's Cat Snake	R			x				x				x	
	Dendrelaphis tristis	Common Bronzeback	VC				x	x			x		x	x	x
	Elaphe helena	Trinket Snake	UC			x		x		x	x	x	x	x	
	Lycodon aulicus	The Commom Wolf Snake	R											x	
	Oligodon arnensis	Kukri Snake	UC			x					x		x	x	
	Oligodon taeniolatus	Varigated Kukri Snake	UC								x	x	x	x	
	Ptyas mucosa	The Common Rat Snake	C					x			x	x	x	x	
	Xenochrophis piscator	Checkered Keelback	VC	x	x	x	x	x	x		x	x	x	x	
Elapidae	*Bungarus caeruleus*	The Common Indian Krait	R											x	
	Naja Naja	Cobra	UC					x		x	x	x	x	x	
Viperidae	*Daboia russelii*	Russell's Viper	UC							x	x		x	x	

SUMMARY

Total number of species	34
No. of families represented	13
Endemic species	3
Nationaly threatened species	6

Annex 05

Checklist of birds recorded from Anawilundawa wetland sanctuary

Habitat:

Tn - Cascading tank and assoiated waterways (Freshater); Bc - Brackishwater canal;

Mr - Marsh including seaonally flooded grassland & reed bed; Pd - Paddy land; Hg - Homegarden;

Th-Sg - Fringing vegetation mossaic of tanks (Wew thaawulla) - Scrub and grass dominant;

Th-Fr - Fringing vegetation mossaic of tanks (Wew thaawulla) - Forest dominant; Rf - Riparian forest

Mn - Mangrove; Sm - Saltmarsh & martitie grassland; Bs - Beach & seashore vegetation

Relative Abundance: VC - Very Common; C - Common; UC - Uncommon; R - Rare; VR - Very Rare

Status: ^{E} Endemic, ^{T} Nationally Threatened, ^{WV} Winter Visitor, ^{V} Vagrant

Family	Species	Common Name	Relative Abundance	Habitat										
				Tn	Bc	Mr	Mn	Sm	Th-fr	Th-sg	Rf	Pd	Hg	Bs
Podicipedidae	*Tachybaptus ruficollis*	Little Grebe	C	x										
Pelecanidae	*Pelecanus philippensis*^{T}	Spot-billed Pelican	VR											
Phalacrocoracidae	*Phalacrocorax carbo*^{T}	Great Cormorant	R	x										
	Phalacrocorax fuscicollis	Indian Cormorant (Indian Shag)	C	x	x		x			x				
	Phalacrocorax niger	Little Cormorant	VC	x	x	x	x			x	x	x	x	
Anhingidae	*Anhinga melanogaster*	Oriental Darter	C	x			x					x		
Ardeidae	*Ardea cinerea*	Grey Heron	C	x	x									
	Ardea purpurea	Purple Heron	C	x		x	x				x	x		
	Casmerodius albus	Great Egret	C	x	x	x	x		x			x		
	Mesophoyx intermedia	Intermediate Egret	C	x			x		x	x	x	x		x
	Egretta garzetta	Little Egret	VC	x	x	x	x	x		x	x	x		
	Bubulcus ibis	Cattle Egret	C	x	x	x		x		x		x		x
	Ardeola grayii	Indian Pond Heron	VC	x	x	x	x		x	x	x	x	x	
	Butorides striatus	Striated Heron (Little Green Heron)	R				x							
	Nycticorax nycticorax	Black-crowned Night Heron	VR											
	Ixobrychus sinensis	Yellow Bittern	R	x										
	Ixobrychus cinnamomeus	Cinnamon Bittern (Chestnut Bittern)	VR											
	Ixobrychus flavicollis	Black Bittern	R	x						x				
Ciconiidae	*Mycteria leucocephala*	Painted Stork	R	x										
	Anastomus oscitans	Asian Openbill	C	x		x		x		x		x		
	Ciconia episcopus	Woolly-necked Stork	R	x										
Threskiornithidae	*Threskiornis melanocephalus*	Black-headed Ibis (White Ibis)	C	x								x		
	Plegadis falcinellus^{WV}	Glossy Ibis	VR											
	Platalea leucorodia	Eurasian Spoonbill	C	x										
Anatidae	*Dendrocygna javanica*	Lesser Whistling Duck (Whistling Teal)	VC	x										
	Nettapus coromandelianus	Cotton Pygmy Goose	C	x										
	Anas acuta^{WV}	Northern Pintail	VC	x										
	Anas querquedula^{WV}	Garganey	VC	x										
	Anas clypeata^{WV}	Northern Shoveller	R	x										
Accipitridae	*Pernis ptilorhynchus*	Oriental Honey-buzzard	VR											
	Elanus caeruleus	Black-winged Kite	R	x										
	Haliastur indus	Brahminy Kite	C	x		x	x	x	x	x	x	x	x	
	Haliaeetus leucogaster	White-bellied Fish Eagle	C	x	x			x	x			x		
	Ichthyophaga ichthyaetus	Grey-headed Fish Eagle	R	x						x				

Family	Species	Common Name	Relative Abundance	Habitat											
				Tn	Bc	Mr	Mn	Sm	Th-fr	Th-sg	Rf	Pd	Hg	Bs	
	Spilornis cheela	Crested Serpent Eagle	UC						x						
	Circus pygargus	Montagu's Harrier	VR												
	Circus aeruginosus[WV]	Western Marsh Harrier	C	x					x	x	x	x			
	Accipiter badius	Shikra	UC	x					x	x	x	x	x		
	Hieraaetus pennatus[WV]	Booted Eagle	VR												
	Spizaetus cirrhatus	Changeable Hawk Eagle	VR												
Falconidae	*Falco tinnunculus*[WV,T]	Common Kestrel	VR												
Phasianidae	*Francolinus pondicerianus*[T]	Grey Francolin	R									x			
	Gallus lafayettii[E]	Sri Lanka Jungle Fowl	UC						x	x	x				
	Pavo cristatus	Indian Peafowl	VR												
Turnicidae	*Turnix suscitator*	Barred Button Quail	R									x			
Rallidae	*Porzana fusca*[T]	Ruddy-breasted Crake	VR												
	Amaurornis phoenicurus	White-breasted Waterhen	C	x			x		x	x	x	x	x		
	Gallicrex cinerea	Watercock	VR												
	Gallinula chloropus	Common Moorhen	UC	x											
	Porphyrio porphyrio	Purple Swamp Hen (Purple Coot)	VC	x							x	x			
	Fulica atra[T]	Common Coot (Black Coot)	UC	x											
Jacanidae	*Hydrophasianus chirurgus*	Pheasant-tailed Jacana	VC	x							x				
Rostratulidae	*Rostratula benghalensis*	Greater Painted-snipe	VR												
Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt	C	x	x		x	x				x			
Burhinidae	*Burhinus oedicnemus*	Eurasian Thick-knee (Stone Curlew)	UC	x											
Charadriidae	*Vanellus indicus*	Red-wattled Lapwing	VC	x	x	x		x	x	x	x	x	x		
	Pluvialis fulva[WV]	Pacific Golden Plover	C	x				x							
	Pluvialis squatarola[WV]	Grey Plover	VR												
	Charadrius dubius	Little Ringed Plover	C	x											
	Charadrius alexandrinus	Kentish Plover	R	x											
	Charadrius mongolus[WV]	Mongolian Plover (Lesser Sand Plover)	C	x											
	Charadrius leschenaultii[WV]	Greater Sand Plover	R	x											
Scolopacidae	*Limosa limosa*[WV]	Black-tailed Godwit	UC	x											
	Numenius phaeopus[WV]	Whimbrel	UC	x			x					x		x	
	Numenius arquata[WV]	Eurasian Curlew	R											x	
	Tringa totanus[WV]	Common Redshank	C	x	x							x			
	Tringa stagnatilis[WV]	Marsh Sandpiper	C	x	x							x			
	Tringa nebularia[WV]	Common Greenshank	UC	x			x								
	Tringa ochropus[WV]	Green Sandpiper	R	x	x										
	Tringa glareola[WV]	Wood Sandpiper	C	x	x										
	Actitis Hypoleucos	Common Sandpiper	UC	x			x								
	Gallinago stenura[WV]	Pintail Snipe	C	x			x								
	Calidris minuta[WV]	Little Stint	R	x	x										
	Calidris temminckii[WV]	Temminck's Stint	VR												
	Calidris ferruginea[WV]	Curlew Sandpiper	R	x											
Laridae	*Chlidonias hybridus*	Whiskered Tern	C	x	x		x	x				x		x	
	Childonias leucopterus[WV]	White-winged Tern	R											x	
	Gelochelidon nilotica	Gull-billed Tern	C	x	x		x	x	x			x		x	
	Sterna albifrons	Little Tern	R	x											
Columbidae	*Columba livia*	Rock Pigeon (Feral Pigeon)	C	x			x			x					
	Streptopelia chinensis	Spotted Dove	VC	x		x	x	x	x	x	x		x	x	
	Treron bicincta	Orange-breasted Green Pigeon	C	x					x	x			x		
	Treron pompadora	Pompadour Green Pigeon	C						x	x					
Psittacidae	*Psittacula kramerii*	Rose-ringed Parakeet	VC	x					x	x	x	x	x		
Cuculidae	*Clamator coromandus*[WV]	Chestnut-winged Cuckoo	VR												
	Oxylophus jacobinus	Pied Cuckoo (Pied Crested Cuckoo)	VR												
	Cuculus micropterus	Indian Cuckoo	R						x						
	Cacomantis merulinus	Plaintive Cuckoo	R							x			x		
	Eudynamys scolopacea	Asian Koel	C		x		x		x	x	x	x	x		
	Rhopodytes viridirostris	Blue-faced Malkoha	C						x	x	x				
	Centropus sinensis	Greater Coucal (Common Coucal)	C	x			x		x	x	x	x	x		
Strigidae	*Otus sunia*	Oriental Scops Owl (Little Scops Owl)	VR												

Family	Species	Common Name	Relative Abundance	Habitat											
				Tn	Bc	Mr	Mn	Sm	Th-fr	Th-sg	Rf	Pd	Hg	Bs	
	Otus bakkamoena	Collared Scops Owl (Indian Scops Owl)	VR												
	Bubo zeylonensis	Brown Fish Owl	R						x		x				
	Strix leptogrammica	Brown Wood Owl	VR												
	Glaucidium radiatum	Jungle Owlet	VR												
	Ninox scutulata	Brown Hawk Owl	R						x						
Caprimulgidae	*Caprimulgus atripennis*	Jerdon's Nightjar (Long-tailed Nightjar)	VR												
	Caprimulgus asiaticus	Indian Nightjar (Common Nightjar)	R						x						
Apodidae	*Aerodramus unicolor*	Indian Swiftlet (Edible-nest Swiftlet)	VR												
	Cypsiurus balasiensis	Asian Palm Swift	VC	x		x		x	x	x	x	x	x	x	
Hemiprocnidae	*Hemiprocne longipennis*	Grey-rumped Treeswift	VR												
Alcedinidae	*Ceryle rudis*	Pied Kingfisher	C	x			x					x			
	Alcedo atthis	Common Kingfisher	C	x					x	x	x		x		
	Halcyon capensis	Stork-billed Kingfisher	C	x					x		x		x		
	Halcyon smyrnensis	White-throated Kingfisher	C	x	x				x	x	x	x	x		
Meropidae	*Merops orientalis*	Little Green Bee-eater	C	x		x			x	x		x			
	Merops philippinus[WV]	Blue-tailed Bee-eater	C	x	x	x	x	x	x	x	x	x	x		
	Merops leschenaulti	Chestnut-headed Bee-eater	R							x		x			
Coraciidae	*Coracias benghalensis*	Indian Roller	C	x	x	x			x	x		x			
Bucerotidae	*Tockus gingalensis*[E,T]	Sri Lanka Grey Hornbill	VR												
Capitonidae	*Megalaima zeylanica*	Brown-headed Barbet	C	x					x	x	x	x	x		
	Megalaima rubricapilla	Crimson-fronted Barbet (Small Barbet)	VR												
	Megalaima haemacephala	Coppersmith Barbet (Crimson-breasted Barbet)	UC						x	x	x				
Picidae	*Picoides moluccensis*	Brown-capped Woodpecker (Pygmy Woodpecker)	VR												
	Dinopium benghalense	Black-rumped Flameback (Red-backed Woodpecker)	C						x	x	x				
	Chrysocolaptes festivus[T]	White-naped Woodpecker	R								x		x		
Pittidae	*Pitta brachyura*[WV]	Indian Pitta	R						x	x			x		
Alaudidae	*Mirafra assamica*	Rufous-winged Lark	R			x									
	Alauda gulgula	Oriental Skylark	C	x				x		x					
	Eremopterix grisea	Ashy-crowned Sparrow Lark	C	x				x				x			
Hirundinidae	*Hirundo rustica*[WV]	Barn Swallow (East Asian Swallow)	VC	x	x	x	x	x	x	x	x	x	x	x	
Motacillidae	*Dendronanthus indicus*[WV]	Forest Wagtail	C						x	x	x				
	Motacilla cinerea[WV]	Grey Wagtail	VR												
	Anthus rufulus	Paddyfield Pipit (Indian Pipit)	C	x		x		x		x		x		x	
Campephagidae	*Coracina macei*	Large Cuckooshrike	R							x	x				
	Coracina melanoptera	Black-headed Cuckooshrike	VR												
	Pericrocotus cinnamomeus	Small Minivet (Little Minivet)	VR						x						
	Tephrodornis pondicerianus	Common Woodshrike	R							x					
Pycnonotidae	*Pycnonotus cafer*	Red-vented Bulbul	C	x					x	x	x	x			
	Pycnonotus luteolus	White-browed Bulbul	C			x	x		x	x	x		x		
Irenidae	*Aegithina tiphia*	Common Iora	C				x		x	x	x		x		
	Chloropsis cochinchinensis	Jerdon's Leafbird (Jerdon's Chloropsis)	C						x	x	x				
	Chloropsis aurifrons	Golden-fronted Leafbird (Gold-fronted Chloropsis)	R								x				
Laniidae	*Lanius cristatus*[WV]	Brown Shrike	C						x	x	x	x			
Turdidae	*Copsychus saularis*	Oriental Magpie Robin (Southern Magpie Robin)	UC						x		x		x		
	Copsychus malabaricus	White-rumped Shama	R							x					
	Saxicoloides fulicata	Black-backed Robin (Ceylon Black Robin)	R								x				
Timaliidae	*Dumetia hyperythra*	Tawny-bellied Babbler (White-throated Babbler)	VR												

Family	Species	Common Name	Relative Abundance	Habitat											
				Tn	Bc	Mr	Mn	Sm	Th-fr	Th-sg	Rf	Pd	Hg	Bs	
	Turdoides affinis	Yellow-billed Babbler (Common Babbler)	C						x	x	x	x	x		
Sylviidae	*Locustella certhiola*[WV]	Pallas's Grasshopper Warbler	R			x									
	Acrocephalus dumetorum[WV]	Blyth's Reed Warbler	UC				x				x				
	Cisticola juncidis	Zitting Cisticola (Streaked Fantail Warbler)	C	x	x	x				x		x			
	Prinia sylvatica	Jungle Prinia (Ceylon Large Prinia)	VR												
	Prinia socialis	Ashy Prinia	VR												
	Prinia subflava	Plain Prinia (Ceylon White-browed Prinia)	UC	x					x	x					
	Orthotomus sutorius	Common Tailorbird	C						x	x	x	x	x		
	Phylloscopus nitidus[WV]	Bright-green Warbler (Green Tree Warbler)	R				x		x						
Muscicapidae	*Muscicapa dauurica*[WV]	Asian Brown Flycatcher	C						x		x				
Monarchidae	*Terpsiphone paradisi*	Asian Paradise-flycatcher	C	x					x	x	x		x		
Sittidae	*Sitta frontalis*	Velvet-fronted Nuthatch	VR												
Dicaeidae	*Dicaeum erythrorhynchos*	Pale-billed Flowerpecker (Samll Flowerpecker)	C	x			x		x	x	x	x	x		
Nectariniidae	*Nectarinia zeylonica*	Purple-rumped Sunbird	C			x	x		x	x	x	x	x		
	Nectarinia lotenia	Long-billed Sunbird (Loten's Sunbird)	C				x		x	x	x		x		
	Nectarinia asiatica	Purple Sunbird	C			x			x	x	x		x		
Estrildidae	*Lonchura punctulata*	Scaly-breasted Munia (Spotted Munia)	C	x		x	x		x	x	x	x	x		
	Lonchura malacca	Black-headed Munia	VR												
Ploceidae	*Passer domesticus*	House Sparrow	VR												
	Ploceus philippinus	Baya Weaver	VR												
Sturnidae	*Sturnus pagodarum*[WV]	Brahminy Starling (Brahminy Myna)	R						x	x					
	Acridotheres tristis	Common Myna	VC	x		x	x	x	x	x	x	x	x		
Oriolidae	*Oriolus xanthornus*	Black-hooded Oriole	C						x	x	x		x		
Dicruridae	*Dicrurus macrocercus*	Black Drongo	VR												
	Dicrurus leucophaeus[WV]	Grey Drongo (Ashy Drongo)	R							x					
	Dicrurus caerulescens	White-bellied Drongo	C						x	x	x				
Artamidae	*Artamus fuscus*	Ashy Woodswallow (Ashy Swallow-shrike)	C	x		x			x	x	x	x	x		
Corvidae	*Corvus splendens*	House Crow (Grey-necked Crow)	VC	x		x	x	x	x	x	x	x	x	x	
	Corvus macrorhynchos	Large-billed Crow (Jungle / Black Crow)	C	x		x	x		x	x	x	x	x		

56 168

SUMMARY

Total number of species	168
No. of families represented	56
Endemic species	2
Nationaly threatened species	8
No of wintor visitors	37

Annex 06
Checklist of mammals recorded from Anawilundawa wetland sanctuary

Habitat:

Tn - Cascading tank; Rv - Canal & Stream; Mr - Marsh including seaonally flooded grassland & reed bed

Pd - Paddy land; Th - Fringing vegetation mossaic of tanks (Wew thaawulla); Rf - Riparian forest

Mn - Mangrove; Sm - Saltmarsh & maritime grassland; Bc - Brackishwater canal; Bs - Beach & seashore vegetation

Bn - Tank bund vegetation; Hg - Homegarden

Relative Abundance: VC - Very Common; C - Common; UC - Uncommon; R - Rare; VR - Very Rare

Status: ^{E} Endemic, ^{T} Nationally Threatened

Family	Species	Commom Name	Relative Abundance	Habitat						
				Tn	Mn	Th	Bn	Rf	Pd	Hg
Soricidae	*Suncus murinus*	Musk Shrew	UC							x
Hipposideridae	*Hipposideros speoris*	Schneider's Leaf-nosed Bat	UC							x
Pteropodidae	*Cynopterus sp.*	Fruit-Bat species	C							x
	Pteropus giganteus	Common Flying Fox	VC			x	x	x		x
Cercopithecidae	*Macaca sinica*^{E}	Toque Monkey	C			x	x	x		x
Lorisidae	*Loris lydekkerianus*^{T}	Grey Slender Loris	C			x	x	x		x
Canidae	*Canis aureus*	Sri Lanka Jackal	UC			x		x	x	
Felidae	*Prionailurus rubiginosus*^{T}	Rusty Spotted Cat	VR	x		x				
	Prionailurus viverrinus^{T}	Fishing Cat	UC	x		x		x	x	
Herpestidae	*Herpestes edwardsii*	Grey Mongoose	C			x	x		x	x
	Herpestes smithii	Ruddy Mongoose	UC				x			x
Mustelidae	*Lutra lutra*^{T}	Otter	R	x						
Viverridae	*Viverricula indica*	Small Civet Cat	C			x	x		x	x
	Paradoxurus hermaphroditus	Indian Palm Cat	C				x			x
Tragulidae	*Tragulus meminna*	Mouse Deer	UC			x				x
Hystricidae	*Hystrix indica*	Indian Crested Porcupine	UC			x				
Muridae	*Tatera indica*	Gerbil	C				x			x
	Rattus rattus	House Rat	C							x
Sciuridae	*Funambulus palmarum*	Palm Squirrel	VC		x	x	x	x		x
	Ratufa macroura	Giant Squirrel	UC			x		x		
Leporidae	*Lepus nigricollis*	Black Naped Hare	VC			x	x		x	x
	15	21								

SUMMARY

Total number of species	21
No. of families represented	15
Endemic species	1
Nationaly threatened species	4

Annex 07
Checklist of butterflies recorded from Anawilundawa wetland sanctuary

Habitat:

Mr - Marsh including seaonally flooded grassland & reed bed; Pd - Paddy land; Bn - Tank bund vegetation;

Th-sg - Fringing vegetation mossaic of tanks (Wew thaawulla) - Scrub and grass dominant; Hg - Homegarden;

Th-fr - Fringing vegetation mossaic of tanks (Wew thaawulla) - Forest dominant; Rf - Riparian forest Mn - Mangrove; Sm - Saltmarsh & maritime grassland; Bs - Beach & seashore vegetation

Relative Abundance: VC - Very Common; C - Common; UC - Uncommon; R - Rare; VR - Very Rare

Status: [E] Endemic, [T] Nationally Threatened, [DD] *Data deficient*

Family	Species	Commom Name	Relative Abundance	Habitat											
				Mr	Mn	Sm	Th-fr	Th-sg	Bn	Rf	Pd	Hg	Bs		
Papilionidae	*Troides darsius* [E,T]	Common Birdwing	R					x							
	Pachliopta hector	Crimson Rose	VC	x			x	x	x	x	x	x			
	Pachliopta aristolochiae	Common Rose	C	x			x	x	x		x	x			
	Papilio demoleus	Lime Butterfly	C	x					x			x			
	Papilio polytes	Common Mormon	C					x	x	x		x			
	Papilio polymnestor	Blue Mormon	UC					x		x		x			
	Graphium agamemnon	Tailed Jay	UC					x							
Pieridae	*Leptosia nina*	Psyche	C				x	x	x	x		x			
	Delias eucharis	Jezebel	C			x	x	x	x	x	x	x			
	Belenois aurota	Pioneer	UC		x				x	x	x	x			
	Cepora nerissa	Common Gull	C		x		x		x	x					
	Appias libythea [T]	Striped Albatross	UC	x			x		x			x			
	Appias paulina [T]	Lesser Albatross	UC						x						
	Ixias pyrene	Yellow Orange Tip	UC		x			x				x			
	Hebomoia glaucippe	Great Orange Tip	UC	x			x	x	x	x		x			
	Catopsilia pyranthe	Mottled Immigrant	C	x			x	x	x		x	x			
	Catopsilia pomona	Lemon Migrant	C	x			x	x	x						
	Pareronia ceylanica	Dark Wanderer	UC						x	x		x			
	Colotis amata	Small Salmon Arab	C	x	x	x	x		x	x	x	x	x		
	Colotis etrida	Little Orange Tip	UC						x						
	Eurema brigitta	Small Grass Yellow	C				x	x	x	x	x	x			
	Eurema hecabe	Common Grass Yellow	C		x		x	x	x		x	x			
Nymphalidae	*Tirumala limniace*	Blue Tiger	VC			x	x	x	x	x	x	x			
	Tirumala septentrionis	Dark Blue Tiger	UC					x							
	Parantica aglea	Glassy Tiger	UC					x	x						
	Danaus chrysippus	Plain Tiger	VC		x	x	x	x	x	x	x	x			
	Danaus genutia	Common Tiger	C				x	x	x	x	x	x			
	Euploea core	Common Crow	VC				x	x	x	x		x			
	Euploea sylvester	Double-banded Crow	UC					x							
	Euploea klugii	Brown King Crow	UC					x							
	Ariadne ariadne	Angled Castor	UC						x	x		x			
	Byblia ilithyia	Joker	UC						x						
	Phalanta phalanta	Common Leopard	UC					x							
	Junonia lemonias	Lemon Pansy	C				x	x	x	x					
	Junonia atlites	Grey Pansy	UC												
	Junonia iphita	Chocolate Soldier	C				x	x	x			x			
	Junonia almana	Peacock Pansy	UC				x				x				

Family	Species	Commom Name	Relative Abundance	Habitat											
				Mr	Mn	Sm	Th-fr	Th-sg	Bn	Rf	Pd	Hg	Bs		
	Hypolimnas bolina	Great Eggfly	UC		x			x							
	Hypolimnas misippus	Danaid Eggfly	UC				x	x							
	Neptis hylas	Common Sailor	C				x		x			x			
	Ewthalia aconthea	Baron	UC					x				x			
	Polyura athamas	Nawab	R					x		x					
	Orsotriaena medus	Nigger	UC					x				x			
	Mycalesis persius	Common Bushbrown	UC					x							
	Ypthima ceylonica	White Four-ring	UC					x				x			
	Charaxes psaphon[I]	Tawny Rajah	R					x		x					
	Acraea violae	Tawny Coster	C		x								x		
	Melanitis leda	Common Evening Brown	UC					x				x			
	Elymnias hypermnestra	Common Palmfly	UC					x	x			x			
Lycaenidae	*Spalgis epews*[T]	Apefly	R									x			
	Curetis thetis	Indian Sunbeam	UC		x			x							
	Arhopala amantes[T]	Large Oakblue	UC					x							
	Zesius chrysomallus[T]	Redspot	UC				x								
	Amblypodia anita[T]	Purple Leafblue	R						x						
	Spindasis vulcanus[T]	Common Silverline	R						x						
	Tajuria cippus	Peacock Royal	UC						x						
	Raphinda amor	Monkey-puzzle	R					x							
	Jamides celano	Common Cerulian	C	x				x	x	x		x			
	Jamides bochus	Dark Cerulean	C				x		x	x			x		
	Catochysops strabo	Forget-me-not	UC						x						
	Lamides boeticus	Pea Blue	UC						x						
	Syntrucus plinius	Zebra Blue	UC						x						
	Castalius rosimon	Common Pierrot	UC					x	x	x					
	Tarucus callinara[DD]	Butler's Spotted Pierrot	UC						x	x					
	Zizeeria karsandra[T]	Dark Grass Blue	UC	x			x								
	Zizina otis	Lesser Grass Blue	C			x	x		x		x	x	x		
	Zizula hylax[T]	Tiny Grass Blue	UC						x	x					
	Azanus jesous[T]	African Babul Blue	UC						x						
	Chilades lajus	Lime Blue	UC						x						
Hesperiidae	*Hasora chromus*	Common Banded Awl	UC				x			x					
	Suastus gremius	Indian Palm Bob	UC						x	x					
	Ampittia dioscorides	Bush Hopper	C						x		x				
	Iambrix salsala	Chestnut Bob	UC									x			
	Spalia galba	Indian Skipper	UC						x						
	Sarangesa dasahara[T]	Common Small Flat	UC					x							
	Taractrocera maevius	Common Grass Dart	UC					x							
	Pelopidas sp.	Swift sp.	UC					x							
	Potanthus sp.	Dart sp.	UC					x							

SUMMARY

Total number of species	78
No. of families represented	5
Endemic species	1
Nationaly threatened species	13
Data deficient in national threateed list	1

Annex 08
Checklist of dragonflies & damselflies recorded from Anawilundawa wetland sanctuary

Habitat:

Tn - Cascading tank; Rv - Canal & Stream; Mr - Marsh including seaonally flooded grassland & reed bed

Pd - Paddy land; Th - Fringing vegetation mossaic of tanks (Wew thaawulla); Rf - Riparian forest

Mn - Mangrove; Sm - Saltmarsh & maritime grassland; Bc - Brackishwater canal; Bs - Beach & seashore vegetation

Bn - Tank bund vegetation; Hg - Homegarden

Relative Abundance: VC - Very Common; C - Common; UC - Uncommon; R - Rare; VR - Very Rare

Status: ^{E} Endemic, ^{T} Nationally Threatened

Family	Species	Commom Name		Habitat											
				Tn	Rv	Mr	Mn	Bc	Th	Bn	Rf	Pd	Hg		
Platycnemididae	*Copera marginipes*	Rimmed Featherleg		x	x	x									
Coenagrionoidae	*Ceriagrion coromandelianum*	Yellow Damselfly		x	x	x			x	x		x	x		
	Ischnura aurora	Dawn Bluetail		x	x	x									
	Pseudagrion malabaricum	Malabar Sprite							x		x				
Gomphidae	*Ictinogomphus rapax*	Asian Tiger		x	x	x			x			x			
Libelluloidae	*Orthetrum sabina*	Sombre Skimmer		x	x	x	x		x		x	x			
	Potamarcha congener			x	x		x		x						
	Rhodothemis rufa	Spine-legged Reedling		x	x		x		x						
	Diplacodes trivialis	Little Blue darter		x		x			x						
	Neurothermis tullia	Black Velvet-wing		x	x	x		x	x	x		x			
	Rhyothemis variegata	Variable Glider		x	x	x		x	x	x		x			
	Aethriamanta brevipennis	Black-headed Basker		x	x	x			x						
	Brachythemis contaminata	Orange-winged Groundling		x	x	x			x			x			

SUMMARY

Total number of species	13
No. of families represented	4
Endemic species	0
Nationaly threatened species	0

Annex 09
Checklist of some aquatic molluscs recorded from Anawilundawa wetland sanctuary

Status: [E] Endemic, [T] Nationally Threatened

Family	Species
Veneridae	*Meretrix casta*
Corbiculidae	*Geloina coaxans*
Ampullariidae	*Pila globosa*
Lymnaeidae	*Lymnaea luteola*
Potamididae	*Cerithidea cingulata*
Planorbidae	*Gyraulus convexiusculus*

SUMMARY

Total number of species	6
No. of families represented	6
Endemic species	0

IUCN – The World Conservation Union

Founded in 1948, The World Conservation Union brings together States, government agencies and a diverse range of non-governmental organizations in a unique world partnership: over 1000 members in all, spread across some 140 countries.

As a Union, IUCN seeks to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

The World Conservation Union builds on the strengths of its members, networks and partners to enhance their capacity and to support global alliances to safeguard natural resources at local, regional and global levels.

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