BIODIVERSITAS
Volume 17, Number 1, April 2016
Pages: 1-10

ISSN: 1412-033X
E-ISSN: 2085-4722
DOI: 10.13057/biodiv/d170101

Evaluation of vegetation types in the West Zagros (Beiranshahr region as a case study), in Lorestan Province, Iran

ATENA ESLAMI FAROUJI, HAMED KHODAYARI♥
Department of Biology, Faculty of Science, Lorestan University, 5 km Khorramabad toward Tehran, Khorramabad, Iran. Tel./Fax.: +98-6633120114, ♥email: khodayari.h@lu.ac.ir

Manuscript received: 18 June 2015. Revision accepted: 12 November 2015.

Abstract. *Farouji AE, Khodayari H. 2016. Evaluation of vegetation types in the West Zagros (Beiranshahr region as a case study), in Lorestan Province, Iran. Biodiversita 17: 1-10.* The accurate identification of plant communities and their distribution are classical tools for mapping and classification of plants. Plants are strongly sensitive against changing environmental conditions. Moreover, Iran has a special position in Asia which has been creating a diverse ecosystem. Close floristic studies are necessary for precise determination of diversity and uniformity. To determine plant species in different vegetation types in Beiran shahr region, modified multi-scale Whittaker plots were constructed. This studied area was about 20000 ha and located in Northwest to Southwest of Iran. Eighty-nine plots were made in different longitude and latitudes. The minimum and maximum heights were 1101 and 2489 m asl., respectively. Within each modified multi-scale plots, each species was explored. Of 608 species, 498 and 97 are belonging to dicotyledons and monocotyledons, and remained 13 species were Pteridophytes. As measured, Therophyte and Champhyte are the dominant and recessive form of life in studied area. Based on species of each plot and subplots, mean Jaccard's coefficient, number of unique species and mean unique species/plot were estimated for each vegetation type. It is obvious that there is a clear correlation between Slopes of the species-log area curve and Mean number of unique species per plot.

Keywords: Beiranshahr, Iran, life form, vegetation type, Northwest, Zagros

INTRODUCTION

To determine all layers of vegetation in an ecosystem not only forests but also all parts of an area must be considered. Ecosystems have different parts in the world such as mountains (Lindenmayer et al. 2006). In fact, the accurate identification of plant communities and their distribution are classical tools for mapping and classification of plants (Tiner 1999). Iran has a special position in Asia which has been creating a diverse ecosystem (Alvarez-Rogel et al. 2006). Close floristic studies are necessary for precise determination of diversity. According to these aims, some protected areas are created for more environmental conservation (Lindenmayer and Franklin 2002). Biology conservation has a precise discipline in nature and will disturb if the conservation biologist doesn't make a right decision in different environments (May 1984). It should be noted that mentioned factors are not enough for conservation biology and it need more aspects like distribution of each species either rare or abundant, earth position whether polluted or not and, etc (Lombard et al. 1997). It should be noticed that the diversity of many urban areas are less than the natural ones because of some disturbance which caused by people. As a result, the geographic diversity and ecological complexity will be decreased soon (Marsh 1984). Ethical basics have a huge effect on conservation goals (Passmore 1974).

It should be considered that, conservation biology is based on systematic, ecology and many other biological fields which paid attention to all organisms in biotic world (Forman 1995). Unfortunately, conservation biology is noticed as a limited principle between biodiversity conservation and economic development (Daly and Cobb 1989). Investigators used various indices to estimate species diversity. Moreover, Whittaker method, sample both tree and herb strata instantly, is a common procedure that the herb-layer plots nested within reticular plots (Shmida 1984). Such plots have different sizes according to plant dimension. Therefore, species-area curves could be constructed. Such curves transparent many significant things like diversity, richness and all differences in each vegetation type. Beside this, log (species)-log (area) curves could be good coefficients of determination of vegetation types. To investigate ecosystems which need more watchful conservation, it was decided to use multi-scale Whittaker plots in West and Northwest of Iran. As a geological view, the studied area which situated in the West of Iran, has a very special status, this means that it include Sanandaj-Sirjan metamorphic zone (North of Boroujerd to South of Doroud). The remaining part belongs to Zagros Mountains. These two bodies don't have similar morphologies, for instance; Rocks are metamorphic In Sanandaj-Sirjan region, but sedimentary rocks are dominant in Zagros area.

The most important functional properties of Zagros vegetative area is protection and conservation issues (Chong and Stohlgren 2007). Briefly, the importance of vegetation as well as ecosystems accentuates conservation discussion (Magurran 2004). Eventually, we can say that each species considered as a renewable resource that must be examined (Coppolillo et al. 2004).

Zagros Mountain is stretched along Northwest to Southwest of Iran. It comprises about 10 provinces, more than 50 cities, important rivers, and a strategic place for agriculture and livestock (Fattahi 2001). Furthermore, over 885750 hectares of Lorestan Province cover with vegetation (total of 32 percent). The aims of this study were evaluation of vegetation types, life forms (Phanerophytes, Chameophytes, Semi-Cryptophytes, Cryptophytes and Therophytes), Chorotypes, determination of unique species and environmental conservation status of plant species in Beiranshahr region, located in Lorestan Province (middle Zagros), Iran.

MATERIALS AND METHODS

Study area

The study area (Beiranshahr, formerly called Chaghalvandi) is about 20,000 ha and located in the northwest of Khorramabad, Lorestan Province, middle part of Zagros Mountain, Iran (33°64′ N, 48°56′ E) (Figure 1).

Procedures

To investigate topoclimatic gradients which constitute various vegetation types, several plots (Eighty-nine) were constructed. The minimum and maximum heights above sea level were 1101 and 2489 m, respectively. Based on floristic composition of vegetation types in recent investi-gations, the reticulated modified multi-scale Whittaker plot includes a 200 m^2 plot which consists of one 25 m² sub-plot, centrally. In the opposite corner of chief plot and around the inside of plot perimeter, two 5 m² and ten 0.5 m² sub-plots were constructed, respectively. The size of the plots depends upon vegetation types. For instance; if there is an herbal floristic composition, the size of these modified multi-scale Whittaker could be declined. Therefore, the area of main plot and subplots will 200 m², 25, 2.5 and 0.5 m², correspondingly (Figure 2).Total of eighty-nine modified multi-scale Whittaker plots were set up in 5 vegetation types utilizing random sampling. Within each modified multi-scale plots, each species was explored. Based on species of each plot and subplots, mean Jaccard's coefficient, species area evaluation (slope, r² and c), number of unique species (species that was only recorded from one vegetation type), mean unique species/ plot and species-area lognormal curves were estimated for each vegetation type using Excel 2013 and PAST ver. 2.17.

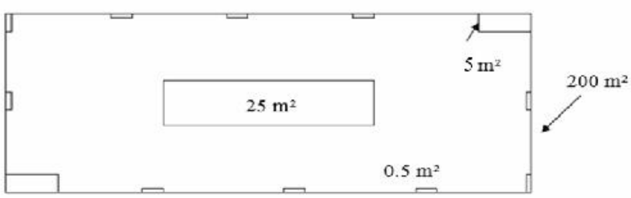

Figure 2. 200 m² modified multi- scale Whittaker plots and sub- plots in investigated regions in Beiran shahr region, Lorestan Province, Iran.

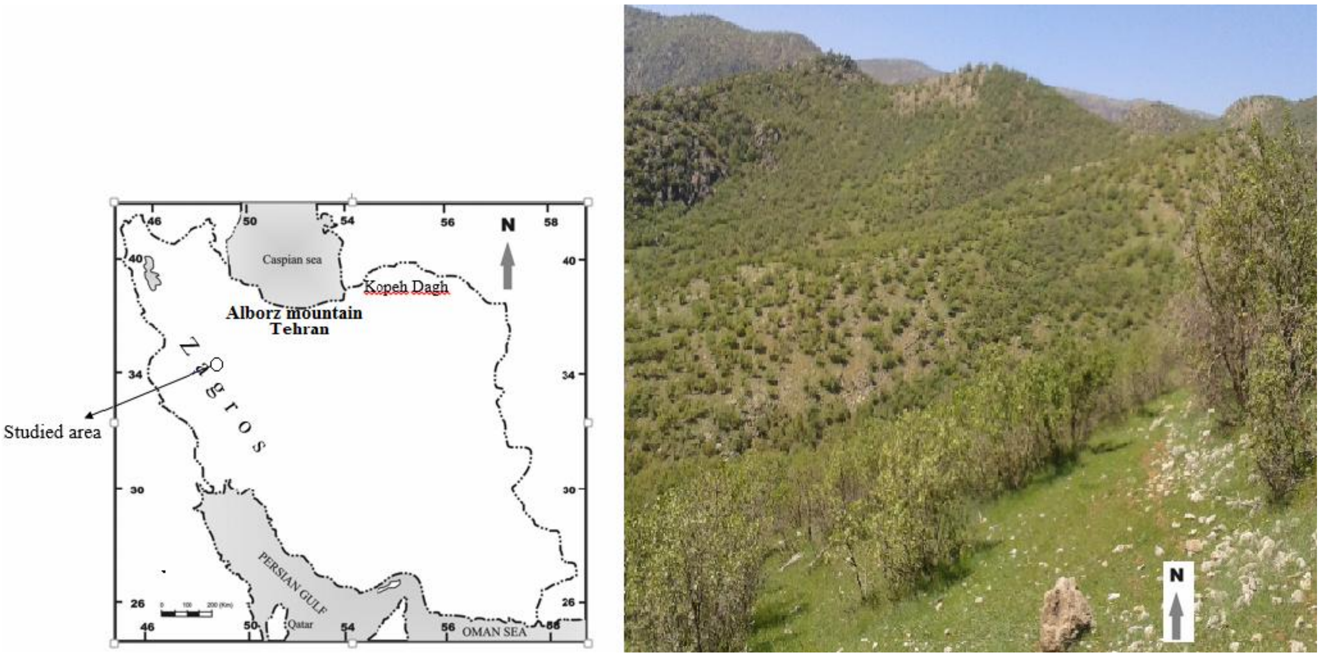

Figure 1. The Map of Iran (left) and studied area (Beiranshahr) in Zagros Mountain at Lorestan Province, Iran

Data analysis

In addition, some species were transferred to Lorestan University Herbarium to negotiate stages of identification (Raunkiaer 1934). Then, Chorotype and life form of each species was carefully investigated (some species listed in Table 5) (Stohlgren et al. 1997a, b; Chong and Stohlgren 2007). On the other hand, an index of overlap between lists, Jaccard's coefficient, was used to correct the slope of the species-log (area) curves. Jaccard's coefficient is defined as (Krebs 1999): J= A / (A + B + C)

A is the number of species which occurred in both plots, B is the species just on the first plot, and C is the species on second plot but not on the first one (Krebs 1999). Jaccard's coefficient is useful for comprising all plots within a vegetation type. The threatened species list was extracted from Red data book of Iran (Jalili and Jamzad 1999).

RESULTS AND DISCUSSION

Results

According to collected species for all vegetation types in eighty-nine modified multi-scale Whittaker plots, 608 species belonging to 334 genera and 74 families (Table 5) were identified (Mozafarian 2000). Of 608 species, 498 and 97 are belonging to dicotyledons and monocotyledons, orderly, and remained 13 species were Pteridophytes. Totally, Asteraceae (99.16%), Papilionaceae (57.9%), and Poaceae (54.8%) families have the most species in all studied area. Generally, the most genera are *Centaurea* (14), *Astragalus* (12) and *Trifolium* (10) respectively in five vegetation types. The major types of these districts are (i) Annual and perennial herbs including many families such as Asteraceae, Poaceae, Apiaceae and Brassicaceae (53, 32, 28 and 26 genera, orderly) which made the major part of vegetation type 1. According to evidences, it can be predicted that biodiversity have been declining over time because of severe livestock grazing (Helms 1998). In this layer, the most abundant species owned by *Centaurea*, *Astragalus, Trifolium*, respectively. (ii) Higher elevations transparent some more character species (*Eryngium caucasicum* Trautv., *Muscari neglectum* Guss. ex Ten., *Scilla arenaria* Baker, *Achillea wilhelmsii* C. Koch, *Anthemis odontostephana* Boiss., *Centaurea virgata* subsp. *squarrosa* (Boiss.) Gugler). Obviously, each layer involve the species of former layer, but with different abundances (iii) Lamiaceae, Orchidaceae and Rosaceae families have seen more in the third layer. (iv) Gradually, shrubs and trees (*Astragalus gossypinus* Fisch., *Astragalus microcephalus* Boiss., *Prunus arabica* (Olivier) Meikle, *Prunus cerasus* L., *Prunus orientalis* (Mill.) Koehne) have noticed and (5) in the fifth layer trees (as mentioned in the fourth layer) are dominated. Actually, many factors such as temperature, elevation, soil structure, and grazing degree were varied from area to area. The curve equations showed that, in the slope of species-area curves, the slope of Type 1 (0.7499) and Type 4 (0.2) had the most and least ranges (Table 1). The Type 1 had the lowest and Type 4 and 5 had the highest adjusted r^2 among others. Based on Jaccard's coefficient, the third and fifth layer of vegetation types are the most and least heterogeneous areas (Table 1). According to Table 2, the maximum and minimum number of unique species were observed in first and forth layer. Moreover, the mean number of species in each vegetation type was calculated (Table 3). Thus, most effort in conservation management must be devoted to forth layer and the others need less attention based upon total score of ranking (Margules and Pressey 2000).

Discussion

The authors noticed that plant life forms depend on many factors such as genetic and environmental properties, elevation from sea, climate, soil texture, and plant distribution (Lindenmayer et al. 2008). The life form of each ecosystem represents the adaptation of each plant in various climates and each layer has its own effect on environmental structure and function, but Gilliam believe that the role of herbaceous layer is more (Gilliam 2007). As measured, Therophyte and Champhyte are the dominant and recessive form of life in studied area, respectively. The number of other life forms (Hemicryptophyte, Cryptophyte, Phanerophyte) are among these ranges. Therophyte high frequency can be due to abundant destruction in this region (different process such as road construction, building manufacturing, traffic, grazing and etc). Chamaephytes such as the spiny *Astragalus* indicate their importance in soil stabilization and erosion control. In any case, climate and life forms shows close relationships between each other (Chou et al. 2000). It should be noticed that many phytosociologists are concerned about environmental conservation and the dilemma of threatening species. Based on this research each ecologist faced with detection of areas which need serious attention. Geophytes are rare in investigated region because these plants are intolerance to dry and arid climate. It should be noted that some species such as *Astragalus* demonstrate more attendance by increasing height. Moreover, because of the limited topographic variation, plant distribution was uniform (Giriraj et al. 2008).

To identify rare species, researchers use many criteria such as length of life, life forms, geographical distribution and plants utilization. Existence of endangered or vulnerable species could be a sign of degradation in this region (Myers et al. 2000). The number of endangered species resounds the significance of conservation biology in each vegetation type and normally it used as a standard for conservation management (Table 4). According to Table 5, it is obvious that there is a clear correlation between Slopes of species-log area curve and Mean number of unique species per plot. Because of similar sample unit and sampling area for all vegetation types, the number of unique species are trustful. However, this result is accordance with Pilehvar et al. (2010) research in central Zagros forests. Heterogeneity can be estimated by Jaccard's coefficient. Obviously, more species were find in more heterogenous areas. As a result, mean number of unique species per plot can be compared with others and necessary conservation requirements will be specified for each vegetation type in studied area. Absolutely, vegetation type 3 has the most heterogeneity according to Jaccard's coefficient, but the most ranking belonging to Type 1 (Table 5).

Table 1. species-area curves and mean Jaccard's coefficient for five vegetation types in Beiran shahr, Lorestan Province, Iran.

Vegetation type	Species area			Jaccard 's coefficient
	Slope	c	r^2	
Type 1	0.7499	0.0578	0.9098	0.14
Type 2	0.3306	0.4839	0.9483	0.70
Type 3	0.4566	1.378	0.9733	0.10
Type 4	0.2	5.4	1	0.50
Type 5	0.4	2	1	0.90

Table 2 number of unique species and mean unique species/ plot in each vegetation type.

Vegetation type	Mean number of species in each vegetation type	Number of unique species in each vegetation type	Mean number of unique species/ plot
Type 1	158.3	51	7.6
Type 2	108.9	18	3.1
Type 3	112	31	5.1
Type 4	78.6	14	2.9
Type 5	90.2	27	4.9

Table 3. The list of threatened species in each studied layer (vegetation type). Note: LR: lower risk; EN: endangered; DD: data deficient

Scientific name	Type 1	Type 2	Type 3	Type 4	Type 5
Mentha longifolia (L.) L.				LR	LR
Tanacetum polycephalum Sch. Bip.	LR			LR	LR
Jurinea carduiformis (Jaub. & Spach.) Boiss.	LR		LR	LR	LR
Cousinia cylindracea Boiss.		LR	LR	LR	LR
Pilostyles haussknechtii Boiss.	DD	DD			
Prangos uloptera DC.		EN	EN	EN	EN
Ferulago contracta Boiss. & Hausskn.			LR	LR	LR
Dianthus austroiranicus Lemperg				LR	LR
Cousinia khorramabadensis Bornm.	DD	DD			
Sameraria stylophora Boiss.			LR	LR	LR
Fraxinus rotundifolia Mill.			LR	LR	LR
Amygdalus haussknechtii (C. K. Schnider) Bornm.		LR	LR	LR	LR
Gallium kurdicum Boiss. and Hohen.	DD	DD			
Bunium luristanicum Rech. f.	DD	DD	DD		
Eryngium creticum Lam.	DD	DD	DD		
Stachys persepolitana Boiss.		LR	LR	LR	LR
Total	7	9	10	11	11

Table 4. Ranking measurement and absolute value for each vegetation type

Vegetation type	Mean number of species	Number of threatened species	Slopes of the species-log area curve	Jaccard's coefficient	Mean number of unique species per plot	Total score of ranking
Type 1	158.3 (5)	7 (1)	0.7499 (5)	0.14 (4)	7.6 (5)	20
Type 2	108.9 (3)	9 (2)	0.4 (3)	0.70 (2)	4.9 (3)	13
Type 3	112 (4)	10 (3)	0.4566 (4)	0.10 (5)	5.1 (4)	19
Type 4	78.6 (1)	11 (4)	0.2 (1)	0.50 (3)	2.9 (1)	10
Type 5	90.2 (2)	11 (4)	0.3306 (2)	0.90 (1)	3.1 (2)	11

Table 5. Floristic list of some characteristic species in Beiran shahr, Lorestan Province, Iran (ES: Euro-Siberian, IT: Irano-Turanian, M: Mediterranean, Cosm: Cosmopolitan (Reshinger, 1963-2001)

Taxa	Species No.	Genus No.	Life form	Chorotype
Adianthaceae	1			
Adiantum capillus-veneris L.		1	Hemicryptophyte	Cosm
Amaranthaceae	5			
Amaranthus albus L.		4	Therophyte	IT
Amaranthus blitoides S. Watson			Therophyte	IT
Gomphrena brachystylis F. Muell.		1	Therophyte	IT
Amaryllidaceae	8			
Allium jesdianum Boiss. & Buhse			Cryptophyte	IT
Narcissus tazetta L.		1	Cryptophyte	IT
Apiaceae/Umbeliferae	44			
Bunium luristanicum Rech. f.		3		IT
Bunium paucifolium DC.			Cryptophyte	IT
Bunium rectangulum Boiss. & Hausskn.			Cryptophyte	IT
Bupleurum falcatum subsp. cernuum (Ten.) Arcang.		1	Hemicryptophyte	IT
Chaerophyllum macropodum Boiss.		1	Hemicryptophyte	IT
Daucus broteroi Ten.		1	Therophyte	ES, IT, M
Dorema aucheri Boiss.		1	Therophyte	IT, M, ES
Eryngium billardieri Delile.		6	Hemicryptophyte	IT, M
Eryngium caucasicum Trautv.			Hemicryptophyte	IT, M
Eryngium creticum Lam.			Hemicryptophyte	IT, M
Eryngium glomeratum Lam.			Hemicryptophyte	IT, M
Eryngium noeanum Boiss.			Hemicryptophyte	IT
Eryngium thyrsoideum Boiss.			Therophyte	IT, M
Prangos uloptera DC.		1	Hemicryptophyte	IT, M
Pycnocycla flabellifolia Boiss.		1	Hemicryptophyte	IT
Korshinskia assyriaca (Freyn & Bornm.) Pimenov & Kljuykov		1	Hemicryptophyte	IT
Scandix iberica M. Bieb		2	Therophyte	IT
Scandix pecten-veneris L.			Therophyte	IT
Smyrniopsis aucheri Boiss.		1	Hemicryptophyte	IT
Smyrnium cordifolium Boiss.		1	Hemicryptophyte	IT, ES
Turgenia latifolia (L.) Hoffm.		1	Therophyte	IT, M, ES
Zosimia absinthifolia Link		1	Therophyte	IT
Asparagaceae	10			
Leopoldia comosa (L.) Parl.		2	Cryptophyte	IT, M
Leopoldia tenuiflora (Tausch) Heldr.			Cryptophyte	IT, M
Muscari neglectum Guss. ex Ten.		1	Cryptophyte	IT, M
Ornithogalum brachystachys C. Koch		2	Cryptophyte	IT, M
Ornithogalum persicum Hausskn. ex Bornm.			Cryptophyte	IT, M
Pseudomuscari inconstrictum (Rech.f.) Garbari		1	Cryptophyte	IT, M, ES
Scilla arenaria Baker		1	Cryptophyte	IT, M
Zagrosia persica (Hausskn.) Speta		1	Cryptophyte	IT
Asteraceae/Compositae	99			
Achillea aleppica DC.		3	Hemicryptophyte	IT
Achillea arabica Kotschy			Hemicryptophyte	IT
Achillea wilhelmsii K. Koch			Cryptophyte	IT, M, ES
Anthemis cota Sibth. & Sm.		6	Hemicryptophyte	IT, M
Anthemis cotula L.			Hemicryptophyte	IT, M
Anthemis haussknechtii Boiss. & Reut.			Therophyte	IT
Anthemis microcephala (Schrenk) B.Fedtsch.			Hemicryptophyte	IT, M
Anthemis odontostephana Boiss.			Hemicryptophyte	IT, M
Anthemis pseudocotula Boiss.			Hemicryptophyte	IT, M
Artemisia haussknechtii Boiss.		2	Hemicryptophyte	IT
Artemisia vulgaris Burm. F.			Therophyte	IT
Centaurea amadanensis Sch. Bip.		14	Therophyte	IT, M, ES
Centaurea behen L.			Therophyte	IT
Centaurea bruguierana subsp. *belangeriana* (DC.) Bornm.			Therophyte	IT
Centaurea elymaitica Mozaff.			Therophyte	IT
Centaurea hyalolepis Boiss.			Therophyte	IT
Centaurea iberica Trevir. ex Spreng.			Therophyte	IT, M, ES
Centaurea intricata Boiss.			Therophyte	IT

Centaurea irritans Wagenitz			Therophyte	IT
Centaurea koeieana Bornm.			Therophyte	IT
Centaurea minor Willd. ex Spreng.			Therophyte	IT
Centaurea paradoxa Mozaff.			Therophyte	IT, M, ES
Centaurea solstitialis L.			Therophyte	IT, ES
Centaurea virgata subsp. *squarrosa* (Boiss.) Gugler			Hemicryptophyte	IT, ES
Chardinia orientalis (L.) Kuntze		1	Therophyte	IT
Cichorium intybus L.		2	Therophyte	Cosmo
Cichorium pumilum Jacq.			Therophyte	IT, M
Cirsium sorocephalum Fisch. & C. A. Mey.		2	Hemicryptophyte	IT
Cousinia haussknechtii C.Winkl.			Hemicryptophyte	IT
Cousinia jacobsii Rech. f.			Hemicryptophyte	IT
Cousinia stenocephala Boiss.			Hemicryptophyte	IT
Echinops kermanshahanicus Mozaff.		5	Hemicryptophyte	IT
Echinops mosulensis Rech. f.			Hemicryptophyte	IT
Echinops pachyphyllus Rech. f.			Hemicryptophyte	IT
Echinops quercifolius Freyn.			Hemicryptophyte	IT
Echinops viscidulus Mozaff.			Hemicryptophyte	IT
Gundelia tournefortii L.		1	Hemicryptophyte	IT
Inula britannica L.		1	Hemicryptophyte	IT
Jurinea carduiformis (Jaub. & Spach) Boiss.		1	Therophyte	IT
Lactuca tuberosa Jacq.			Hemicryptophyte	IT, M
Onopordum carduchorum Bornm. & Beauverd		2	Therophyte	IT
Onopordum heteracanthum C. A. Mey.			Hemicryptophyte	IT
Sonchus asper (L.) Hill		2	Hemicryptophyte	IT, ES
Sonchus oleraceus (L.) L.			Hemicryptophyte	Cosm
Tanacetum polycephalum Sch. Bip.		1	Hemicryptophyte	IT, M, ES
Taraxacum sonchoides (D. Don) Sch. Bip.		2	Hemicryptophyte	IT
Taraxacum wallichii DC.			Hemicryptophyte	IT
Tragopogon buphthalmoides (DC.) Boiss.		3	Hemicryptophyte	IT
Tragopogon porrifolius subsp. *longirostris* (Sch. Bip.) Greuter			Hemicryptophyte	IT
Tragopogon vaginatus Ownbey & Rech. F.			Hemicryptophyte	IT
Biebersteiniaceae	1			
Biebersteinia multifida DC.		1	Cryptophyte	IT
Boraginaceae	19			
Anchusa azurea Mill.		2	Hemicryptophyte	IT, ES
Anchusa strigosa Banks & Sol.			Hemicryptophyte	IT, ES
Echium italicum L.		1	Therophyte	IT, ES
Heliotropium europaeum L.		3	Hemicryptophyte	IT, ES
Heliotropium noeanum Boiss.			Hemicryptophyte	IT
Heliotropium supinum L.			Hemicryptophyte	IT
Myosotis arvensis (L.) Hill		2	Therophyte	IT
Myosotis refracta Boiss.			Therophyte	IT, M
Onosma asperrima Bornm.		7	Hemicryptophyte	IT
Onosma bulbotrichum DC.			Hemicryptophyte	IT
Onosma dasytrichum Boiss.			Hemicryptophyte	IT
Onosma haussknechtii Bornm.			Hemicryptophyte	IT
Onosma microcarpum DC.			Hemicryptophyte	IT
Onosma rostellatum Lehm.			Hemicryptophyte	IT
Onosma sericeum Willd.			Hemicryptophyte	IT
Brassicaceae (Cruciferae)	28			
Alyssum bracteatum Boiss. & Buhse		1	Hemicryptophyte	IT
Brassica nigra (L.) K. Koch		1	Therophyte	M
Capsella bursa-pastoris (L.) Medik.		1	Therophyte	P1
Descurainia sophia (L.) Webb ex Prantl		1	Therophyte	Cosm
Lepidium draba L.		2	Therophyte	IT
Lepidium latifolium L.			Therophyte	IT
Sameraria stylophora Boiss.		1	Therophyte	IT
Sisymbrium officinale (L.) Scop.			Therophyte	IT, ES
Caryophyllaceae	21			
Acanthophyllum caespitosum Boiss.		2	Cryptophyte	IT
Acanthophyllum mucronatum C. A. Mey.			Cryptophyte	IT
Arenaria leptoclados Boiss.		1	Hemicryptophyte	
Cerastium dichotomum subsp. *inflatum* Cullen		1	Therophyte	IT, M
Dianthus austroiranicus Lemperg		3	Hemicryptophyte	IT

Dianthus macranthoides Hausskn. ex Bornm.			Hemicryptophyte	IT
Dianthus orientalis Adams			Hemicryptophyte	IT
Gypsophila elymaitica Mozaff.		3	Hemicryptophyte	IT
Gypsophila pallida Stapf			Hemicryptophyte	IT
Silene chaetodonta Boiss.		4	Hemicryptophyte	IT
Silene conoidea L.			Therophyte	Cosm
Silene odontopetala Fenzl.			Therophyte	IT, M
Silene microsperma Fenzl.			Hemicryptophyte	IT, M, ES
Stellaria alaschanica Y. Z. Zhao		1	Hemicryptophyte	IT
Chenopodiaceae/ Amaranthaceae	5			
Atriplex lasiantha Boiss.		1	Therophyte	IT
Salsola canescens (Moq.) Boiss.		1	Therophyte	IT
Colchicaceae	2			
Colchicum Kotschyi Boiss.		2	Cryptophyte	IT
Colchicum persicum Baker.			Cryptophyte	IT
Cyperaceae	7			
Cyperus eremicus Kukkunen.		4	Hemicryptophyte	IT
Cyperus longus L.			Hemicryptophyte	IT
Euphorbiaceae	9			
Euphorbia aleppica L.		8	Therophyte	IT, M
Euphorbia helioscopia L.			Therophyte	IT
Geraniaceae	4			
Geranium tuberosum L.			Cryptophyte	IT
Iridaceae	5			
Gladiolus atroviolaceus Boiss.		2	Cryptophyte	IT
Gladiolus italicus Mill.			Cryptophyte	IT, M
Iris × germanica L.		1	Cryptophyte	IT
Ixioliriaceae	1			
Ixiolirion tataricum (Pall.) Schult. & Schult. f.		1	Cryptophyte	IT
Juncaceae	4			
Juncus inflexus L.			Hemicryptophyte	Cosm.
Juncus maritimus Lam.			Hemicryptophyte	Cosm.
Lamiaceae (Labiatae)	43			
Eremostachys macrophylla Montbr. & Auch.		1	Hemicryptophyte	IT
Lamium album L.		2	Therophyte	IT
Lamium amplexicaule L.			Therophyte	IT
Marrubium astracanicum Jacq.		3	Hemicryptophyte	IT
Marrubium cuneatum Banks & Sol.		2	Hemicryptophyte	IT
Marrubium vulgare L.			Hemicryptophyte	IT, M
Nepeta meyeri Benth.		4	Therophyte	IT
Nepeta petraea Benth.			Therophyte	IT
Phlomis Bruguieri Desf.		3	Hemicryptophyte	IT
Phlomis kurdica Rech. f.			Hemicryptophyte	IT
Phlomis olivieri Benth.			Hemicryptophyte	IT
Salvia indica L.			Hemicryptophyte	IT
Salvia limbata C. A. Mey.			Hemicryptophyte	IT
Salvia multicaulis Vahl			Hemicryptophyte	IT
Salvia palaestina Benth.			Hemicryptophyte	IT
Salvia persepolitana Boiss.			Hemicryptophyte	IT
Salvia sclarea L.			Hemicryptophyte	IT
Satureja bachtiarica Bunge		2	Hemicryptophyte	IT
Satureja khuzistanica Jamzad			Hemicryptophyte	IT
Stachys benthamiana Boiss.		6	Therophyte	IT
Stachys kermanshahensis Rech. F.			Therophyte	IT
Stachys kurdica Boiss. & Hohen.			Hemicryptophyte	IT
Stachys lavandulifolia Vahl			Hemicryptophyte	IT
Stachys multicaulis Benth.			Hemicryptophyte	IT
Stachys persepolitana Boiss.			Hemicryptophyte	IT
Teucrium oliverianum Ging. ex. Benth.		5	Therophyte	IT
Teucrium orientale L.			Hemicryptophyte	IT
Teucrium polium L.			Hemicryptophyte	Cosm.
Teucrium pumilum Loefl. ex L.			Hemicryptophyte	Cosm.
Teucrium scordium L.			Therophyte	IT

Thymus eriocalix (Ronniger) Jalas		1	Therophyte	IT
Vitex agnus-castus L.		1	Phanerophyte	M
Ziziphora capitata L.		3	Hemicryptophyte	IT
Ziziphora clinopodioides Lam.			Hemicryptophyte	IT
Ziziphora tenuior L.			Therophyte	IT
Liliaceae	7			
Gagea gageoides (Zucc.) Vved.		2	Cryptophyte	Cosm.
Gagea reticulata (Pall.) Schult. & Schult. f.			Cryptophyte	Cosm.
Tulipa Montana Lindl.		2	Cryptophyte	IT
Tulipa uniflora (L.) Besser ex Baker			Cryptophyte	IT
Malvaceae	6			
Alcea angulata (Freyn & Sint.) ex Iljain		2	Hemicryptophyte	IT
Alcea kurdica (Schlest.) Alef			Hemicryptophyte	IT
Malva neglecta Wallr.		3	Hemicryptophyte	IT, M, ES
Malva nicaeensis All.			Therophyte	IT, M
Orchidaceae	3			
Orchis adenocheila Czerniak.		3	Hemicryptophyte	IT
Orchis anatolica Boiss.			Hemicryptophyte	IT
Papaveraceae	6			
Corydalis rupestris Kotschy.		1	Therophyte	
Glaucium corniculatum (L.) Curtis		1	Therophyte	IT, M
Papaver dubium L.		3	Therophyte	IT, M, ES
Papaver macrostomum Boiss. & A. Huet			Therophyte	IT
Papaver rhoeas L.			Therophyte	IT, M
Roemeria refracta DC.		1	Therophyte	ES
Papilionaceae/Leguminosae	57			
Alhagi persarum Boiss. & Buhse		1	Hemicryptophyte	IT, M
Astragalus adscendens Boiss. & Hausskn.		12	Champhyte	IT
Astragalus baba-alliar Parsa			Champhyte	IT
Astragalus bodeanus Fisch.			Champhyte	IT
Astragalus campylorhynchus Fisch. and C. Mey.			Champhyte	IT
Astragalus ecbatanus Bunge.			Champhyte	IT
Astragalus gossypina (Fisch.) Podlech			Champhyte	IT
Astragalus microcephalus Willd.			Champhyte	IT, M, ES
Astragalus neomozaffarianii Maassoumi			Hemicryptophyte	IT
Astragalus rhodosemius Boiss. & Hausskn.			Hemicryptophyte	IT, ES
Astragalus rytidocarpus Ledeb.			Hemicryptophyte	IT
Astragalus scorpioides Willd.			Hemicryptophyte	IT
Astragalus verus Olivier			Champhyte	IT
Glycyrrhiza glabra L.		1	Hemicryptophyte	IT, M, ES
Hymenocarpos circinnatus (L.) Savi		1	Therophyte	M
Lathyrus cicera L.		4	Therophyte	IT,M
Lathyrus hirsutus L.			Therophyte	IT
Lotus corniculatus L.		1	Therophyte	IT
Medicago crassipes (Boiss.) E. Small		8	Therophyte	IT, ES, M
Medicago laciniata (L.) Mill.			Therophyte	IT, ES, M
Medicago persica (Boiss.) E. Small			Therophyte	IT
Medicago polymorpha L.			Therophyte	Cosm.
Trifolium alexandrium L.		10	Hemicryptophyte	IT, M
Trifolium bullatum Boiss. & Hausskn.			Hemicryptophyte	IT, M
Trifolium campestre Schreb.			Hemicryptophyte	IT, M, ES
Trifolium echinatum M. Bieb.			Therophyte	IT, ES
Trifolium fragiferum L.			Therophyte	IT, ES
Trifolium grandiflorum schreb.			Therophyte	IT, ES
Trifolium lappaceum L.			Therophyte	IT, ES
Trifolium nigrescens subsp. petrisavii (Clementi) Holmboe.			Therophyte	M
Trifolium purpureum Loisel.			Therophyte	IT, M
Trifolium repens L.			Therophyte	IT
Trigonella spruneriana Boiss.		1	Therophyte	IT
Trigonella stellata Forssk.		1	Therophyte	IT
Vicia sativa subsp. *amphicarpa* (Dorthes) Asch.		4	Therophyte	IT, ES, M
Vicia sativa L.			Therophyte	IT, M, ES
Vicia villosa Roth			Therophyte	IT, ES

Poaceae/Gramineae	54			
Aegilops tauschii Coss.		3	Therophyte	IT, M
Aegilops triuncialis L.			Therophyte	IT, M
Aegilops umbellulata Zhuk.			Therophyte	IT
Agropyron trichophorum (Link.) K. Richter.		1	Cryptophyte	ES, M
Avena fatua L.			Therophyte	IT, M
Bromus danthoniae Trin.		6	Therophyte	IT
Bromus japonicus Thunb.			Therophyte	IT
Bromus sericeus Ten.			Therophyte	IT, M
Bromus sterilis L.			Therophyte	IT, M
Bromus tectorum L.			Therophyte	IT, M
Bromus tomentellus Boiss.			Therophyte	IT, M
Carex phacota Spreng.		1	Hemicryptophyte	IT
Hordeum brevisubulatum (Trin.) Link		5		IT, M
Hordeum bulbosum L.			Cryptophyte	IT, M
Hordeum murinum subsp. *glucum* (Steud.) Tzvelev			Therophyte	IT, M
Hordeum spontaneum K. Koch.			Therophyte	IT, M
Lolium rigidum Gaudin.			Therophyte	IT, M
Phleum iranicum Bornm. & Gauba		1	Champhyte	IT
Phragmites australis (Cav.) Trin. ex Steud.		1	Champhyte	IT, ES, M
Poa annua L.		3	Hemicryptophyte	Cosm.
Stipa hohenackeriana Trin. & Rupr.			Hemicryptophyte	IT
Taeniatherum caput-medusae (L.) Nevski.		1	Therophyte	IT,M
Polygonaceae	8			
Rumex dentatus L.		2	Therophyte	IT
Rumex ephedroides Bornm.			Hemicryptophyte	IT, M, ES
Ranunculaceae	12			
Adonis microcarpa DC.			Therophyte	M
Anemone biflora DC.		3	Cryptophyte	IT, M
Anemone coronaria L.			Cryptophyte	IT, M
Anemone elongata D. Don.			Cryptophyte	IT, M
Consolida orientalis (J. Gay.) Schrodinger		1	Therophyte	IT
Delphinium ambiguum L.		1	Therophyte	IT
Ranunculus asiaticus L.		3	Therophyte	IT, M
Ranunculus millefolius Banks & Sol.				IT
Ranunculus oxyspermus Willd.			Therophyte	IT
Rosaceae	20			
Amygdalus haussknechtii (C.K. Schnider) Bornm.		2	Phanerophyte	IT
Amygdalus lycoides Spach			Phanerophyte	IT
Cotoneaster morulus Pojark.		1	Phanerophyte	IT
Crataegus atrosanguinea Pojark.		4	Phanerophyte	IT, ES
Crataegus meyeri Pojark.			Phanerophyte	IT, ES
Prunus arabica (Olivier) Meikle		5	Phanerophyte	IT
Prunus cerasus L.			Phanerophyte	IT
Prunus mahaleb L.			Phanerophyte	IT
Prunus microcarpa C. A. Mey.			Phanerophyte	IT, M
Prunus orientalis (Mill.) Koehne			Phanerophyte	IT
Pyrus glabra Boiss.		2	Phanerophyte	IT
Pyrus syriaca Boiss.			Phanerophyte	IT, M
Rosa berberifolia Pall.		3	Phanerophyte	IT, M
Rosa canina L.			Phanerophyte	IT, ES, M
Rosa elymaitica Boiss. & Hausskn. ex Boiss.			Phanerophyte	IT, ES
Rubus anatolicus Focke		2	Phanerophyte	IT
Rubus caesius L.			Champhyte	IT, ES
Sanguisorba minor Scop.		1	Hemicryptophyte	IT, ES, M
Rubiaceae	10			
Galium humifusum M. Bieb.			Hemicryptophyte	IT, M, ES
Galium kurdicum Boiss. & Hohen.			Hemicryptophyte	IT, M, ES
Galium parisiense L.			Hemicryptophyte	IT, M, ES
Galium setaceum Lam.			Hemicryptophyte	IT
Galium tricornutum Dandy			Hemicryptophyte	IT
Galium verum L.			Hemicryptophyte	IT
Scrophulariaceae	7			
Scrophularia alpestris J. Gay ex Benth.		3	Hemicryptophyte	IT
Scrophularia atrata Pennell.			Hemicryptophyte	IT

Scrophularia striata Boiss.		1	Hemicryptophyte	IT
Verbascum agrimoniifolium Huber-Morath		3	Hemicryptophyte	IT
Solanaceae	4			
Hyoscyamus tenuicaulis Schönb.-Tem.		1	Hemicryptophyte	IT
Solanum americanum Mill.		2	Hemicryptophyte	IT, ES, M
Solanum luteum Mill.			Hemicryptophyte	IT, ES, M
Urticaceae	3			
Urtica dioica L.		2	Hemicryptophyte	IT, ES
Urtica pilulifera L.			Therophyte	IT, M, ES
Violaceae	1			
Viola modesta House		1	Therophyte	IT, M
Zygophyllaceae	1			
Tribulus terrestris L.	0	1	Therophyte	IT, ES, M

REFERENCES

Alvarez-Rogel J, Martinez-Sanches JJ, Blazquez LC, Semitiel CMM. 2006. A conceptual model of salt marsh plant distribution in coastal dunes of Southeastern Spain. Wetlands 26: 703-717.

Chong, GW, Stohlgren TJ. 2007. Species-area cureves indicate the importance of habitats contributions to regional biodiversity. Ecol Indic 7: 387-395.

Chou C, Chen T, Liao C, Peng C. 2000. Long-term ecological research in the Yuan gang Lake Forest ecosystem. Vegetation composition and analysis. Bot Bull Acad Sin 41: 61-72.

Coppolillo P, Gomez H, Maisels F, Wallace R. 2004. Selection criteria for suites of landscape species as a basis for site-based conservation, Biological Conservation. 115: 419-430.

Daly HE, Cobb JBJr. 1989. For the common good: redirecting the economy toward community, the environment, and a sustainable future. Beacon Press, Boston, MA.

Fattahi M. 2001. Degradation West forests of Iran, Research Institute forests and rangelands Of Iran.

Forman RTT. 1995. Land Mosaics: The Ecology of Landscapes and Regions. Cambridge University Press, Cambridge, UK.

Giriraj A, Murthy MSR, Ramesh BR. 2008 Vegetation Composition, Structure and Patterns of Diversity: A Case Study from the Tropical Wet Evergreen Forests of the Western Ghats, India. Edin J Bot 65: 1-22.

Helms JA. 1998. The dictionary of Forestry. The Section of American Forests and CABI Publishing, New York.

Jalili A, Jamzad Z. 1999 Red Data Book of Iran. Research institute of forest and rangelands, Tehran.

Krebs CJ. 1999. Eclolgical Methodology. 2nd ed. Benjamin Cummings, Reading, UK.

Lindenmayer DB, Franklin JF. 2002. Conserving Forest Biodiversity: A Comprehensive Multiscaled Approach. Island Press, Washington, DC.

Lindenmayer DB, Franklin JF, Fischer J. 2006. General management principals and a checklist of strategies to guide forest biodiversity conservation. Boil Conserv 131: 433-445.

Lindenmayer DB, Margules CR, Botkin D. 2008. The focal species approach and landscape; Management of protected areas and conservation of biodiversity in Iran, International Journal of Environmental Studies Restoration: a critique. Conserv Biol 16: 338-345.

Lombard AT, Cowling, RM, Pressey RL. Mustart PJ. 1997. Reserve selection in a species-rich and fragmented landscape on Agulhas plain, South Africa. Conserv Biol 11 (5): 1101-1116.

Magurran AE. 2004. Measuring Biological Diversity. (Periodical style-Accepted for publication), Blackwell Publishing, London, UK.

Margules CR, Pressey RL. 2000. Systematic conservation planning. Nature. 405: 242-53.

Marsh RM. 1984. An overview: real and apparent patterns in community structure. In: Strong DRJr, Simberloff D, Abele LG, Thistle AB (eds). Ecological Communities, Conceptual Issues and the Evidence. Princeton University Press, Princeton, NJ.

May RM. 1984. An overview: real and apparent patterns in community structure. In: Strong DRJr, Simberloff D, Abele LG, Thistle AB (eds). Ecological Communities, Conceptual Issues and the Evidence. Princeton University Press, Princeton, NJ.

Mozafarian M. 2000. Plant Systmatics. Amirkabir Press, Tehran.

Myers N, Mittermeier RA, Mittermeier CG, da Fonseca GAB, Kent J. 2000. Biodiversity hotspots for conservation priorities. Nature. 403: 853-858.

Passmore J. 1974. Man's Responsibility for Nature: Ecological Problems and Western Traditions. Duckworth, London.

Pilehvar B, Veiskarami G, Taheri Akaber K, Soosani J. 2010. Relative contribution of vegetation types to regional biodiversity in Central Zagros forests of Iran. Biodiv Conserv 19: 3361-3374.

Raunkiaer C. 1934. The Life Forms of Plants and Statistical Plant Geography. Clarendon Press, Oxford.

Shmida A. 1984. Whittaker's plant diversity sampling method. Isr J Bot 33: 41-46.

Stohlgren TJ, Chong CW, Kalkhan MA, Schell LD. 1997a. Rapid assessment of plant diversity patterns: a methodology for landscapes. Environ Monit Assess 48: 25-43.

Stohlgren TJ, Coughenour MB, Chong GW, Binkley D, Kalkhan MA, Schell LD, Buckley DJ, Berry JK. 1997b. Analysis of plant diversity. Landsc Ecol 12: 155-170.

Tiner RW. 1999. Wetlands Indicators. A Guide to Wetland Identification, Delineation, Classification, and Mapping. Lewis Publishers, CRC Press, Boca Raton, FL.