

## PRELIMINARY STUDY OF AQUATIC AND MARSHLAND ANGIOSPERMS OF ZHOB DISTRICT, BALOCHISTAN, PAKISTAN

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### Abstract

The present preliminary study is based on the results of the research work carried out in Zhob District, Balochistan, Pakistan, during 2012-2014. The area was surveyed and collection of hydrophytes and marshland plants was made from 20 sites of various aquatic habitats. The collected material was identified with the help of available literature, and internet sources and by comparing with herbarium specimens. Data inventory consists of botanical name, family, distribution. In this study 40 plant species belonging to 18 families were identified. Cyperaceae was the largest family that contributed 08 species (20%), followed by Poaceae with 07 species (17.5%), Polygonaceae 03 species (07.50 %). Seven families with 2 species (5%) each; while the last 08 families contributed 1 species (2.5%) each. Detailed account of the semi aquatic and marshland angiosperms of Zhob is not available. Therefore, the present study is an attempt to highlight such angiospermic plant species.

**Key words:** Hydrophytes, Marshland, Zhob, Angiosperms.

### Introduction

Zhob is the northern most district of Balochistan Province (Pakistan) lying between 67°48'41"- 69°44'43" East longitudes and 30°26'54"-31°57'8" North latitudes (Fig. 1). The area of the district is about 12,400 km<sup>2</sup>. The topography of the district consists of mountains and valleys with the elevation ranging from 930-2,658 meters above sea level. The temperature shows marked fluctuations both seasonal and diurnal, with significant aridity. January is coldest month of the year and July is the hottest. The mean minimum and maximum temperatures during winter are -4°C and 15°C, respectively, compared to 20°C and 36°C during summer. The Zhob River flows in the district, which is flooded during summer monsoon season. Many perennial and seasonal streams flow from the mountains to the Zhob valley. The soil is gravelly sandy loam (Nazir *et al.*, 1994).

Aquatic plants are essential to prevent too much turbidity (muddiness) and erosion of soil and to maintain delicate balance of nutrients in water. Vegetation along the banks of ponds offers habitat for water fowl, protection to fishes, and enhances the plankton density (Nazir & Younas, 1979). Water plants play an important role in maintaining healthy ecosystems while providing food, medicines and building materials.

Aquatic angiosperms represent a considerable part of the world's flora (Sardar *et al.*, 2013). About 79 families and 380 genera contain aquatic species (Cook *et al.*, 1974). The hydrophytes are structurally different from mesophytes or xerophytes by possessing less developed protective and conductive tissues. The cortex of stem and root, the ground tissue of the petiole, and the leaf mesophyll of aquatic plants have been adapted characteristically for buoyancy and aeration (Marwat *et al.*, 2011a). Based on the relationship to water and air, the aquatic plants are of various types, some are *submerged hydrophytes* (having no contact with

atmosphere) which may be free floating (e.g., *Ceratophyllum*, *Myriophyllum*, and *Utricularia* etc.) or rooted (*Hydrilla*, *Vallisneria*, *Potamogeton*, etc.). Others are *floating hydrophytes* (which float on the surface or slightly below the surface of water but are in contact with air), which may be free floating, e.g., duck weeds (*Lemna* and *Wolffia*), water hyacinth (*Eichhornia crassipes*) or rooted to substratum, e.g., lotus (*Nelumbium*) and water lily (*Nymphaea*). Still others are plants that are partly in water and partly in air. The aquatic part may be in shallow water or muddy substratum (Singh, 2012). Such habitats include banks of canals, rivers, periphery of water bodies which are mostly in earthen dams, and partly in masonry dams, drainage ditches and water ponds near villages. These may be called semi-aquatic but more appropriately referred to as emergent aquatic (Marwat *et al.*, 2013).

There are conditions where vast areas of land remain swamped with water for long periods of time, and may only dry out in severe drought situations. Such lands are known as marshes or swampy areas. They support a different type of vegetation which may include plants that are capable of growing under both flooded and saturated conditions (Lancar & Krake, 2002). Some floristic work has been carried out and a number of research papers have appeared in different journals on aquatic plants in the country by (Jafri, 1966; Stewart, 1972; Beg & Samad, 1974; Ahmed & Younis, 1979; Omer & Hashmi, 1987; Leghari *et al.*, 1999; Qaiser, 2001; Leghari, 2004; Maseeh, 2007; Marwat *et al.*, 2009; Marwat *et al.*, 2011a, b and Marwat *et al.*, 2013) but no detailed research work about aquatic angiosperms of Zhob has been undertaken. The present preliminary study is an attempt to highlight some of the aquatic angiospermic plant species of the research area. Further more work is needed in this regard.

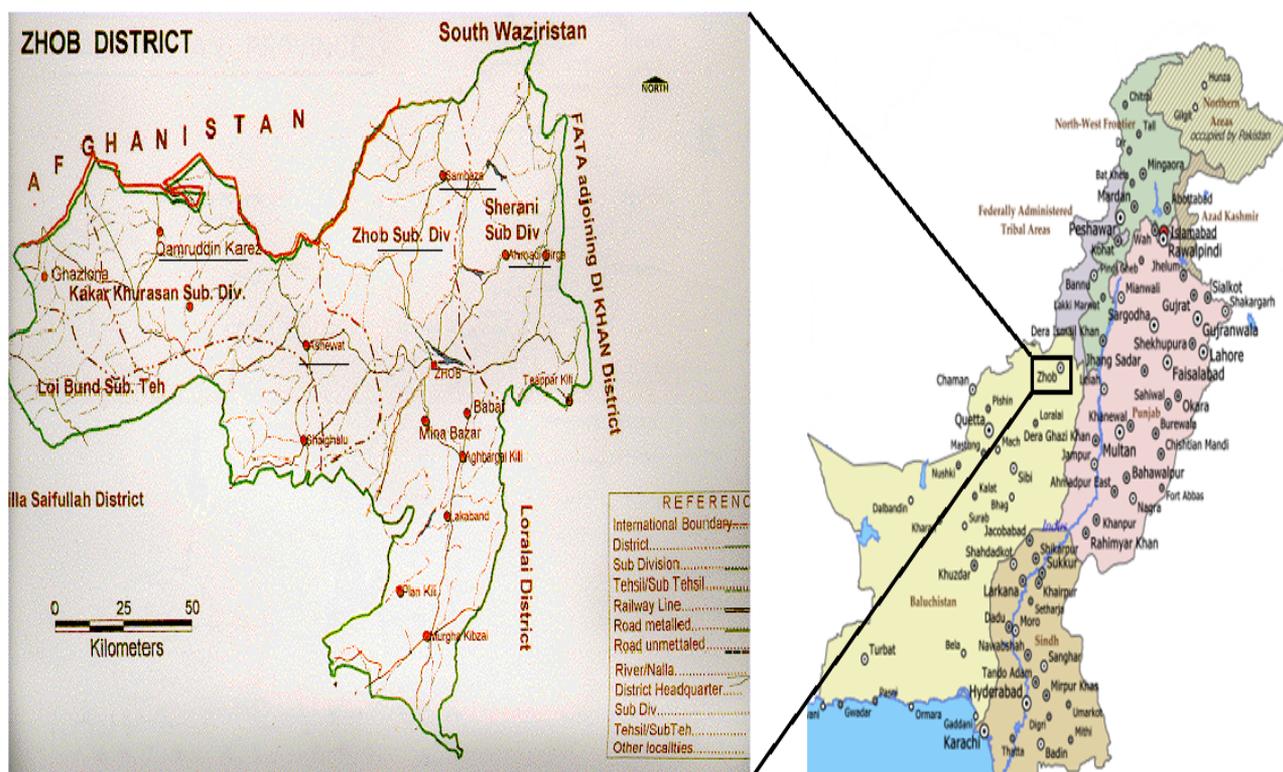


Fig. 1. Map of Zhob District, Balochistan, Pakistan.

## Material and Methods

A floristic study of the semi-aquatic and marshland plants of Zhob District, Balochistan, Pakistan, was conducted during 2012-2014. The specimens were collected from various aquatic habitats such as Zhob River bed, slow-running streams, and sides of streams, vegetable fields, sewerage canals and marshy places of the study area. The research area was surveyed to investigate the plant species. Field trips were arranged to various villages and mountain streams. Many species were collected and photographs were taken. Plants were identified with the help of available literature, and internet. Literature used for identification included Jafri (1966), Beg & Samad (1974), Bhopal & Chaudhri (1977a, b), Qaiser (2001), Ahmad & Younis (1979), Cope (1982), Marwat *et al.* (1996), Leghari *et al.* (1999) & Leghari (2004). Plants with botanical names, common names, family, class, habit, flowering and fruiting period, availability, distribution, and % age share of families were listed in Tables 1-3. Photographs of some plants were also made.

## Result and Discussion

The present preliminary study was conducted for the first time in Zhob District, Balochistan, Pakistan. During the study, 40 species and 35 genera belonging to 18 families were recorded from the area (Table 1). Of these, monocots were represented by 21 species belonging to 19 genera and 6 families, while dicots contributed 19 species of 16 genera and 12 families. Cyperaceae was the largest family that contributed 08 species (20%), followed by Poaceae with 07 species (17.5%), Polygonaceae 03 species (07.50%), and next seven families with 2 species

(5%) each; while the remaining 08 families contributed 1 species (2.5%) each (Fig. 2 and Tables 2-3). Enumeration of the taxa is as follows:

*Arundo*: The genus *Arundo* (Poaceae) has 12 species which are distributed in tropical and temperate regions of the world. One species, *Arundo donax* L. is reported from Pakistan (Cope, 1982). This is an aquatic species, and grows in damp places such as ditches, streams, and riverbanks, developing excellently in well drained soils where plentiful wetness and sunlight is present (Anon., 2011). *Arundo donax* is also found in Zhob District (Fig. 3).

*Bolboschoenus* of Cyperaceae, possesses about 16 species, which are worldwide in distribution except in S. America. In Pakistan, it is represented by two species, *B. affinis* (Roth) Drobov and *B. glaucus* (Lam.) S.G. Smith (Kukkonen, 2001). *B. affinis* occurs in shallow water, irrigation channels, waste land pools, rice fields. *B. glaucus* is found in 'Scirpus-community' of shallow water in brooks and also artificial depressions (Marwat *et al.*, 2013). One species, *B. affinis* is also found in Zhob District.

The genus *Brachiaria* (Poaceae), consists of 80-90 species which are tropical and subtropical in distribution, mostly found in Africa (Cook *et al.*, 1974; Cope, 1982). Six species occur in Pakistan (Cope, 1982) of which *B. ramosa* is found in Zhob District. This species is usually abundant in rice fields, along ditches and canals and in marshes (Marwat *et al.*, 2013).

*Carex stenophylla* (Cyperaceae) usually develops in season or permanently damp grassland, as well as on river beach and wet roadsides usually on sandy or stony, frequently in slight saline soils (Lansdown, 2013). It is also found in Zhob district.

Table 1. Hydrophytes and marshland plants of Zhob District, Balochistan, Pakistan.

S. No.	Botanical name	Family	Vernacular name	Common name	Availability
1.	<i>Arundo donax</i>	Poaceae	Nal,Narri,darwai	Gaint reed	Common
2.	<i>Bolboschoenus affinis</i>	Cyperaceae	Dumbi ghas, Sarmagha		Common
3.	<i>Brachiaria ramosa</i>	Poaceae	Ghandheri, Kori, Jahanda, Sworai	Browntop millet	Common
4.	<i>Carex stenophylla</i>	Cyperaceae	Motlai		Not common
5.	<i>Chenopodium glaucum</i>	Chenopodiaceae	-----	Oak-leaved goosefoot	Common
6.	<i>Coronopus didymus</i>	Brassicaceae	Jangli halon, Naksari, Sarghondai	Swine cress	Common
7.	<i>Cyperus rotundus</i>	Cyperaceae	Deela, Surmagha	Nut sedge	Common
8.	<i>Echinochloa colona</i>	Poaceae	Swank, dhiddan, wobo-washa	Jungle rice	Common
9.	<i>Eleocharis palustris</i> var. <i>iranica</i>	Cyperaceae	-----	Spike rush	Not common
10.	<i>Epipactis veratrifolia</i>	Orchidaceae	-----	Eastern marsh helleborine,	Rare
11.	<i>Hydrilla verticillata</i>	Hydrocharitaceae	-----	water thyme	Not common
12.	<i>Isolepis setacea</i>	Cyperaceae	-----	bristle club-rush	Rare
13.	<i>Juncus inflexus</i>	Juncaceae	Chab		Not common
14.	<i>J. maritimus</i>	Juncaceae	Chab		Not common
15.	<i>Mentha longifolia</i>	Lamiaceae	Jangli podina, Shinshobai	Horse mint	Common
16.	<i>Myriophyllum spicatum</i>	Haloragidaceae	-----	Water milfoil	Not common
17.	<i>Nasturtium officinale</i>	Brassicaceae	Piriya Halim	Water cress	Common
18.	<i>Paspalum paspaloides</i>	Poaceae	Naru ghas, Khar-chaman	Water grass	Common
19.	<i>Persicaria longiseta</i>	Polygonaceae	-----	bristly lady's thumb	Common
20.	<i>Persicaria maculosa</i>	Polygonaceae	Anjal-gona	spotted lady's thumb, redshank	Common
21.	<i>Phalaris minor</i>	Poaceae	Dumbi-siti, Bajri-washa	Bird's seed grass	Common
22.	<i>Phragmites australis</i>	Poaceae	Dila, Dargha, Darwai	Common reed	Not common
23.	<i>Phyla nodiflora</i>	Verbenaceae	Bukan	Frogfruit, cape	Common
24.	<i>Polypogon fugax</i>	Poaceae	Gule-Sarh	Asia minor blue grass	Not common
25.	<i>Portulaca oleracea</i>	Portulacaceae	Kulfa, Lunak, Pakhare	Purslane	Common
26.	<i>Potamogeton natans</i>	Potamogetonaceae	-----	broad-leaved pondweed	Rare
27.	<i>P. perfoliatus</i>	Potamogetonaceae	-----		Rare
28.	<i>Pycnus flavidus</i>	Cyperaceae	-----		Not common
29.	<i>Ranunculus muricatus</i>	Ranunculaceae	Ghundai	Butter-cup	Not common
30.	<i>R. scleratus</i>	Ranunculaceae	Jhal dhania, Ghundai	Blister buttercup	Not common
31.	<i>Rumex dentatus</i>	Polygonaceae	Jangli palak, Parpanry	Toothed dock	Common
32.	<i>Samolus valerandi</i>	Primulaceae	-----	seaside brookweed	Not common
33.	<i>Schoenoplectus litoralis</i>	Cyperaceae	-----		Rare
34.	<i>Scirpoides holoschoenus</i> subsp. <i>Australis</i>	Cyperaceae	-----	headed Club-rush	Rare
35.	<i>Sonchus maritimus</i>	Asteraceae	-----		Not common
36.	<i>Suaeda fruticosa</i>	Chenopodiaceae	Ushoon, Zumai Lani, Lana, Rigit	Seablite	Not common
37.	<i>Symphytotrichum squamatum</i>	Asteraceae	-----		Common
38.	<i>Typha domingensis</i>	Typhaceae	Kundar, Lukha	Southern cat-tail	Common
39.	<i>Veronica anagallis-aquatica</i>	Scrophulariaceae	-----		Not common
40.	<i>Veronica beccabunga</i>	Scrophulariaceae	-----		Not common

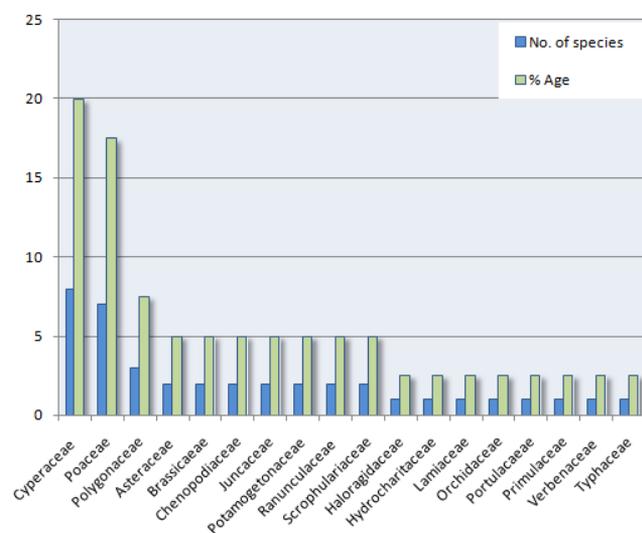


Fig. 2. Showing the % age share of families in semi-aquatic and marshland angiosperms of Zhob district.

*Chenopodium*: *Chenopodium* (Chenopodiaceae) of about 150-170 species, is worldwide in distribution, mostly in subtropical and temperate regions (Freitag *et al.*, 2001). *Chenopodium glaucum* is found in Gardens, roadsides, lake shores (Fig. 3). Usually occurs in wetlands, but occasionally in non-wetlands.

*Cyperus* (Cyperaceae) is a large genus of about 600 species, globally distributed throughout the tropical and temperate regions (Kukkonen, 2001). The plants are mostly aquatic and growing in still or slow-moving water, represented in Pakistan by about 40 species. *C. rotundus* L. which also occurs in our research area, is found in ditches, ponds and rivers shores, and rice fields (Marwat *et al.*, 2013).

*Coronopus* (Brassicaceae) is composed of about 10 species, mostly Eurasian; only one species, *Coronopus didymus* (L.) Smith occurs in Pakistan (Jafri, 1973). This species, is also reported from Zhob district.

Table 2. Distribution of Hydrophytes and marshland plants in different areas Zhob district.

S No.	Botanical name	Habitat	Local distribution
1.	<i>Arundo donax</i>	Monocot	Silyaza, Kili Shaikhan, Brunj, Zhob River, Kili Apozai, Zhob City, Viala kili, Sawara
2.	<i>Bolboschoenus affinis</i>	Monocot	Viala kili
3.	<i>Brachiaria ramose</i>	Monocot	Silyaza, Kili Shaikhan, Brunj, Zhob River, Kili Apozai, Zhob City, Viala kili, Sawara, Murgha Kibzai
4.	<i>Carex stenophylla</i>	Monocot	Viala kili
5.	<i>Chenopodium glaucum</i>	Dicot	Zhob City, Kili Apozai
6.	<i>Coronopus didymus</i>	Dicot	Kili Apozai, Zhob City
7.	<i>Cyperus rotundus</i>	Monocot	Silyaza, Kili Shaikhan, Brunj, Zhob River, Kili Apozai, Zhob City, Viala kili, Sawara
8.	<i>Echinochloa colona</i>	Monocot	Silyaza, Kili Shaikhan, Brunj, Zhob River, Kili Apozai, Zhob City, Viala kili, Sawara
9.	<i>Eleocharis palustris</i> var. <i>iranica</i>	Monocot	Wala Akram kili
10.	<i>Epipactis veratrifolia</i>	Monocot	Wala Akram kili
11.	<i>Hydrilla verticillata</i>	Dicot	Chukhan
12.	<i>Isolepis setacea</i>	Monocot	Wala Akram kili
13.	<i>Juncus inflexus</i>	Monocot	Viala kili, Zhob River
14.	<i>Juncus maritimus</i>	Monocot	Viala kili, Zhob River
15.	<i>Mentha longifolia</i>	Dicot	Dodazai kili Silyaza, Kili Shaikhan, Brunj, Zhob River, Kili Apozai, Zhob City, Viala kili, Sawara, Toradarga, Badanzai
16.	<i>Myriophyllum spicatum</i>	Dicot	Kili Shaikhan
17.	<i>Nasturtium officinale</i>	Dicot	Silyaza, Kili Shaikhan, Brunj, Zhob River, Kili Apozai, Zhob City, Viala kili, Sawara, Shahabzai
18.	<i>Paspalum paspaloides</i>	Monocot	Silyaza, Kili Shaikhan, Brunj, Zhob River, Kili Apozai, Zhob City, Viala kili, Sawara
19.	<i>Persicaria longiseta</i>	Dicot	Silyaza, Kili Apozai
20.	<i>Persicaria maculosa</i>	Dicot	Silyaza, Kili Apozai, Badanzai
21.	<i>Phalaris minor</i>	Monocot	Kili Apozai
22.	<i>Phragmites australis</i>	Monocot	Viala kili
23.	<i>Phyla nodiflora</i>	Dicot	Viala kili
24.	<i>Polypogon fugax</i>	Monocot	Zhob River
25.	<i>Portulaca oleracea</i>	Dicot	Silyaza, Kili Shaikhan, Brunj, Zhob River, Kili Apozai, Zhob City, Viala kili, Sawara
26.	<i>Potamogeton natans</i>	Monocot	Dodazai kili
27.	<i>Potamogeton perfoliatus</i>	Monocot	Dodazai kili
28.	<i>Pycnus flavidus</i>	Monocot	Kili Apozai
29.	<i>Ranunculus muricatus</i>	Dicot	Zhob City
30.	<i>Ranunculus scleratus</i>	Dicot	Zhob City
31.	<i>Rumex dentatus</i>	Dicot	Silyaza, Kili Shaikhan, Brunj, Zhob River, Kili Apozai, Zhob City, Viala kili, Sawara
32.	<i>Samolus valerandi</i>	Dicot	Kili Shaikhan, Silyaza
33.	<i>Schoenoplectus litoralis</i>	Monocot	Brunj
34.	<i>Scirpoides holoschoenus</i> subsp. <i>australis</i>	Monocot	Murgha Kibzai
35.	<i>Sonchus maritimus</i>	Dicot	Kili Shaikhan
36.	<i>Suaeda fruticosa</i>	Dicot	Zhob River, Silyaza
37.	<i>Symphyotrichum squamatum</i>	Dicot	Silyaza, Kili Shaikhan, Brunj, Zhob River, Kili Apozai, Zhob City, Viala kili, Sawara
38.	<i>Typha domingensis</i>	Monocot	Zhob River, Viala kili, Sawara
39.	<i>Veronica anagallis-aquatica</i>	Dicot	Zhob City
40.	<i>Veronica beccabunga</i>	Dicot	Zhob City

**Table 3. Percentage of families of aquatic plant species in Zhob district.**

S. #	Family	No. of species	% Age
1.	Cyperaceae	08	20.00
2.	Poaceae	07	17.50
3.	Polygonaceae	03	07.50
4.	Asteraceae	02	05.00
5.	Brassicaceae	02	05.00
6.	Chenopodiaceae	02	05.00
7.	Juncaceae	02	05.00
8.	Potamogetonaceae	02	05.00
9.	Ranunculaceae	02	05.00
10.	Scrophulariaceae	02	05.00
11.	Haloragidaceae	01	02.50
12.	Hydrocharitaceae	01	02.50
13.	Lamiaceae	01	02.50
14.	Orchidaceae	01	02.50
15.	Portulacaceae	01	02.50
16.	Primulaceae	01	02.50
17.	Verbenaceae	01	02.50
18.	Typhaceae	01	02.50
<b>Total</b>		<b>40</b>	<b>100.00</b>

*Echinochloa* (Poaceae): This genus consists of 20-30 species which are scattered globally in the warmer parts of the world. Half of the species are hydrophytes or amphibians (Cook *et al.*, 1974; Cope, 1982). Five species are recorded from Pakistan (Cope, 1982). *Echinochloa crus-galli* is a good fodder grass (Marwat *et al.*, 2012). It frequently occurs in wet places and rice fields of rice in Pakistan (Marwat *et al.*, 2013) and also found in Zhob District.

*Eclipta* (Asteraceae) genus has 3-4 species (Cook *et al.*, 1974) or 5 species (Marwat *et al.*, 2013). A single species, *E. prostrata* (L.) L., is reported from Zhob district. Though it is not strictly hydrophyte yet it usually occurs in standing water, in rice fields and irrigation ditches (Cook *et al.*, 1974).

*Eleocharis* (Poaceae): The genus *Eleocharis* comprises of about 150-200 species which are worldwide in distribution (Cook *et al.*, 1974; Marwat *et al.*, 1996; Kukkonen, 2001). Most of them are found in marshy places and shallow water. Some of the species occur as weeds in rice fields (Cook *et al.*, 1974). About 10 species are found in Pakistan (Kukkonen, 2001). In Zhob one species, *E. palustris* (L.) L. found in shallow water pond, marshland, wet meadows.

*Epipactis* (Orchidaceae): It has about 30 species which are mostly Eurasiatic species. Also found in mediterranean and eastern Africa, in Central and North America. 4 species are found in Pakistan. *Epipactis veratrifolia* found on places, near springs and rivers, on wet and mossy rocks, up to 2500m. (Renz, 1984). *Epipactis veratrifolia* is found around seepages and springs on rocky cliffs and marshy depressions in the mountains. It prefers wet sites often on calcareous substrates (Fay, 2013).

*Hydrilla* L.C. (Hydrocharitaceae) Rich. A monotypic genus, distributed in Eurasia and Africa to Australia;

introduced in the New World. Gregarious in ditches, pools, lakes, wet rice fields and slow-running water streams (Ghafoor 1985). It is also found in Zhob District as single species *H. verticillata*.

*Isolepis* (Cyperaceae): It contains about 35 species, occur in all the continents. It is represented in Pakistan by only one species, *Isolepis setacea* (L.) R. Br. This species typically grows on water courses, in marshy places with moving water (Kukkonen, 2001), the muddy margins of standing waters, occasionally on the margins of streams and on seasonally flooded or permanently moist disturbed ground (Lansdown, 2013). *Isolepis setacea* is also found in Zhob.

*Juncus*: *Juncus* (Juncaceae) is a genus of more than 200 species of which 16 species are found in Pakistan, mostly in damp habitats in hilly regions. Species belonging to the genus *Juncus* are known as 'Rushes'. *Juncus inflexus* L. mostly distributed in Europe, Asia, N. Africa; introduced elsewhere. A common species of wet places in the hilly parts of Pakistan (Jafri, 1981). In Zhob it also occurs in marshland.

*Myriophyllum*: The genus *Myriophyllum* (Haloragidaceae) includes 40-45 cosmopolitan species (Cook *et al.*, 1974; Ghazanfar, 1977). The species frequently are hydrophytes, found in various habitats (Cook *et al.*, 1974). Two species are found in Pakistan. *M. spicatum* occurs in fresh water lakes, rivers and canals in the Baluchistan, Baltistan and Kashmir areas of Pakistan (Ghazanfar, 1977). In our research area i.e., Zhob district it is also found (Fig. 3). *M. spicatum* is widely distributed and is considered as a menace (troublemaker) because it sometimes may slow down the water currents or water channels may be blocked (Cook *et al.*, 1974).

*Mentha*: The genus *Mentha* (Lamiaceae) has 25-30 species mainly distributed in the temperate areas of Eurasia, Australia and southern Africa; introduced elsewhere. From Pakistan 6 species but this account of species is inevitably provisional; many specimens can only be named tentatively (Hedge, 1990). In Zhob district one semi-aquatic species, *Mentha longifolia* was investigated. *M. longifolia* is a polymorphic aromatic herb (Hedge, 1990). The correct nomenclatural citation of this species is, to some extent, a matter of opinion. In this paper following (Hedge, 1990). *M. longifolia* has been favoured.

*Nasturtium* (Brassicaceae): The genus *Nasturtium* consists of 2 species which are distributed in the Northern hemisphere. In Pakistan it is also represented by two species (Jafri, 1973). In our research area i.e., Zhob, *Nasturtium officinale* R. Brown. is found (Fig. 3). The habitats of this species are streams, ditches, lakes, swamps, marshes.

*Paspalum* (Poaceae) has 200-250 species (Cook, 1974; Cope, 1982) distributed in the warmer regions of the world, with most species in America. A few species are aquatic or semi-aquatic (Cook, 1974). Three species are reported from Pakistan, one of them has been introduced (Cope, 1982). One species, *P. paspalodes* (Michx.) Scribner was found in Zhob district. It occurs as a garden weed, along ditches and irrigation channels, as a weed in rice-fields and is gregarious in swampy places (Cope, 1982). It may become weedy in our research area i.e. Zhob district.



Fig. 3 A. *Arundo donax*, B. *Chenopodium glaucum*, C. *Myriophyllum spicatum*, D. *Nasturtium officinale*.  
Source: All the photos by author.

*Persicaria* (Polygonaceae) consists of about 150 species, which are distributed in North temperate regions of both the hemisphere. In Pakistan, it is represented by 21 species. Two species, *P. longseta* (De Bruyn) Kitagawa and *P. maculosa* S. F. Gay. are found in Zhob District. *P. longseta* develops in ditches, damp places. *P. maculosa* grows in moist shady places, among the rocks and marshlands (Qaiser, 2001).

*Phalaris* (Poaceae) is a genus of 15-20 species distributed throughout the world (Cook, 1974; Cope, 1982). Only 2 species are native to Pakistan, but several have been introduced, mainly in bird-seed (Cope, 1982). It is represented by one species, *Phalaris minor* in Zhob district. It is a weed of cultivated fields and moist places. *Phragmites* (Poaceae) is a cosmopolitan genus of 3-4 species (Cook, 1974) but less common in the tropics. It is usually found in dense stands fringing streams, rivers, ponds and lakes, in

marshes and in estuaries (Cook, 1974), 2 species of which occur in Pakistan (Cope, 1982). In Zhob it is represented by one species, *Phragmites australis* (Cay.) Trin. ex Steud., which occurs in swamps and beside streams of the area. *Phyla* (Verbenaceae) is a small genus of c. 10 species which are frequently distributed in North and Central America. Of these, 1-2 species are reported from warmer parts of Asia and Africa. *Phyla nodiflora* (L.) Greene is the species, found in Pakistan (Jafri & Ghafoor, 1974) and Zhob district as well. *P. nodiflora* is distributed in damp places, often in gregarious patches of the presently research area.

*Polypogon*: The genus *Polypogon* (Poaceae) has 15 species which are distributed in subtropical and warm temperate regions of the world. In Pakistan it is represented by 2 species. One species, *Polypogon fugax* is usually found in wet ground beside lakes and streams or in marshes (Cope, 1982). This species is also collected from Zhob District.



Fig. 4. G. *Potamogeton perfoliatus*, H. *P. natans*, I. *Scirpoides-holoschoenus*, J. *Sonchus maritimus*.

Source: All the photos by author.

*Portulaca* (Portulacaceae) has about 200 species, chiefly found in America but also occur in tropical and subtropical zones of the world (Ghafoor, 1973). It is represented by 5 species in Pakistan. One species, *P. oleracea* L. occurs in Zhob District. This species grows as a weed in cultivated grounds and waste damp marshy places. The species is of ethnobotanical importance (Sher *et al.*, 2011; Marwat *et al.*, 2011c).

*Potamogeton* has about 100 species that are cosmopolitan in distribution and occurs in large variety of

habitats (Cook *et al.*, 1974). About 12 species are reported from Pakistan (Aziz & Jaferi, 1975). One floating species, *Potamogeton natans* and *P. perfoliatus* submerged species were recorded from Zhob (Fig. 4).

*Pycneus* (Cyperaceae) genus consists of c.70 species, distributed in tropical and warm areas; represented in Pakistan by 6 species (Kukkonen, 2001). In Zhob it is represented by *P. flavidus* (Retz.) T. Koyama. *P. flavidus* is found in marshy places, along river banks and rice fields (Marwat & Khan, 2008).

*Ranunculus*: The genus *Ranunculus* (Ranunculaceae), is a large genus, contains about 400-600 (Cook, 1974; Chen, 2011) of these 35 species are aquatic which are cosmopolitan in distribution (Cook, 1974). In Pakistan *Ranunculus* represented by 23-36 species (Qureshi & Chaudhri, 1988; Riedle & Nasir, 1991). In Zhob two species, *R. muricatus* L. and *R. scleratus* L. are found. These two species commonly grows in marshy places.

*Rumex* (Polygonaceae) genus consists of more than 200 species, distributed in temperate of the world. In Pakistan it is represented by about 15 species (Bhopal & Chaudri, 1977b). One species, *Rumex dentatus* L., is found in Zhob. It grows in disturbed habitat, frequently in damp areas, such as lakeshores and the boundaries of cultivated grounds.

*Samolus*: Genus *Samolus* (Primulaceae) has 10-15 species which are cosmopolitan in distribution but mainly in the S. Hemisphere. Represented in Pakistan by 1 species, *Samolus valerandi*. This species occurs in moist places and shallow water, along streams and springs, and several species are found in brackish water (Cook, 1974; Nasir, 1984). The above species is also reported from Zhob District.

*Suaeda* (Chenopodiaceae) genus is composed of about 80-90 halophytic species, distributed throughout the world, but primarily extra-tropical, growing on wet, moist or dry saline, alkaline and gypsiferous soils in semideserts, deserts and along sea-shores. It is represented in Pakistan by 7 species. (Freitag *et al.*, 2001) or 9 species (Bhopal & Chaudhri, 1977a) and Zhob district by one species. In Pakistan, *S. fruticosa* is the most common and ecologically most adaptable species of the genus (Freitag *et al.*, 2001).

*Schoenoplectus* (Cyperaceae): There are c. 60 species, included in genus *Schoenoplectus*, which are widespread in the world. 11 species are found in Pakistan (Kukkonen, 2001) and one species, *S. litoralis* (Schrad.) Palla occurs in Zhob. *S. litoralis* is partially submerged aquatic herb found in marshy grounds (Marwat *et al.*, 2008), alluvial meadows, by rivers and lakes, rice fields (Kukkonen, 2001).

*Scirpoides* (Cyperaceae): The genus *Scirpoides* is unique because it has a pseudolateral compact globose spike heads. It consists of c. 3 species, distributed in Europe and Africa (Australia?). *Scirpoides* is represented in Pakistan by one subspecies (Kukkonen, 2001). *Scirpoides holoschoenus* subsp. *australis* (L.) Soják grows in damp pastures, at springs, on river and lake shores. In Zhob the same species is found (Fig. 4).

*Sonchus* (Asteraceae) genus has about 90 species in its wider circumscription. *S. maritimus* L. (Fig. 4). common on irrigation drainage channels, roadside (Qureshi *et al.*, 2002). It is also in our research area i.e., Zhob, *Symphotrichum* (Asteraceae) consists of about 90 species distributed in Asia, Europe, North and South America. *Symphotrichum subulatum* (Michaux) G. L. Nesom Disturbed areas, roadsides, grassy fields, irrigation ditches, rice field margins; near sea level to 2000 m. (Chen & Brouillet, 2011).

*Typha*: The genus *Typha* (Typhaceae) has about 10-11 species. It is mainly distributed in Northern Hemisphere. It also occurs in different marshland environment (Omer & Hashmi, 1987; Thomas, 2008). In Pakistan, its 5 species have been reported (Omer & Hashmi, 1987). One species, *Typha domingensis* Pers. is found in Zhob District. This species abundantly occurs in fresh and brackish marshland, and along water courses (Swapna *et al.*, 2011).

*Veronica*: The genus *Veronica* (Scrophulariaceae), includes c. 250 species which are widely occur in temperate regions. The aquatic species, which belongs to section *Beccabunga* (Hill) Dum. are c.12 in number. They are mostly present in damp places. *V. anagalis-aquatica* L., *V. catenata* Pennell., *V. glandifera* Pennell and *V. connate* Rafin. are typically found at least partially submerged (Cook, 1974). *V. anagalis-aquatica* L. *Veronica beccabunga* also occur in Zhob District (i.e., our research area).

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