INT. J. BIOL. BIOTECH., 2 (1): 77-83, 2005.

FLORAL BIODIVERSITY OF THE WETLANDS OF INDUS DELTA AREA, SOUTHERN SINDH

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ABSTRACT

Specimens of aquatic and wetland species were collected and identified during the year of 2001. The voucher specimens were submitted in the Karachi University Herbarium (KUH). The present study has recognized twenty-three new records of aquatic, semi-aquatic and wetland plant species during this period.

Key words: Biodiversity, wetlands, Sindh

INTRODUCTION

Wetlands are those areas where inundation must occur for at least 14 days and saturation for at least 60 consecutive days (Cook, 1996). There are various types of wetlands like wooded land, peat land, flood plains, mangrove swamps, etc. Each and every wetland is much rich in floristic biodiversity. There is no hard and fast definition of wetland plants. While it is easy to recognize a plant growing in a pond or lake as hydrophyte, species in the transitional zone between wetland and dry land may not be exactly recognized as hydrophytes. Therefore, according to broader definition, all those plant species are called aquatic or wetland species which spend at least some part of their life-cycle in partially submerged condition (Cook, 1996).

Earlier wetlands were regarded as the breeding grounds of mosquitoes and other noxious insects but in recent decades the importance of wetlands has been recognized due to their ecological services and useful living resources like edible plants, fish, medicinal plants, etc. Besides their productivity wetlands also play an important role in ecology such as Mangrove forests bind the silt which comes through the river flow, provide protection against erosion by buffering wave action (Twilley, 1995). Because of the function of cleaning impurities from the system wetlands have been referred to as kidneys of the landscape (Bush, 1997). There are several wetlands in the province of Sindh, either connected with Indus or with certain seasonal rivers. Some of those are designated as Ramsar sites like Haleji and Keenjhar lakes, due to large number of over-wintering migratory birds. Although most of the bird species have been recognized and listed, any comprehensive inventory of wetlands plant species, which are the primary producers in the ecosystem, is not available. For this reason the present work has been undertaken.

MATERIALS AND METHODS

Different wetlands of the Indus delta region were visited during the year of 2001. Following is the list of localities with the dates of visits:

1. Keenjhar Lake (7th April, 22nd April, 13th June, 12th July and 27th December)
2. Haleji Lake (5th May and 25th December)
3. Korangi Fishries (18th June and 12th July)
4. Korangi Creek (5th May and 12th July)
5. Malir River (24th May, 18th June, 12th July and 27th December)
6. Lyari River (29th May, 15th June and 13th September)
7. Chashma Goth (24th May, 18th June and 12th July)

Each wetland was visited more than once to record the seasonal variation in the vegetation of that area. The voucher specimens have been deposited in the Karachi University Herbarium (KUH).

RESULTS

Previous studies recognized 94 species of aquatic and semi-aquatic plants from Sindh (Khatoon and Ali, 1999). The present study has increased the number of such species to 117, i.e., twenty-three new records are reported here from the wetlands of Indus delta area. More comprehensive work may increase this number. Taxonomic breakup of major plant groups is shown in Fig.**1**. Complete list of plant species is provided in Table.1. Three species viz. *Cyperus articulatus, Alisma gramineum,* and *Potamogeton lucens* (Fig. **2**) are reported for the first time from Sindh.

Schoenoplectus lupulinus was reported from Nagar Parkar and Thar (Kukkonen, 2001). Recent study has revealed its distribution extending to the Indus delta area, as it has been collected from Korangi creek and Indus river bed under Sujawal bridge.

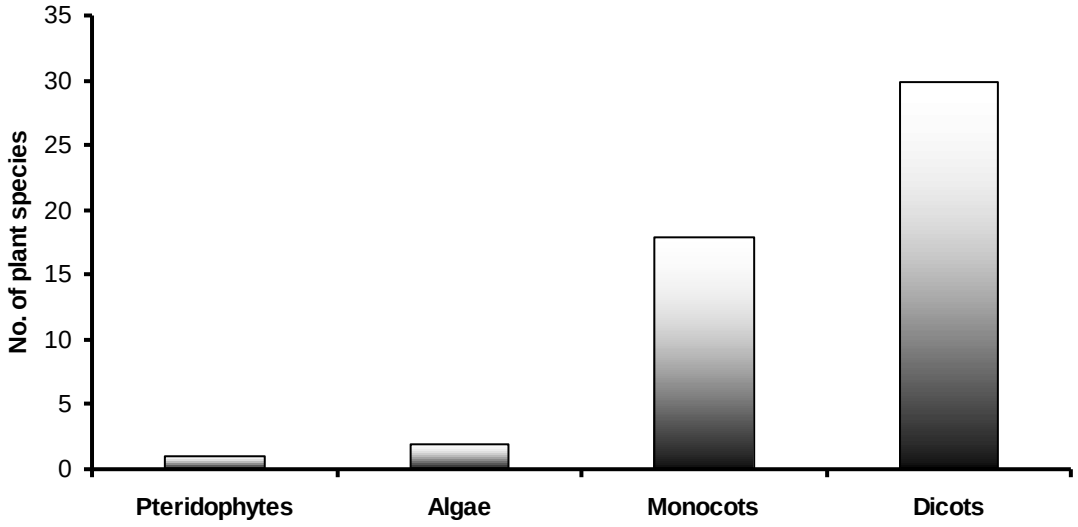

Fig. 1. Taxonomic breakup of major plant groups.

Table.1. List of wetland plants of Indus delta area, Southern Sindh.

Pteridophytes:
Marsiliaceae
Marsilia minuta L.
Azollaceae
Azolla pinnata R. Br.
Salviniaceae
**Salvinia molesta* Mitchell
S. natans (L.) Allioni
Equisetaceae
Equisetum ramosissimum Sesf. sub sp. debile (Roxb.) Hauke
Algae:
Characeae
**Chara sp.*
**Cladophora sp.*
Angiosperms - Monocotyledons:
Typhaceae
**Typha domingensis* Pers.
Potamogetonaceae
Potamogeton pectinatus L.
**P. perfoliatus* L.
**P. nodosus* Poir.
***P. lucens* L.
Zannichelliaceae
Zannichellia palustris L.
Najadaceae
Najas marina L.
**N. minor* All.
Aponogetonaceae
Aponogeton natans (L.) Engl. & Krause
Alismataceae

Table 1 Cont'd….

Sagittaria sagittifolia L.
****Alisma gramineum* Lej.
Hydrocharitaceae
**Hydrilla verticillata* (L.f.) L.C. Rich
**Vallisneria spiralis* L.
**Otalia alisnoides
Araceae
**Pistia stratiotes* L.
Lemnaceae
Lemna minor L.
Pontederiaceae
**Eichhornia crassipes* (Mart.) Schlecht
Juncaceae
Juncus maritimus Lam.
J. punctorius L.f.
Cyperaceae
Bulbostylis barbata (Rottb.) Clarke
****Cyperus articulatus* L.
C. difformis L.
C. hapan L.
**C. laevigatus* L.
Eleocharis atropurpurea (Retz.) Presl.
E. dulcis (Burm. f.) Henschel
E. geniculata (L.) R. & S.
E. palustris (L.) R. Br.
Fimbristylis bisumbellata (Forssk.) Bub.
F. complanata (Retz.) Link
F. cymosa R. Br.
F. dichotoma (L.) Vahl
F. ferruginea (L.) Vahl
F. quinquangularis (Vahl) Kunth
Scripus affinis Roth
S. articulatus L.
S. grossus L. f.
S. lateriflorus Gmel.
S. litoralis Schrad.
S. maritimus L.
S. squarrosus L.
S. triqueter L.
**Schoenoplectus lupulinus* L.
Gramineae (Poaceae)
Saccharum spontaneum L.
**S. munja* Roxb.
**Desmostachya bipinnata* (L.) Stapf.
Echinochloa colonum (L.) Link
E. stagnina (Retz.) P. Beauv.
Paspalidium geminatum (Forssk.) Stapf
**P. flavidum* (Retz.) A. Camus
**Paspalum paspaloides* (Michx.) Scribner
**Aeloropus lagopoides* (L.) Trin. ex Thw.
**Phragmites australis* (Cav.) Trin. ex Steud.
Ph. Karka (Retz.) Trin. ex Steud.
Diplachne fusca (L.) P. Beauv.
Oryza coarctata Roxb.

Table 1 Cont'd….

Angiosperms - Dicotyledons:

Polygonaceae
- **Persicaria glabra* (Willd.) Gomes
- **Rumex dentatus* L.

Euphorbiaceae
- **Euphorbia serpens* Kunth.
- **Euphorbia prostrate* L.

Chenopodiaceae
- **Arthrocnemum indicum* (Willd.) Moq.
- **A. macrostachyum* (Moric) C.Koch.

Ceratophyllaceae
- ***Ceratophyllum demersum* L.

Amaranthaceae
- **Alternanthera sessilis* (L.) DC.
- **Amaranthus graecizans* (L.) Thell
- **A. viridis* L.

Boraginaceae
- *Coldenia procumbens* L.
- **Heliotropium ovalifolium* Forssk

Nelumbonaceae
- **Nelumbo nucifera* Gaertn.

Papilionaceae
- *Aeshynomene aspera* L.

Nymphaeaceae
- **Nymphaea nouchali* Burm. f.
- *N. lotus* L.
- *N. stellata* Willd.

Elatinaceae
- **Bergia ammanoides* Heyne ex Roth

Tamaricaceae
- *Tamarix aphylla* (L.) Krast.
- *T. dioica* Roxb. ex Roth
- **T. indica* Willd.
- **T. passernioides* Del. ex Desf.
- **T. alii* Qaiser
- **T. pakistanica* Qaiser

Lythraceae
- *Ammania baccifera* L.
- *Lythrum salicaria* L.

Sonneratiaceae
- *Sonneratia caseolaris* (L.) Engl.

Rhizophoraceae
- *Bruguiera gymnorrhiza* (L.) Savigny
- *Ceriops tagal* (Perr.) C.B. Robinson
- *C. roxburghiana* Arn.
- *Rhizophora mucronata* Poir.

Trapaceae
- *Trapa bispinosa* Roxb.

Haloragidaceae
- *Myriophyllum spicatum* L.
- *M. verticillatum* L.

Myrsinaceae
- *Aegiceras corniculatus* (L.) Blanco

Gentianaceae
- *Enicostemma hyssopifolium* (Willd.) Verdoon

Table 1 Cont'd….

Asclepiadaceae
**Oxystelma esculentum* (L.f.) R. Br.
Convolvulaceae
**Ipomoea aquatica* Forsk.
I. pes-caprae (L.) Sweet
**I. carnea* Jacq.
Avicenniaceae
**Avicennia marina* (Forssk.) Vierh.
Verbenaceae
**Phyla nodiflora* (L.) Greene
Scrophulariaceae
**Bacopa monnieri* (L.) Wettstein
Peplidium humifusum Del.
Veronica polita Fries
V. undulata Wall.
Sphenocleaceae
Sphenoclea zeylanica Gaertn.
Compositae (Asteraceae)
Blumea lacera DC.
B. obliqua (L.) Druce
Conyza aegyptiaca Ait.
Conyza bonariensis (L.) Cronq.
**Eclipta prostrata* (L.) L.
Flaveria trinervia (Spreng.) Mohr.
**Grangea maderaspatensis* (L.) Poir.
**Xanthium strumarium* L.
Cucurbitaceae
**Coccinia grandis* (L.) Voigt.
Molluginaceae
**Glinis lotoides* L.

* Collected by author during this study; ** New records made during this study

DISCUSSION

In most climates there is a seasonal fluctuation of the water table. Habitats with standing water for most of the year may dry out completely in the summer whilst terrestrial soil may be flooded during a rainy season. At no time there is an abrupt change from land to water, but rather a gradual transition from dry through water logged to submerged soils. The reversion of vascular plants to aquatic life has involved colonization of all these transitional habitats as well as the water itself, and some of the marginal sites that are periodically flooded have come to possess their own distinctive plant association (Sculthorpe, 1967).

This periodical phenomenon has been well observed at Keenjhar Lake. In winter, water level in the lake is high, that submerges most of the marginal soil up to the water and dykes. With the start of summer, the water gradually recedes, due to which in March-April, the soil along margins is exposed and it is water-saturated. Rich vegetation comprising species like *Coldenia procumbens, Glinus lotoides, Persicaria glabra, Ipomoea carnea* (Fig. **3**), *Ipomoea aquatica* (Fig. **4**)*. Phyla nodiflora, Amaranthus graecizans, Heliotropium ovalifolium,* etc. develops on this soil. Later in summer (June-July), this soil dries up and most of the plants die. Then again in the monsoon season (late July-Sept.) the vegetation along water margin develops.

Haleji Lake is the 2nd largest lake of the Southern Sindh but it shows less floristic diversity as compared to Keenjhar Lake. The reason for this may be the lack of marginal water logged soil due to the construction of dyke. Due to the low rainfall over past many years, and high temperatures Malir River is much shrunken, on the other hand over-exploitation of river water for agriculture is continuously diminishing it further. The clearing of land for agriculture along the river has completely destroyed the marginal wetland flora. The same condition is seen at the Lyari River. Due to the heavy discharge of domestic and industrial effluents from its populated banks, Lyari River is completely destroyed and looks like a large municipal drain. There is no true hydrophyte in Lyari River except the alien invasive species *Eichhornia crassipes*. Very little marginal wetland flora is left due to the clearing of land for

agricultural and other purposes.

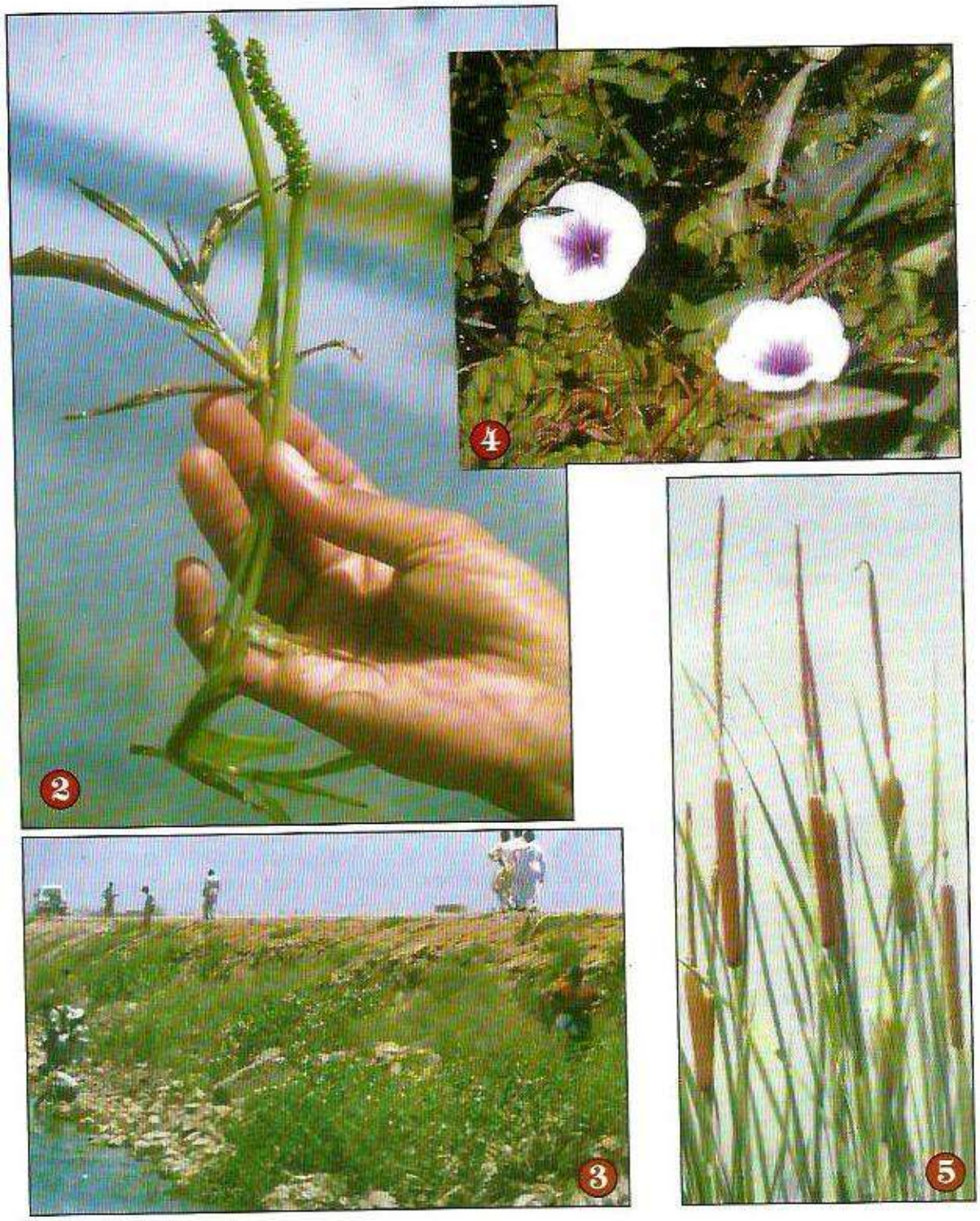

Fig.2. *Potamogeton lucens* at Keenjhar Lake
Fig.3. Stony embankment of Keenjhar Lake with various wetland plant species (*Ipomoea carnea* prominent)
Fig.4. Salvinia molesta and *Ipomoea aquatica* at Keenjhar Lake.
Fig.5. *Typha domingensis* at Karachi University Campus

Plants and animals in the landscape can be divided into those that occur there naturally i.e. native species and those that have been introduced as a result of human activities i.e. exotic species. Usually exotic species become problematic in any habitat, aquatic habitats are particularly at risk of invasion (Khatoon and Ali, 1999). One local example is the invasion of *Salvinia molesta* (Fig. **4**) in Keenjhar and Haleji Lakes and their associated canals. Its rapid spread is threatening the floristic diversity of Haleji, Keenjhar Lake and their associated canals. In Malir and Lyari Rivers *E. crassipes* and *Pistia stratiotes* have become invasive and, gradually reducing the water table due to the heavy transpiration. Besides these exotic species, *Phragmites* spp. and *Typha* spp. (Fig. **5**) have disproportionately increased their population, abundantly found in almost every wetland studied in the present work. Abundance of these amphibious species indicates the heavy siltation and sedimentation of these wetlands.

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(*Accepted for publication 25 October 2004*)