

بررسی فلور و تنوع زیستگاهی گیاهان آوندی و خزها در پارک

ملی بوجاق، شمال ایران

Contribution to the vascular and bryophyte flora as well as habitat diversity
of the Boujagh National Park, N. Iran

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پارک ملی بوجاق اولین پارک خشکی- دریایی ایران و همچنین اولین پارک ملی در استان گیلان (شمال ایران) محسوب می‌شود. این منطقه پناهگاه حیاتی و مهم برای تعداد بسیار زیادی پرندگان مهاجر و گونه‌های ارزشمند گیاهی و جانوری است. تحقیق حاضر نشان داد که فلور این منطقه شامل ۲۴۸ آرایه آوندی و ۱۰ گونه خز می‌باشد. از این تعداد، شش گونه انحصاری فلور ایران می‌باشند. طیف کورولوژیکی گونه‌های گیاهی نشان داد که بیشتر آن‌ها عناصری با پراکنش وسیع می‌باشند (یعنی چند منطقه‌ای، تقریباً جهان شمول و جهان شمول). تروفیت‌ها غالب‌ترین شکل زیستی در این منطقه هستند. اکولوژی و ترکیب فلوریستیک رویشگاه‌های این پارک مورد بررسی قرار گرفت. علاوه بر این، لیست دقیق فلوریستیک منطقه ارایه شده است. مطالعه فنولوژیکی در منطقه، زمان‌های مختلف گلدهی یا میوه‌دهی را در گونه‌های گیاهی در فصول رشد نشان داد. گونه‌های *Centella asiatica* و *Eleocharis caduca* که از گونه‌های نادر ایران می‌باشند برای بار دوم در ایران از این منطقه جمع‌آوری شده‌اند (متن کامل مقاله در قسمت انگلیسی آورده شده است).

واژه‌های کلیدی: تنوع رویشگاهی، پارک ملی بوجاق، کوروتیپ، فلور، شکل زیستی، شمال ایران

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**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).

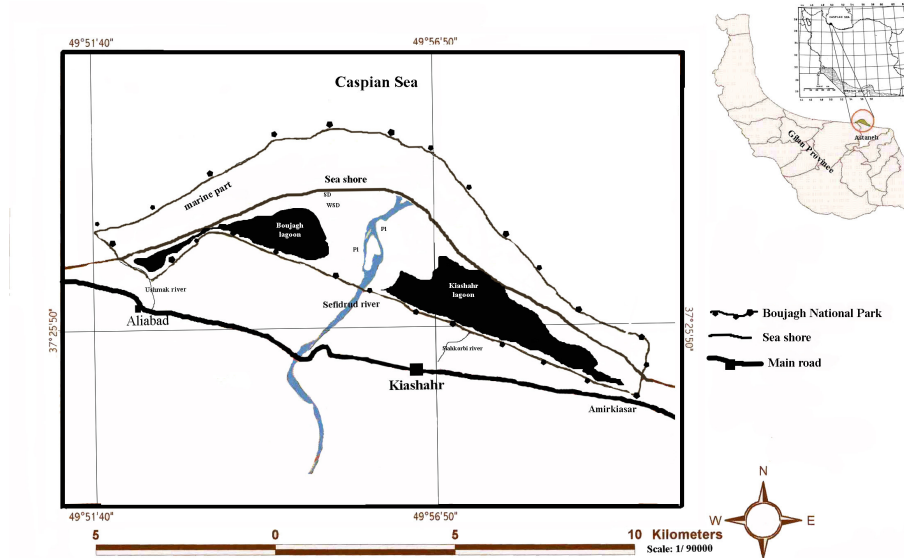


Fig. 1. Map of Boujagh National Park (Pl: plain along the Sefid-Rud river, SD: sand dune and WSD: wet sand dune).

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).

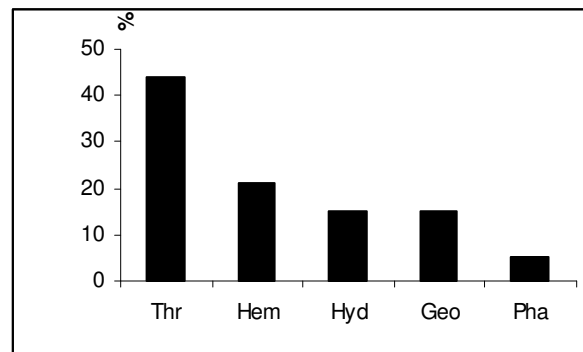


Fig. 2. Life form spectrum in Boujagh National Park (abbreviation according to Table 1).

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%).

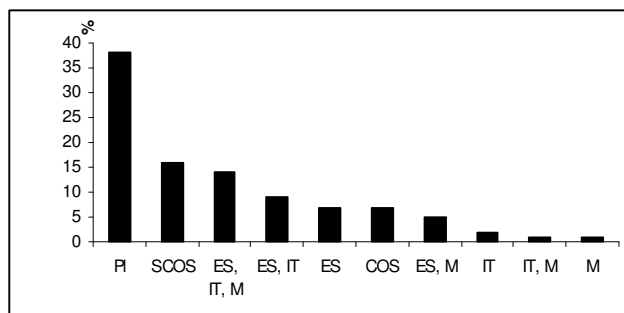


Fig. 3. Chorotype spectrum in Boujagh National Park (abbreviation according to Table 1).

- 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.

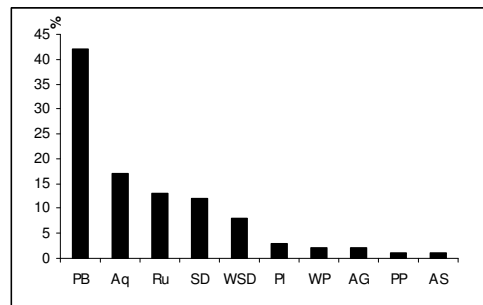


Fig. 4. Proportion of species richness in different habitat of Boujagh National Park (abbreviation according to Table 1).

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 %).

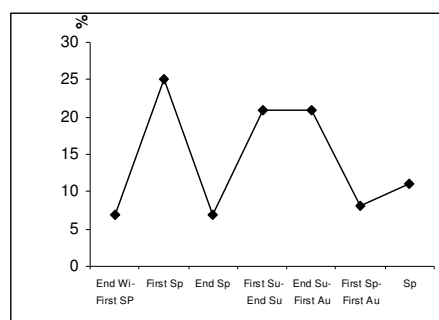


Fig. 5. Frequency of plants with flowering/fruitletting stage (in percent) in each time period (abbreviation according to Table 1).

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> Scop. | 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> (Swartz.) 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 flavesence</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(H yg), 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 (+Hyr) | 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 hygrophite 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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