

**CONTRIBUTION TO THE VASCULAR AND
BRYOPHYTE FLORA AS WELL AS HABITAT
DIVERSITY OF THE BOUJAGH NATIONAL PARK,
N. IRAN**

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Abstract

Boujagh National Park is the first founded land-marine national park in Iran and the first national park in Gilan Province, N. Iran. This area is a critical refuge for a lot of migratory birds and so many valuable coastal flora and fauna. The present study revealed that, the flora of this area comprises 248 vascular plants and 10 bryophytes out of which six taxa are endemic for the flora of Iran. Chorotype spectrum of the plant species showed that most of them were widespread elements, i.e. pluriregional, subcosmopolitan and cosmopolitan. Therophytes were dominant life form in the Park. Ecology and floristic composition of all habitats in Boujagh National Park were surveyed and summarized as a histogram. Moreover, detailed floristic inventory was presented. Phenological study in the area, revealed different

Key words: Habitat diversity, Boujagh National Park, Chorotype, Flora, Life form, Gilan, N. Iran

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times of flower/fruit in plant species during growing seasons. In addition, *Centella asiatica* and *Eleocharis caduca*, which had been considered as two rare species in Iran, were collected for the second time in Iran from this area.

Introduction

Boujagh National Park is the first founded land-marine national park and one of 19th National Parks in Iran as well as the first one in Gilan Province (ANONYMOUS 2006). Before it was regarded as a national Park, part of Boujagh area had been declared a Ramsar site (one of the 22 internationally important wetlands catalogued in Iran) due to its biodiversity and birds refuges (ANONYMOUS 2002). This area located in Caspian coastline, between two other important RAMSAR sites, Amirkelayeh (Lahijan) and Anzali (Bandar-e Anzali) lagoons in Gilan Province. Sefid-Rud river, one of the most important and second largest river of Iran, passes among the park, splits it to two eastern and western parts and finally enters the Caspian Sea. Boujagh National Park includes a complex ecosystem comprising two large lagoons, namely, Boujagh and Kiashahr, Sefid-Rud river and its surrounding vast plain as well as sand dune belt in seashore (Fig. 1). Habitat variation in the study area makes it possible to provide diversity of plant taxa as well as the development of ecologically specialized plant communities. The study of these habitats in north of Iran is very important because of the fact that this area serves as a very valuable resting, nesting and wintering place for a wide variety of waterfowls. There is no previous floristic information about Boujagh National Park, nevertheless, some information have been recently provided for other similar coastal ecosystems in north of Iran, i.e. Amirkelayeh lagoon and coasts of Lahijan-Langerud (KUKKONEN *et al.* 2001, NAQINEZHAD & GHAHREMAN 2002, 2004, GHAHREMAN *et al.* 2004), Anzali lagoon (ASRI & EFTEKHARI 2002, GHAHREMAN & ATTAR 2003), Miankaleh wildlife refuge (EJTEHADI *et al.* 2003).

Materials and Methods

Study area and conservation history

Boujagh National Park is located on the coast of Caspian Sea, 6 km of N.W. Kiashahr (Astaneh, Gilan Province) and 15 km N.E. Zibakenar, at

49° 51' 40" - 49° 59' 50" E and 37° 25' 00" - 37° 28' 50" N. Total surface, circumference and mean altitude of the Park is 3278.140 ha, 31.409 km and -23 m respectively (Fig. 1). Northern limit of the Park restricted to six-meter depth line of Caspian Sea. This depth line located in different distance from sea shore, i.e. ca. 700 m in Sefid-Rud mouth up to 400 m in some places of the Park. Moreover, the study area is faced with Aliabad village (Zibakenar), Kiashahr town and Amirkiasar village in the south, TV/Radio station (Amirkiasar) in the east and Ushmak river in the West.

Boujagh National Park includes a complex ecosystem comprising two main parts, marine and land. Land parts include a fresh water coastal wetland, Boujagh wetland in the west, Sefid-Rud river and its mouth in the center and a relatively large lagoon, Kiashahr in the east. Boujagh wetland is located between Ushmak river and Sefid-Rud river. This area was designated as "no-hunting area" in Oct. 1998. Kiashahr lagoon is a shallow sea bay with associated permanent freshwater and brackish marshes. This lagoon together with mouth of Sefid-Rud with 500 ha surface was designed as a Ramsar site in June 1975 (ANONYMOUS 2002). Mouth of Sefid-Rud river comprises an estuary with freshwater or Brackish riverine marshes. A large plain part with grassland vegetation found in the bank of Sefid-Rud river, which may be flooded during some rainy seasons (Fig. 1). Based on the reports of Ramsar site database (ANONYMOUS 2002), Kiashahr lagoon was formed in 1960 because of the falling level of Caspian Sea. Between 1960 and 1978, this lagoon used to be a real lagoon with fresh to brackish water with a very narrow open to the sea. Since 1978, a rise back in sea level has obliterated the sand barrier between the lagoon and the Sea. With the result that now, the wetland again constitutes a bay with broad entrance to the sea. Due to Biological and ecological importance of study area, this area (3278.14 ha) including all mentioned parts, reached to the higher level of conservation (National Park) in 2001.

From a geological point of view, the study area lies into the Gilan plain between Caspian sea and Alborz Mts. This area is influenced by quaternary deposits due to sea and Sefid-Rud river. The sand dune belt in northern part of area is produced due to sea currents (ANONYMOUS 1977, 1978).

Using climate method of Gaussen & Emberger, temperate axeric and humid temperate climate were respectively calculated in Boujagh National Park (SABETI

1969). The climate information in the closest weather station to our area (Lahijan station), shows amounts of mean annual precipitation (1425.9 mm) and mean annual temperature (16.74 °C) (see GHAHREMAN *et al.* 2004, Fig. 1).

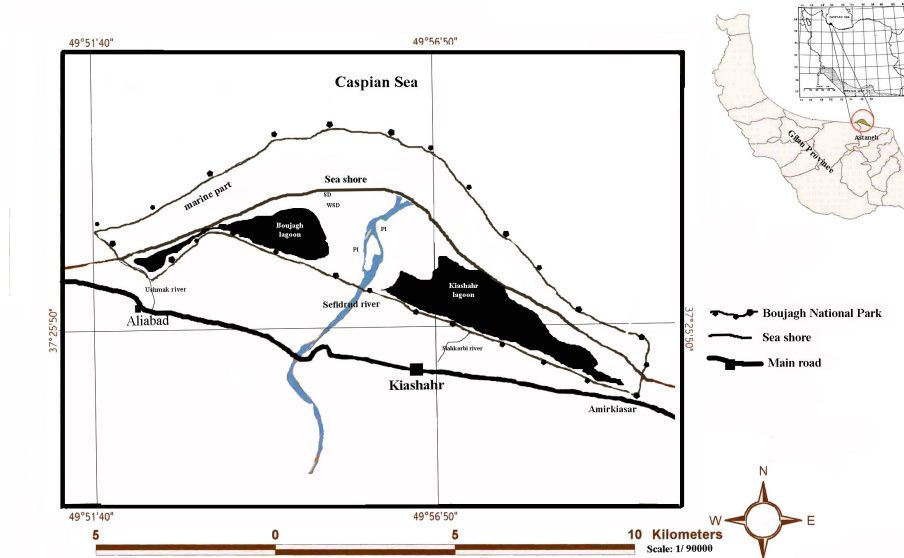


Fig. 1. Map of Boujagh National Park (Pl: plain along the Sefid-Rud river, SD: sand dune and WSD: wet sand dune).

Data collection

Data collection was performed from Mar. 2004 to Mar. 2006. Voucher specimens were deposited in three herbaria namely, Iran Natural History Museum (MMTT), Mazandaran University Herbarium (MUH) and Gilan University Herbarium (GUH). Plant nomenclature (Angiosperms) was based on (RECHINGER 1963-1998, ASSADI *et al.* 1988-2003, DAVIS 1965-1988, TUTIN *et al.* 1964-1980 and KOMAROV 1934-1954). PARSA 1978 and WENDELBO 1976 were used for the determination of ferns. The identification of moss specimens which was performed by the last author, was based on CRUM & ANDERSON (1981), NOGUCHI (1991), NYHOLM (1998) and SMITH (2004). Life forms were named following the Raunkiaer's classification (RAUNKIAER 1934). The distributions of the species are based on the reviews, monographs and distribution information in the floras, particularly Flora Iranica, Flora of Turkey and Flora of Europaea. The

terminology and delimitation of the main phytochoria (Irano-Turanian [IT], Mediterranean [M] and Euro-Siberian [ES]) is based on the known classical works particularly those of (ZOHARY 1973, TAKHTAJAN 1986). Based on author's assessments, PL (Pluriregional elements) are plants ranging in distribution over three phytogeographical regions and SCOS (Subcosmopolitan elements) are plants ranging in distribution over most continents but not all of them. In addition, cosmopolitan elements are abbreviated by COS (Cosmopolitan). For the microhabitats of aquatic species, we used the classification of COOK (1996). Information regarding collection sites habitat preferences, ecological status and phenological condition, based on our own field observation is given for each taxon. In addition, delimitation of the habitats was performed with physiognomical approach and based on the field observation in each habitat.

Results and Discussion

I. Inventory of vascular flora

A total of 248 species of native and naturalized vascular plants belonging to 62 families and 164 genera were known from Boujagh National Park (Table 1). Three families of Pteridophytes and 59 families of Angiosperms (47 dicotyledons and 12 monocotyledon families) constitute the studied flora. Poaceae, Asteraceae, Cyperaceae, Fabaceae, Caryophyllaceae, all exceed 11 taxa and show the highest species richness respectively. Two families are represented by eight taxa, two families with seven taxa, two families with six taxa, three families with five taxa, four families with four taxa, seven families with three taxa, 11 families with two taxa and 26 families have only one taxon.

Six families including Poaceae (23), Asteraceae (20), Cyperaceae (10), Caryophyllaceae (8), Brassicaceae (8) and Fabaceae (7), contain more than seven genera. Two families have six genera, six families have three genera, 10 families have two genera and the rest (38 families) are unigeneric.

As it concerns the species richness of the genus, genera exceeding five species are *Trifolium* (eight spp.), *Cyperus* (seven spp.), *Juncus* (six spp.), *Potamogeton* (five spp.), *Typha* (five spp.), and *Polygonum* (five spp.). One genus is represented by eight taxa, one genus with seven taxa, one genus with six taxa, three

genera with five taxa, three genera with 4 taxa, 9 genera with three species, 26 genera with 2 species and 121 genera only with a single taxon.

In the assessment of life form spectrum, the dominant life forms are therophytes, which constitute 44% of studied flora, followed by the hemicryptophytes (21%), hydrophytes (15%), geophytes (15%) and phanerophytes (5%) (Fig. 2).

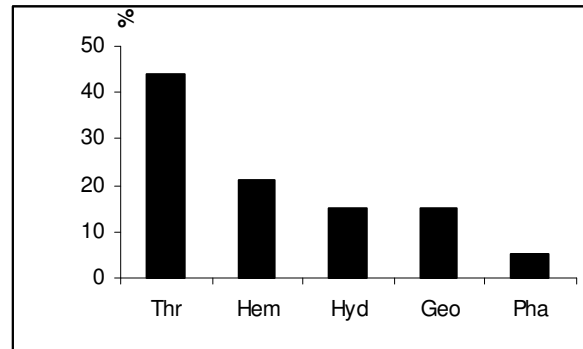


Fig. 2. Life form spectrum in Boujagh National Park (abbreviation according to Table 1).

Although, therophytes occur abundantly in desert areas (ARCHIBOLD 1995), a high presence of this life form proves destruction pressure in some parts of our studied area. Such an abundant presence of therophytes has been previously observed in other studied ecosystems (GHAHREMAN *et al.* 2006).

Chorologically, the following taxa are endemic or nearly endemic to the Hyrcanian district: *Alcea hyrcana*, *Alnus subcordata*, *Daucus littoralis* ssp. *hyrcanus* and *Papaver chelidoniifolium*.

The species that are confined to Euxino-Hyrcanian sub-province (according to ZOHARY 1973) are *Alnus glutinosa* ssp. *barbata* and *Typha caspica*. The presence of these endemic taxa indicates special ecologic and biogeographic importance of the area.

Chorologically, in the total sites, the flora is much affected by pluriregional elements (Fig. 4). Phytogeographical elements include PI (38%), SCOS (16%), ES, IT, M (14%), ES, IT (9%), ES (7%), COS (7%), ES, M (5%), IT (2%), IT, M (1%)

and M (1 %) (Fig. 3). It is obvious that most of plant species are widespread elements (ca. 60%).

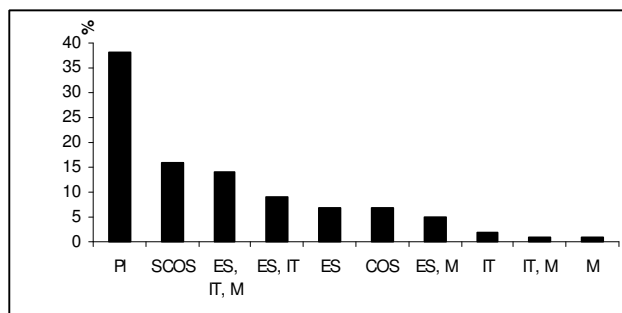


Fig. 3. Chorotype spectrum in Boujagh National Park (abbreviation according to Table 1).

- Bryophytes:

Ten moss species were found in different habitats mainly on sand dunes in Boujagh National Park. These species belong to six genera and four families (Table 2).

II. Habitat and Ecology

Despite of rather homogenous aquatic vegetation in a large part of area, several different habitats occurred in the Boujagh National Park. These habitats are ecological niches for the diversity of plant and animal species and can be classified as follow:

1. Sand dune habitat (SD in Table 1 and Fig. 1): This habitat is a barrier between the Sea and land habitats. Sand dune belt is characterized with some psammophytes which exclusively or preferably grow on this habitat e.g.: *Agriophyllum squarrosum*, *Arguzia sibirica*, *Atriplex tatarica*, *Cakile maritima*, *Cerastium semidecandrum*, *Chenopodium ambrosioides*, *Convolvulus persicus*, *Corispermum orientale*, *Crepis foetida* subsp. *foetida*, *Daucus littoralis* subsp. *hyrcanus*, *Maresia nana*, *Mulgidium tataricum*, *Salsola kali* and *Silene conica*.

Similar vegetation and species cover some other coastal areas of Caspian sea shore (AKHANI 2003, EJTEHADI *et al.* 2003, GHAHREMAN & ATTAR 2003 and GHAHREMAN *et al.* 2004).

2. Wet coastal areas (wet sand dunes = WSD in Table 1 and Fig. 1): there is a relatively wet habitat in the southern part of sandy habitat in a longer distance from the coast but still on sandy soils. The population of *Juncus acutus* definitely covers this habitat and constitutes wet stripe-like vegetation around the sand dunes. Some of frequent species in this habitat are: *Aster tripolium*, *Carex otrubae*, *Centaureum pulchellum*, *Crypsis schoenoides*, *Cynanchum acutum*, *Hypericum perforatum*, *Juncus maritimus*, *Juncus acutus*, *Lactuca seriolla*, *Lotus* spp., *Lycopus europaeus*, *Lythrum hyssopifolia*, *Medicago* spp., *Potentilla supina* and *Trifolium* spp.

The habitat structure was surveyed in other parts of Caspian shore (GHAHREMAN *et al.* 2004). These investigations revealed new reports in these areas (KUKKONEN *et al.* 2001, NAQINEZHAD & GHAHREMAN 2002).

3. Aquatic habitats (Aq in Table 1):

3-1: Open water parts: these parts are characterized with some floating [Aq (FI) in Table 1] and submerged flora [Aq (Su) in Table 1] e.g.: *Azolla filiculoides*, *Ceratophyllum demersum*, *Lemna* spp., *Myriophyllum spicatum*, *Najas* spp., *Nymphoides peltatum* and *Utricularia neglecta*.

Two main wetlands of the Park i.e. Boujagh and Kiashahr as well as some small stearms and river are the best representatives of open water habitat (Fig. 1).

Some ponds with brackish water (BW in Table 1) was found in eastern and western parts of Sefid-Rud mouth that represented some halophyte species e.g. *Ruppia maritima*. A large salty marshland can be also observed in some areas where they were dominated with *Juncus acutus* populations. *Spergularia marina* and *Salicornia europea* are of main elements of these marshlands (WSSD in Table 1).

3-2: Marginal parts (Em in Table 1): these parts cover the peripheral margin of open water areas in Boujagh and Kiashahr wetlands as well as some marshlands and are characterized with emergent helophytic flora, e.g.: *Berula angustifolia*, *Cladium mariscus*, *Galium elongatum*, *Hydrocotyle ranunculoides*, *Iris pseudacorus*, *Nasturtium officinale*, *Nelumbium nuciferum*, *Phragmites australis*, *Ranunculus* spp., *Schoenoplectus* spp., *Solanum dulcamara* and *Typha* spp.

3-3: Wet places (WP in Table 1): Some plant species are adapted to relatively lower wetness and grow on wet places near to wetlands, rivers, streams etc. i.e.:

Cardamine hirsute, *Hydrocotyle vulgare*, *Inula britannica*, *Ranunculus muricatus*, *Rorripa islandica*, *Salicornia europaea*, *Schoenus nigricans* and *Spergularia marina*.

4. The vast alluvial plain habitat along the Sefid-Rud river (PI in Table 1 and Fig. 1): This habitat covers permanently alluvial plain parts along the bank of Sefid-Rud river. The plain with possessing of a favorable humid soil can be considered as one of the most diverse habitat for many plant and animal species. Some parts of this habitat have been covered with more or less large patches of *Juncus acutus* populations. Some elements of this habitat are *Centella asiatica*, *Euphorbia helioscopia*, *Fimbristylis bisumbellata*, *Juncus acutus*, *Juncus maritimus*, *Myosotis palustris*, *Portulaca oleracea*, *Trifolium* spp. and *Verbena officinalis*.

Tamarix ramossisima and *Alnus subcordata* populations (AS in Table 1) were observed as two small separated patches in the eastern part of Sefid-Rud river.

5. Woodland habitats

5-1: *Alnus glutinosa* patches (AG in Table 1):

Alnus glutinosa subsp. *barbata* is a hygrophyte species that usually grows in the wet places near to most wetlands (GHAHREMAN & ATTAR 2003, GHAHREMAN *et al.* 2004). However, this species cannot be accounted as a marginal plant in aquatic habitats of Boujagh National Park. It seems that the salinity is a main factor to prevent the growing of *Alnus glutinosa* in the Park. The only small patch of this species has been found near to Boujagh Pasgah station with wet soil. *Polygonum* spp., *Galium elongatum*, *Solanum persicum* etc. grow in this habitat.

5-2: *Punica granatum*-*Paliurus spina-christi* patch (PP in Table 1): Two spiny shrub, namely, *Punica granatum* and *Paliurus spina-christi*, constitute a small patch in the easternmost of the park. Soil of this habitat is sandy and is characterized with some psammophytes flora.

6. Marine habitat: This habitat lacked vascular plant species and was investigated for algae species (Fig. 1).

7. Ruderal habitat (Ru in Table 1): Some parts of the National Park was destroyed and characterized with some ruderal species such as: *Amaranthus* spp., *Capsella bursa-pastoris*, *Chondrilla juncea*, *Glaucium contortuplicatum*, *Melilotus indicus*,

Oxalis corniculata, *Papaver chelidonifolium*, *Polygonum arenastrum*, *Tragopogon reticulatus*, *Trifolium striatum*, *Urtica* spp. and *Xanthium spinosum*.

This habitat is located beside the roads or cultivated places which are influenced by human activities.

A column in Table 1 is relevant to habitat diversity of plant species. The number of plant species (in percent) which can be found in each habitat is summarized in Fig. 4. This figure shows also number of plants grow in more than one habitat (PB in Fig. 4). It is obvious that most of plant species in study area grow in different habitats (ca. 40%) following with aquatic, ruderal, sandy habitats.

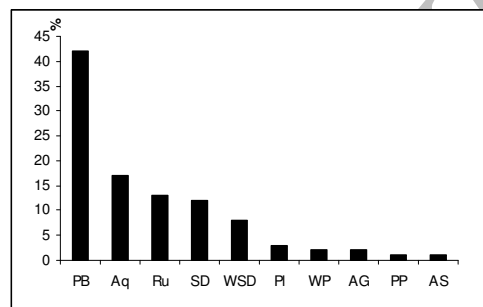


Fig. 4. Proportion of species richness in different habitat of Boujagh National Park (abbreviation according to Table 1).

Flowering/fruiting stage of plants in study area

An interesting variation of flower/fruit time of plants has been surveyed in Boujagh National Park. Figure 6 shows frequency of plants (in percent) which can be found with reproductive organs in each time period. Based on our studies, half of the plant species grow in spring and approximately 42 percent of plants grow in summer (Fig. 5). Some plants grow in a long period, i.e. during whole spring and summer to autumn (8 %).

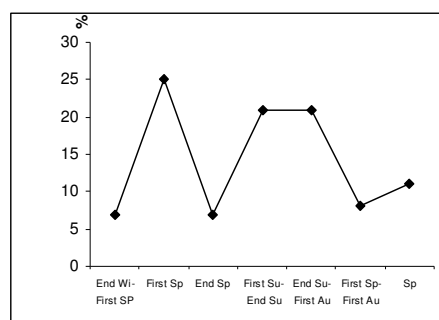


Fig. 5. Frequency of plants with flowering/fruitletting stage (in percent) in each time period (abbreviation according to Table 1).

Table 1. Floristic list of Boujagh National Park

Taxa	Habitat	Life form	Chorotype	Flowering/fruitletting duration	Hb. No. (MMTT)
Pteridophyta					
Azollaceae					
<i>Azolla filiculoides</i> Lam.	Aq (Fl)	Hyd	Pl	First Sp	13021
Equisetaceae					
<i>Equisetum ramosissimum</i> Desf.	WSD, Pl, SD	Geo	SCOS	First Sp-First Au	13082
Hypolepidaceae					
<i>Pteridium aquilinum</i> (L.) Kuhn	Ru (Hyg)	Geo	COS	First Su-End Su	13112
Spermatophyta					
Angiospermae					
Dicotyledones					
Amaranthaceae					
<i>Amaranthus chlorostachys</i> Willd.	Ru	Thr	Pl	First Su-End Su	12986
<i>Amaranthus lividus</i> L.	Ru	Thr	Pl	End Sp	12987
var. <i>ascendens</i> (Loisel.) Thell.	Ru	Thr	Pl	First Su-End Su	12988
<i>Amaranthus viridis</i> L.	Ru	Thr	Pl	First Su-End Su	12988
Apiaceae					
<i>Apium</i> sp.	Pl	Hem	SCOS	End Sp	12989
<i>Berula angustifolia</i> (L.) Mertens & W.D. Koch	Aq (Em-Hel)	Hyd	SCOS	End Sp	12990
<i>Centella asiatica</i> (L.) Urban	Pl (rare)	Hem	ES, IT	End Sp	12980
<i>Daucus littoralis</i> Smith subsp. <i>hyrcanus</i> Rech.f.	SD	Hem	ES (Hyr-En)	First Su-End Su	12991
<i>Eryngium caucasicum</i> Trautv.	Pl, WSD	Hem	ES, IT, M	End Su-First Au	12992
<i>Hydrocotyle ranunculoides</i> L. f.	Aq (Em-Hel)	Hyd	Pl	End Wi-First Sp	12993
<i>Hydrocotyle vulgaris</i> L.	WP (Hyg)	Geo	ES	First Sp	12994
Apocynaceae					
<i>Trachomitum venetum</i> (L.) Woods.	SD	Hem	ES, IT, M	First Su-End Su	12995
Asclepiadaceae					
<i>Cynanchum acutum</i> L. subsp. <i>acutum</i>	WSD	Pha	ES, IT, M	First Sp-End Su	12996

Table 1. (contd.)

<i>Periploca graeca</i> L.	AG	Pha	ES, IT, M	First Su-End Su	12997
Asteraceae					
<i>Artemisia annua</i> L.	Ru	Thr	ES, IT, M	End Su-First Au	12998
<i>Aster tripolium</i> L.	WSD	Hem	PI	End Su-First Au	12999
<i>Bidens tripartita</i> L.	WSD, Ru	Thr	PI	First Su-End Su	13000
<i>Centaurea iberica</i> Trev. ex Spreng.	WSD, PI	Thr	PI	Sp	13001
<i>Chondrilla juncea</i> L.	Ru	Hem	ES, IT, M	End Su-First Au	13002
<i>Cirsium vulgare</i> (Savi) Ten.	WSD, PI	Hem	PI	First Sp-First Au	13003
<i>Conyza bonariensis</i> (L.) Cronq.	SD,WSD,Ru	Thr	COS	End Su-First Au	13004
<i>Conyza canadensis</i> (L.) Cronq.	WSD,SD,Ru	Thr	COS	First Sp-First Au	13005
<i>Conyzanthus squamatus</i> (Spreng.) Tamamsch	WSD, SD	Hem	SCOS	First Sp-End Su	13006
<i>Crepis foetida</i> L. ssp. <i>foetida</i>	SD	Thr	ES, IT, M	Sp	13007
<i>Eclipta prostrata</i> (L.) L.	WSD, Ru	Thr	PI	End Su-First Au	13008
<i>Filago vulgaris</i> Lam.	SD, PI	Thr	ES	First Sp	13009
<i>Hedypnois rhagadioloides</i> (L.) F.W. Schmidt subsp. <i>cretica</i> (L.) Hayek	Ru	Thr	PI	First Sp	13010
<i>Inula britannica</i> L.	WSD, WP (Hyg)	Geo	PI	End Su-First Au	13011
<i>Lactuca serriola</i> L.	WSD	Hem	PI	First Su-End Su	13012
<i>Mulgedium tataricum</i> (L.) Dc.	SD	Hem	PI	First Su-End Su	13013
<i>Senecio vernalis</i> Waldst. & Kit.	SD, WSD	Thr	ES, IT	End Wi-First SP	13014
<i>Silybium marianum</i> (L.) Gaertn.	Ru	Hem	PI	First Sp	13015
<i>Sonchus asper</i> (L.) Hill.	WSD, PI	Hem	PI	Sp	13016
subsp. <i>glaucescens</i> (Jordan) Ball.					
<i>Sonchus oleraceus</i> L.	WSD, Ru	Thr	COS	Sp	13017
<i>Tragopogon reticulatus</i> Boiss. & Huet.	Ru	Hem	ES	End Sp	13018
<i>Xanthium brasiliicum</i> Vellozo	WSD, SD	Thr	PI	First Su-End Su	13019
<i>Xanthium spinosum</i> L.	Ru	Thr	SCOS	End Su-First Au	13020
Betulaceae					
<i>Alnus glutinosa</i> (L.) Gaertn. subsp. <i>barbata</i> (C.A. Mey.) Yaltirik	AG	Pha	ES (Eux-Hyr)	First Sp	13022
<i>Alnus subcordata</i> C.A. Mey.	AS	Pha	ES (Hyr-En)	First Sp	13023
Boraginaceae					
<i>Arguzia sibirica</i> (L.) Dandy	SD	Hem	PI	Sp	13024
<i>Lithospermum officinale</i> L.	Ru	Hem	PI	First Su-End Su	13025
<i>Myosotis palustris</i> L.	PI (Hyg)	Geo	SCOS	First Sp	13026
Brassicaceae					
<i>Cakile maritima</i> Seop.	SD	Thr	ES, M	Sp	13027
<i>Capsella bursa-pastoris</i> (L.) Medicus	Ru	Hem	SCOS	First Sp	13028
<i>Cardamine hirsuta</i> L.	WP (Hyg)	Thr	COS	End Wi-First SP	13029
<i>Maresia nana</i> (DC.) Batt.	SD	Thr	ES, M	End Wi-First SP	13030
<i>Nasturtium officinale</i> R. Br.	Aq (Em-Hel)	Hyd	PI	First Sp	13031
<i>Raphanus raphanistrum</i> L. subsp. <i>raphanistrum</i>	WSD	Thr	PI	Sp	13032
<i>Rorripa islandica</i> (Oeder) Borbas	WP (Hyg)	Geo	PI	First Sp	13033
<i>Sisymbrium officinale</i> (L.) Scop.	Ru	Thr	PI	First Sp	13034
Caprifoliaceae					
<i>Sambucus ebulus</i> L.	Ru	Geo	PI	First Su-End Su	13035
Caryophyllaceae					
<i>Arenaria leptoclados</i> (Reichenb.) Guss.	SD, WSD	Thr	ES, IT, M	First Sp	13036

Table 1. (contd.)

<i>Cerastium glomeratum</i> Thull.	SD, WSD, Pl	Thr	SCOS	End Wi-First SP	13037
<i>Cerastium</i> sp.	SD	Thr		First Sp	12982
<i>Cerastium semidecandrum</i> L.	SD	Thr	ES, IT, M	First Sp	12985
<i>Minuartia hybrida</i> (Vill.)					
Schischk. subsp. <i>hybrida</i>	SD	Thr	Pl	First Sp	13038
<i>Polycarpon tetraphyllum</i> (L.) L.	WSD, Ru	Thr	Pl	First Sp	13039
<i>Sagina apetala</i> Arduino	WSD, SD	Thr	Pl	First Sp	13040
<i>Silene conica</i> L.	SD	Thr	Pl	End Wi-First SP	13041
<i>Silene gallica</i> L.	SD	Thr	COS	First Sp	13042
<i>Spergularia marina</i> (L.) Griseb.	WP(BW), W SD, Pl	Hem	SCOS	First Sp-End Su	13043
<i>Stellaria media</i> (L.) Vill.	Ru, WSD	Thr	SCOS	End Wi-First SP	13044
Ceratophyllaceae					
<i>Ceratophyllum demersum</i> L.	Aq (Su)	Hyd	SCOS	Sp	13045
Chenopodiaceae					
<i>Agriophyllum squarrosum</i> (L.) Moq.	SD	Thr	ES, IT (+China)	First Su-End Su	13046
<i>Atriplex</i> sp.	WSD	Thr		End Su-First Au	13047
<i>Atriplex tatarica</i> L.	SD	Thr	ES, IT, M (+China)	First Su-End Su	13048
<i>Chenopodium album</i> L.	Ru	Thr	COS	End Su-First Au	13049
<i>Chenopodium ambrosoides</i> L.	SD	Hem	SCOS	First Su-End Su	13050
<i>Corispermum orientale</i> Lam.	SD	Thr	ES (Hyr), IT	Fist Sp-End Su	13051
<i>Salicornia europaea</i> L.	WP (BW), WSSD	Thr	Pl	First Su-End Su	13052
<i>Salsola kali</i> L.	SD	Thr	Pl	First Su-End Su	13053
Convolvulaceae					
<i>Calystegia sepium</i> (L.) R. Br.	WSD	Geo	SCOS	First Su-End Su	13054
<i>Convolvulus arvensis</i> L.	WSD	Hem	SCOS	End Su-First Au	13055
<i>Convolvulus persicus</i> L.	SD	Hem	ES, IT	Sp	13056
Cornaceae					
<i>Cornus australis</i> C.A. Mey.	AG, AS	Pha	ES, IT	End Su-First Au	13057
Cuscutaceae					
<i>Cuscuta campestris</i> Yunck.	SD (Par)	Thr (Par)	COS	Fist Sp-End Su	13058
Euphorbiaceae					
<i>Euphorbia helioscopia</i> L.	Pl, Ru	Thr	ES, IT, M	End Wi-First SP	13083
<i>Euphorbia peplus</i> L.	Ru, Pl, WSD, SD	Thr	ES, IT, M	First Sp-End Su	13084
<i>Euphorbia turcomanica</i> Boiss.	WSD, Ru, Pl	Thr	IT	First Su-End Su	13085
Fabaceae					
<i>Glycyrrhiza echinata</i> L.	SD	Geo	ES, IT, M	First Su-End Su	13086
<i>Lathyrus aphaca</i> L.	Ru, Pl	Thr	ES, IT, M	First Sp	13087
<i>Lotus corniculatus</i> L.	SD, WSD, Pl	Hem	Pl	Fist Sp-End Su	13088
<i>Lotus krylovii</i> Schischk & Serg	SD, WSD	Hem	IT	First Sp	13089
<i>Medicago lupulina</i> L.	SD, WSD	Hem	Pl	End Wi-First Sp	13090
<i>Medicago minima</i> (L.) Bartalini.	SD, WSD	Thr	Pl	First Sp	13091
<i>Medicago polymorpha</i> L.	WSD, SD	Thr	IT, M	End Wi-First Sp	13092
<i>Melilotus albus</i> Medicus	WSD	Hem	Pl	End Su-First Au	13093
<i>Melilotus indicus</i> (L.) All.	Ru	Thr	Pl	First Sp	13094
<i>Melilotus</i> sp.	SD	Hem	ES	End Su-First Au	12984
<i>Trifolium campestre</i> Schreb.	SD, Ru, WSD	Thr	ES, IT, M	Sp	13095
<i>Trifolium fragiferum</i> L.	Pl, WSD, Ru	Geo	Pl	First Sp	13096
<i>Trifolium micranthum</i> Viv.	WSD	Thr	ES, M	End Wi-First Sp	13097
<i>Trifolium repens</i> L. var. <i>repens</i>	WSD, Pl, Ru	Geo	ES, IT, M	First Sp	13098
<i>Trifolium resupinatum</i> L.	WSD, Ru, Pl	Thr	ES, IT, M	Fist Sp-End Su	13099
<i>Trifolium scabrum</i> L.	WSD	Thr	ES, M	First Sp	13100
<i>Trifolium striatum</i> L.	Ru	Thr	ES, M	First Sp	13101
<i>Trifolium suffocatum</i> L.	WSD	Thr	ES, M	First Sp	13102

Table 1. (contd.)

<i>Vicia sativa</i> L.	WSD, Ru, Pl	Thr	ES, IT, M	First Sp	13103
<i>Vicia tetrasperma</i> (L.) Schreb.	WSD, Ru	Thr	ES, IT, M	First Sp	13104
Gentianaceae					
<i>Centaureum pulchellum</i> (Swarts.) Druca	WSD, SD, Pl	Thr	Pl	Fist Sp-End Su	13105
<i>Nymphoides peltatum</i> (Gmel.) O. Kuntze	Aq (Fl)	Hyd	Pl	End Su-First Au	s.n.
Geraniaceae					
<i>Erodium cicutarium</i> (L.) L.	Ru	Hem	ES, IT, M	First Sp	13106
<i>Geranium dissectum</i> L.	Ru	Hem	ES, IT	First Sp	13107
<i>Geranium molle</i> L.	Ru,SD,WSD	Hem	ES, IT	End Wi-First SP	13108
<i>Geranium purpureum</i> Vill.	Ru	Hem	ES, M	First Sp	13109
Haloragaceae					
<i>Myriophyllum spicatum</i> L.	Aq (Su)	Hyd	SCOS	First Su-End Su	13110
Hypericaceae					
<i>Hypericum perforatum</i> L.	WSD	Hem	Pl	First Su-End Su	13111
Lamiaceae					
<i>Lycopus europaeus</i> L.	WSD,WP (Hyg),Pl	Geo	Pl	First Su-End Su	13120
<i>Mentha aquatica</i> L.	WSD, Pl, WP (Hyg)	Geo	ES	First Su-End Su	13121
<i>Mentha pulegium</i> L.	WSD, Pl	Hem	ES	First Su-End Su	13122
<i>Prunella vulgaris</i> L.	WSD	Geo	Pl	First Su-End Su	13123
Lentibulariaceae					
<i>Utricularia neglecta</i> Lehm.	Aq (Su)	Hyd	Pl	Sp	13126
Linaceae					
<i>Linum bienne</i> Miller	WSD, Pl	Hem	M	First Sp-End Su	13127
Lythraceae					
<i>Lythrum hyssopifolia</i> L.	WSD, Pl	Thr	SCOS	Sp	13128
<i>Lythrum salicaria</i> L.	WSD, WP (Hyg)	Hem	SCOS	First Su-End Su	13129
Malvaceae					
<i>Abutilon theophrasti</i> Medicus	Ru (Hyg)	Thr	SCOS	End Su-First Au	13130
<i>Alcea flavovirens</i> Boiss. & Buhse	Ru	Thr	IT (Iran, En)	First Su-End Su	13131
<i>Alcea hyrcana</i> (Grossh.) Grossh.	Ru	Thr	ES (Hyr + Talish)	End Sp	13132
<i>Malva parviflora</i> L.	Ru	Thr	Pl	First Sp	13133
Moraceae					
<i>Morus alba</i> L.	AG	Pha	IT	First Sp	13134
Nelumbaceae					
<i>Nelumbium nuciferum</i> Gaertn.	Aq (Em-Hel) in Boujagh wetland	Hyd	Pl	End Sp	13137
Onagraceae					
<i>Epilobium hirsutum</i> L.	WSD, Pl	Geo	Pl	End Su-First Au	13138
<i>Oenothera biennis</i> L.	SD	Hem	Pl	End Su-First Au	13139
Oxalidaceae					
<i>Oxalis corniculata</i> L.	Ru	Thr	SCOS	First Sp	13140
Papaveraceae					
<i>Glaucium contortuplicatum</i> Boiss.	Ru	Hem	IT (Iran, En)	End Sp	13141
<i>Papaver chelidonifolium</i> Boiss. & Bushe	Ru	Thr	ES (Hyr-En)	First Sp	13142
Plantaginaceae					
<i>Plantago lanceolata</i> L.	WSD, SD	Hem	ES, IT, M	Sp	13143
<i>Plantago major</i> L.	WSD, Pl, Ru	Hem	SCOS	End Su-First Au	13144
<i>Plantago psyllium</i> L.	SD	Thr	Pl	Sp	13145
Polygonaceae					
<i>Polygonum arenastrum</i> Boreau	Ru	Thr	SCOS	Sp	13175

Table 1. (contd.)

<i>Polygonum lapathifolium</i> L. subsp. <i>lapathifolium</i>	WSD, WP (Hyg)	Thr	ES, IT	End Su-First Au	13176
<i>Polygonum lapathifolium</i> L. subsp. <i>pallidum</i> (With.) Fries	Ru, WP (Hyg)	Thr	ES, IT	End Su-First Au	13177
<i>Polygonum mite</i> Schrank	Pl, Ru (Hyg)	Thr	ES, M	First Su-End Su	13178
<i>Polygonum patulum</i> M.B.	SD, Ru	Thr	ES, IT	Sp	13179
<i>Rumex pulcher</i> L.	WSD, Pl	Hem	ES, IT, M	First Su-End Su	13180
<i>Rumex sanguineus</i> L.	WSD, Pl, Ru	Hem	ES	Sp	13181
Portulacaceae					
<i>Portulaca oleracea</i> L.	Pl	Thr	ES, IT, M	End Su-First Au	13182
Primulaceae					
<i>Anagalis arvensis</i> L.	WSD, Pl, SD	Thr	Pl	Sp	13188
<i>Lysimachia dubia</i> Soland.	WSD, WP (Hyg)	Hem	Pl	First Su-End Su	13189
<i>Samolus valerandi</i> L.	WSD, Pl	Hem	Pl	End Su-First Au	13190
Punicaceae					
<i>Punica granatum</i> L.	PP	Pha	ES, IT	End Su-First Au	13191
Ranunculaceae					
<i>Batrachium trichophyllum</i> (Chaix) Bosch.	Aq (Su)	Hyd	SCOS	First Sp	13192
<i>Ranunculus marginatus</i> d'Urv. var. <i>trachycarpus</i> (Fisch. & C.A. Mey.) Aznavour	WSD, WP (Hyg), Pl	Thr	Pl	First Sp	13193
<i>Ranunculus muricatus</i> L.	WP(Hyg), Ru (Hyg)	Thr	IT, M	Sp	13194
<i>Ranunculus ophioglossifolius</i> L.	Aq (Em-Hel)	Thr	ES, IT, M	First Sp	13195
<i>Ranunculus scleratus</i> L.	Aq (Em- Hel) , WP (Hyg)	Thr	Pl	End Wi-First Sp	13196
Rhamnaceae					
<i>Paliurus spina-christi</i> Miller	PP	Pha	ES, IT, M	End Su-First Au	13197
Rosaceae					
<i>Mespilus germanica</i> L.	AG, PP	Pha	ES	First Sp	13198
<i>Potentilla reptans</i> L.	Ru	Hem	ES, IT	First Sp	13199
<i>Potentilla supina</i> L.	SD, WSD	Hem	Pl	End Su-First Au	13200
<i>Rubus sanctus</i> Willd.	Ru, AG	Pha	Pl	First Su-End Su	13201
Rubiaceae					
<i>Galium elongatum</i> C. Presl	Aq (Em- Hel), WP (Hel)	Hyd	ES	First Sp-End Su	13202
<i>Galium ghilanicum</i> Stapf	Pl, Ru, WSD	Thr	ES, IT, M (+Himalaya)	End Wi-First Sp	13203
Scrophulariaceae					
<i>Parentucellia viscosa</i> (L.) Caruel	WSD, Pl	Thr	ES, IT	First Sp	13205
<i>Verbascum</i> sp.	Ru	Hem		First Su-End Su	13206
<i>Veronica anagalloides</i> Guss.	WSD, WP (Hyg)	Thr	Pl	First Sp	13207
<i>Veronica arvensis</i> L.	WSD, WP (Hyg)	Thr	SCOS	First Sp	13208
<i>Veronica persica</i> L.	Ru, WSD,	Thr	SCOS	Sp	13209
<i>Veronica polita</i> Fries	Pl, Ru, WSD	Thr	SCOS	End Wi-First Sp	13210
Solanaceae					
<i>Physalis alkekengi</i> L.	Pl, WSD	Geo	ES, IT	First Su-End Su	13212
<i>Solanum dulcamara</i> L.	Aq (Em-Hel)	Pha	ES, IT	End Su-First Au	13213
<i>Solanum nigrum</i> L.	SD, WSD, Pl	Thr	SCOS	First Su-End Su	13214
Tamaricaceae					
<i>Tamarix ramosissima</i> Ledeb.	SD, Pl	Pha	Pl	First Sp-End Su	13216
Ulmaceae					
<i>Ulmus minor</i> Miller	WP (Hyg)	Pha	ES	End Su-First Au	13222
Urticaceae					

Table 1. (contd.)

<i>Urtica dioica</i> L.	Pl, Ru	Hem	Pl	End Su-First Au	13223
<i>Urtica urens</i> L.	Ru	Thr	SCOS	First Sp	13224
Verbenaceae					
<i>Pyla nodiflora</i> (L.) Greene	SD, WSD, Pl, WP (Hyg)	Hem	Pl	First Su-End Su	13225
<i>Verbena officinalis</i> L.	WSD, Pl	Hem	Pl	End Su-First Au	13226
Zygophyllaceae					
<i>Tribulus terrestris</i> L.	WSD, SD, Ru	Thr	Pl	End Su-First Au	13228
Monocotyledones					
Cyperaceae					
<i>Bolboschoenus affinis</i> (Roth.) Drob.	Aq (Em-Hel)	Hyd	Pl	End Sp	13059
<i>Carex divisa</i> Hudson	Pl (Hyg)	Geo	ES, IT, M	First Sp	13060
<i>Carex otrubae</i> Podpera	WSD	Geo	ES, IT	First Su-End Su	13061
<i>Cladium mariscus</i> (L.) Pohl subsp. <i>mariscus</i>	Aq (Em-Hel)	Hyd	Pl	End Sp	13062
<i>Cyperus difformis</i> L.	WSD, WP (Hyg)	Thr	COS	First Su-End Su	13063
<i>Cyperus distachyos</i> All.	WSD	Geo	Pl	End Su-First Au	13064
<i>Cyperus odoratus</i> L. subsp. <i>transcaucasicus</i> (Kuk.) Kukkonen	WSD, WP (Hyg)	Geo	ES, IT	End Su-First Au	13065
<i>Cyperus rotundus</i> L.	SD, WSD	Geo	COS	Fist Sp-End Su	13066
<i>Cyperus glomeratus</i> L.	Aq (Em-Hel)	Hyd	Pl	End Su-First Au	13067
<i>Cyperus serotinus</i> Rottb.	Aq (Em- Hel), WP (Hyg)	Hyd	Pl	End Su-First Au	13068
<i>Cyperus</i> sp.	SD	Geo		First Su-End Su	13069
<i>Eleocharis caduca</i> (Delile) Schultes	WSD, Pl	Geo	Pl	End Su-First Au	13070
<i>Eleocharis palustris</i> R. Br.	Aq (Em-Hel)	Hyd	Pl	First Sp	13071
<i>Eleocharis uniglumis</i> (Link) Schultes	Aq (Em-Hel)	Hyd	SCOS	End Su-First Au	13072
<i>Fimbristylis bisumbellata</i> (Forssk.) Bubani.	WSD, WP(H yg), Pl	Thr	SCOS	End Su-First Au	13073
<i>Fimbristylis turkestanica</i> (Regel) B. Fedtsch.	WSD, Pl	Geo	Pl	End Su-First Au	13074
<i>Isolepis cernua</i> (Vahl) Roemer & Schultes	WSD	Thr	SCOS	Sp	13075
<i>Pycreus flavesce</i> (L.) Reichenb.	WSD, Pl, WP (Hyg)	Geo	Pl	End Su-First Au	13076
<i>Pycreus flavidus</i> (Retz.) Koyama	WSD, WP (Hyg)	Thr	Pl	End Su-First Au	13077
<i>Schoenoplectus lacustris</i> (L.) Palla	Aq (Em-Hel)	Hyd	ES, IT	End Sp	13078
<i>Schoenoplectus litoralis</i> (Schr.) Palla	Aq (Em-Hel)	Hyd	ES, IT, M	First Sp-End Su	13079
<i>Schoenoplectus triqueter</i> (L.) Palla	Aq (Em-Hel)	Hyd	Pl	End Sp	13080
<i>Schoenus nigricans</i> L.	WP (Hyg)	Geo	ES, IT, M	End Su-First Au	13081
Iridaceae					
<i>Iris pseudacorus</i> L.	Aq (Em-Hel)	Hyd	ES	End Sp	13113
Juncaceae					
<i>Juncus articulatus</i> L.	WP (Hyg), WSD	Geo	Pl	Sp	13114
<i>Juncus acutus</i> L.	WP(Hyg), W SD, Pl	Geo	SCOS	First Sp-End Su	13115

Table 1. (contd.)

<i>Juncus bufonius</i> L.	WSD, WP (Hyg)	Thr	COS	First Sp	13116
<i>Juncus gerardi</i> Loisel.	WSD	Geo	SCOS	First Sp	13117
<i>Juncus maritimus</i> Lam.	WSD, WP(Hyg), Pl	Geo	ES, M	First Su-End Su	13118
<i>Juncus subulatus</i> Forssk.	WSD	Geo	ES, IT, M	First Su-End Su	13119
Lemnaceae					
<i>Lemna minor</i> L.	Aq (Fl)	Hyd	Pl	First Sp	13124
<i>Lemna trisulca</i> L.	Aq (Su)	Hyd	SCOS	End Wi-First Sp	13125
Najadaceae					
<i>Najas graminea</i> Delile	Aq (Su)	Thr	Pl	First Su-End Su	13135
<i>Najas marina</i> L.	Aq (Su)	Thr	SCOS	First Su-End Su	13136
Poaceae					
<i>Alopecurus myosuroides</i> Hudson var. <i>breviaristatus</i> Marchesetti ex Ascherson & Graebner	Pl, Ru	Thr	Pl	End Wi-First Sp	13146
<i>Briza minor</i> L.	Ru, Pl, WSD	Thr	ES, M	First Sp	13147
<i>Bromus brachystachys</i> Hornung	Pl	Thr	ES, IT, M	End Sp	13148
<i>Calamagrostis pseudophragmites</i> (Hall. f.) Koel.	WSD, WP (Hyg)	Geo	Pl	Sp	13149
<i>Catabrosa aquatica</i> (L.) P. Beauv.	Aq (Em-Hel)	Hyd	Pl	First Sp	13150
<i>Catapodium rigidum</i> (L.) C.E. Hubb.	SD	Thr	ES, IT, M	First Sp	13151
<i>Corynephorus articulatus</i> (Desf.) P.Beauv.	WSD	Thr	M (+Hyg)	End Sp	13152
<i>Crypsis schoenoides</i> (L.) Lam.	WSD, SD	Thr	Pl	End Su-First Au	13153
<i>Cynodon dactylon</i> (L.) Pers.	Pl	Hem	Pl	First Su-End Su	13154
<i>Digitaria sanguinalis</i> (L.) Scop. subsp. <i>pectiniformis</i> Henrard	SD, WSD	Thr	Pl	End Su-First Au	13155
<i>Echinochloa crus-galli</i> (L.) P. Beauv.	WSD, WP (Hyg)	Thr	SCOS	End Su-First Au	13156
<i>Eleusine indica</i> (L.) Gaertn.	Ru, WSD	Thr	SCOS	First Su-End Su	13157
<i>Lolium loliaceum</i> (Bory & Chaub.) Hand.	SD	Thr	ES, IT, M	First Sp	13158
<i>Lolium perenne</i> L.	SD	Hem	Pl	First Sp	13159
<i>Lolium persicum</i> Boiss. & Hohen. ex Boiss.	SD, WSD	Thr	ES, IT	First Sp	13160
<i>Lolium rigidum</i> Gaudin	SD	Thr	ES, IT, M	First Sp	13161
<i>Lophochloa phleoides</i> (Vill) Reichenb.	Ru, SD, WSD	Thr	Pl	Sp	13162
<i>Milium vernale</i> M.B.	Ru	Thr	ES, IT	First Sp	13163
<i>Parapholis incurva</i> (L.) G.H. Hubb.	SD	Thr	ES, IT	First Sp	13164
<i>Paspalum dilatatum</i> Poir.	Pl, WSD	Geo	Pl	First Su-End Su	13165
<i>Paspalum paspaloides</i> (Michx.) Scrib.	WSD, WP (Hyg)	Geo	Pl	End Su-First Au	13166
<i>Phragmites australis</i> (Cav.) Trin.	Aq (Em-Hel)	Hyd	COS	End Su-First Au	13167
<i>Poa annua</i> L.	WSD, Ru, WP (Hyg), WSD	Thr	Pl	End Wi-First Sp	13168
<i>Poa trivialis</i> L.	WSD	Geo	Pl	First Sp	13169
<i>Polypogon semiverticillatus</i> (Forssk.) Hyl.	WSD	Thr	Pl	First Sp	13170
<i>Polypogon fugax</i> Nees ex Steud.	WSD, WP (Hyg), SD	Thr	Pl	First Sp	13171
<i>Setaria glauca</i> (L.) P. Beauv.	WSD, Ru	Thr	Pl	End Su-First Au	13172
<i>Sorghum halepense</i> (L.) Pers.	Ru	Geo	SCOS	End Su-First Au	13173
<i>Vulpia myorus</i> (L.) C.C. Gmelin.	SD, Pl	Thr	IT, M	First Sp	13174
Potamogetonaceae					

Table 1. (contd.)

<i>Potamogeton crispus</i> L.	Aq (Su)	Hyd	Pl	First Sp-First Au	13183
<i>Potamogeton nodosus</i> Poir.	Aq (Su)	Hyd	Pl	End Su-First Au	13184
<i>Potamogeton pectinatus</i> L.	Aq (Su)	Hyd	COS	Sp	13185
<i>Potamogeton perfoliatus</i> L.	Aq (Su)	Hyd	SCOS	End Su-First Au	13186
<i>Potamogeton pusillus</i> L.	Aq (Su)	Hyd	SCOS	First Sp-End Su	13187
Ruppiaceae					
<i>Ruppia maritima</i> L.	Aq (BW-Su)	Hyd	COS	First Su-End Su	13204
Smilacaceae					
<i>Smilax excelsa</i> L.	AG	Pha	ES, M	End Su-First Au	13211
Sparganiaceae					
<i>Sparganium neglectum</i> Beeby	Aq (Em-Hel)	Hyd	ES, M	First Su-End Su	13215
Typhaceae					
<i>Typha angustifolia</i>	Aq (Em-Hel)	Hyd	SCOS	End Sp	13217
<i>Typha caspica</i> Pobed.	Aq (Em-Hel)	Hyd	ES (Eux-Hyr)	First Su-End Su	13218
<i>Typha domingensis</i> Persl	Aq (Em-Hel)	Hyd	Pl	First Su-End Su	13219
<i>Typha grossheimii</i> Pobed.	Aq (Em-Hel)	Hyd	ES (Eux-Hyr), IT	First Su-End Su	13220
<i>Typha latifolia</i> L.	Aq (Em-Hel)	Hyd	COS	First Su-End Su	13221
Zannichelliaceae					
<i>Zannichellia palustris</i> L.	Aq (Su)	Hyd	COS	Sp	13227

Symbols and abbreviations used in the table:

- 1. Life form:** Geo (geophyte), Hem (hemicryptophyte), Hyd (hydrophyte), Pha (phanerophyte), Thr (therophyte);
- 2. Chorotype:** COS (cosmopolitan), ES [Euro-Sibirian (Eux-Hyr = Euxino-Hyrcanian, Hyr = Hyrcanian, En = endemic plant)], IT (Irano-Turanian), M (Mediterranean), PL (pluriregional), SCOS (subcosmopolitan);
- 3. Habitat and Ecology:** Aq (aquatic habitats), AG (*Alnus glutinosa* patch), AS (*Alnus subcordata* patch near to fishery station beside to Sefid-Rud river), BW (brackish water), Em (emergent plant), Fl (floating plant), Hel (helophyte), Hyg (hygrophyte), Par (parasite on some other plants), Pl (Sefid-Rud plain), PP (*Punica-Paliurus* patch in Amirkiasar), Ru (ruderal plant), SD (sand dune), Su (submerged plant), WP (wet place), WSD (wet sand dune), WSSD (wet salty sand dune);
- 4. Phenology (flowering/fruiting stage):** Au (autumn), Sp (spring), Su (summer), Wi (winter).

Table 2. Moss flora of Boujagh National Park

Family	Species
Brachytheciaceae	<i>Brachythecium rutabulum</i> (Hedw.) Schimp.
Bryaceae	<i>Bryum argenteum</i> Hedw.
Bryaceae	<i>B. badium</i> (Brid.) Schimp.
Bryaceae	<i>B. capillare</i> Hedw.
Funariaceae	<i>Funaria hygrometrica</i> Hedw.
Pottiaceae	<i>Barbula convoluta</i> Hedw.
Pottiaceae	<i>B. unguiculata</i> Hedw.
Pottiaceae	<i>Didymodon vinealis</i> (Brid.) R.H. Zander
Pottiaceae	<i>D. luridus</i> Hornsch. ex Spreng.
Pottiaceae	<i>Tortulla muralis</i> Hedw.

- Notes on some Iranian rare species in study area:

Centella asiatica (L.) Urban.

Centella asiatica is a hygrophyte plant which is considered as a vulnerable species in the Red Data Book of plant species of Iran (JALILI & JAMZAD 1999). This species is a well-known plant in traditional and modern medicine and mostly distributed in east and southeast Asia (NASIR 1972, SHARMA & JAIMALA 2001, TAGHIZADEH *et al.* 2004). Current information about the distribution of *Centella asiatica* in Iran demonstrates a limited position for this species around the Anzali lagoon, Gilan province (RECHINGER 1987, MOZAFFARIAN 1983). We have no documents for the existence of the species in other areas. Accidentally we found a very small population of this species on the wet habitat of Sefidrud plain (Boujagh National Park). This habitat is more or less similar to the habitat of this species around the Anzali lagoon. In Boujagh National Park, *Centella asiatica* is accompanied with *Juncus acutus*, *Paspalum distichum*, *Plantago major*, *Cynodon dactylon* and *Pyla nodiflora*. Because of a high level of grazing on this limited population, conservational strategy must be seriously considered.

Eleocharis caduca (Delile) Schultes

Eleocharis caduca was recently recorded from the wet sandy soils of Langerud-Lahijan coastline. This plant has been considered as a rare plant in Asia (NAQINEZHAD & GHAHREMAN 2002). The observation of this species in wet sandy soils of Boujagh National Park as well as a similar habitat in Babolsar coastline (Mazandaran Province) proves a clear extension of the species over the wet Caspian shore depressions.

Animal diversity in the study area

According to information gathered by "Ramsar Advisor Missions" (ANONYMOUS 2002), Boujagh National Park provides important staging and wintering habitat for a wide variety of migratory water birds notably, *Phalacrocorax pygmaeus*, a globally threatened species as well as ducks, shorebirds, gulls, terns, raptors *Circus aeruginosus* and *Falco columbarius*. The open grassy areas and dunes near the river mouth provide breeding habitat for *Glareola pratincta*, while a small

patch of woodland to the south of Kiashahr lagoon supports a large colony of herons and egrets. Little bittern *Ixobrychus minutus*, is a passage migrant or summer visitor. The golden jackal *Canis aureus* is common to the area. In addition, this area is an important breeding and nursery ground for various fish species.

Human uses and destruction

Activities at the study area include grazing of livestock, reed cutting and wild fowl hunting. This National Park is an important centre for commercial fishing. There is a large fisheries station on the southern part.

Land to the south of the park is mostly under cultivation by people from fishing villages. A considerable amount of fisheries research has been carried out by the National Fisheries Organization (Shilat). Main disturbances at the Park are hunting pressure on waterfowl (mainly in winter) and heavy transport pressure by boats from the extensive commercial fisheries. There is also considerable disturbance from recreational activities during weekend and holidays.

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