Journal of Novel Applied Sciences
Available online at www.jnasci.org
©2013 JNAS Journal-2013-2-12/666-677
ISSN 2322-5149 ©2013 JNAS

Flora, life form and chorotypes of coastal sand dune of southwest of Caspian Sea, Gilan province, N. Iran

M. Ravanbakhsh[1*], F. BazdideVahdati[2], A. Moradi[3] and T. Amini[4]

1- Academic Center for education, Cultural Research (ACECR), Environmental research Institute, Siadati street,Western side of Mohtasham Garden, Rasht, Gilan, Iran
2- Department of Biology, Faculty of Science, the University of Gilan, Rasht, Iran
3- Research Institute of Natural Resource, Rasht, Gilan, Iran
4- Research Institute of Natural Resource, Nooshar, Gilan Mazandaran, Iran

***Corresponding author*:** M. Ravanbakhsh

ABSTRACT: Iran is one of the most important centers of plant diversity into account old world comes closer to 22 percent of its 8000 plant species are exclusively. The present study involves the flora of the coastal sand dune in Guilan province, northwest Iran. During 2012-13, we examined the plant specimens collected in this area and determined that there are 232 vascular plant taxa (212 species, 13 subspecies, and 7 varieties) in 148 genera and 58 families. The largest families are *Poaceae* (30 taxa), *Asteraceae* (19), and *Fabaceae* (12) **.**Genera represented by the greatest number of species are *Cypecus* and *Juncus* (7). From the chronological point of view, the largest proportion of the flora belongs to the pluriregional elements. Classification based on life form indicates that the therophytes comprise the largest proportion of the plants in the study area.

***Keywords*:** Plant Biodiversity, Coastal sand dune, Caspian sea ,Gilan, Iran.

INTRODUCTION

Coastal dune ecosystems are unique habitats because of their ecological diversity and the occurrence of many rare and endemic species. Dune plant communities and associated fauna are threatened by disturbance from increasing human activities, natural erosion processes, and sea-level changes (Carboni et al., 2009; Feagin et al., 2005).

In many regions of the world, coastal dune ecosystems have been extensively modified because of the increasing demand for use of coastal resources in conjunction with population and industrial growth. Large coastal dune areas have been modified by forestry, tourism, and water extraction. In many cases, the native and endemic species have been eliminated or replaced by introduced exotics. As a result, these systems are often in an advanced state of degradation, irreversibly altered, or lost (Martı´nez et al., 2004).

Vegetation and floristic composition are very important for conservation of biodiversity by providing habitat for wildlife and contributing to the ecologically sustainable management of natural resources. Documenting floristic composition and vegetation types are valuable for continuing ecological research, management and conservation of plants and wildlife. Any disturbance or changes in the native vegetation may affect wildlife, sustainable use of natural resources and conservation of biological diversity (Ejtehadi et al., 2005)

Iran is one of the centers of plant diversity is considered old world so that nearly 22 percent of the 8000 plant species of flora are the endemic (Ghahreman, 1994). Despite to endangered state of coastal vegetation in Iran, some fragmented sandy areas are still natural. Some of these separated sandy patches often constitute parts of Caspian coastal ecosystems designed in Ramsar checklist of International Wetlands (The Ramsar checklist, 2006) and others are considered as part of protected coastal areas.(Naqinezhad, 2012)

There are a few scattered works on the flora and vegetation of fragmentary intact areas of south Caspian coast. Studies with floristic viewpoint were carried out on some coastal ecosystems of eastern areas of Caspian shores (Mazandaran Province) by Frey & Probst, (1974); Zohary, (1973); Akhani, (2003); Ejtehadi et al, (2003); Shokri et al., (2004); Asri et al (2007) and Sharifnia et al, (2007). Similar studies were carried out on the western areas (Gilan Province) by Naqinezhad, (2001); Kukkonen et al, (2001); Asri and Eftekhari, 2002; Ghahreman and Attar, 2003; Naqinezhad et al, 2002; Ghahreman et al., 2004; Khodadadi, (2009); Naqinezhad, (2012). Based on the understanding of the natural vegetation composition, this study aims to evaluate the significance Iran coastal dune habitats for biodiversity conservation in general with the study area. In order to achieve this, the Flora of a nearly unaltered coastal sector in southwest caspian sea (Gilan Province) was studied.

MATERIALS AND METHODS

Study Area:

The research area comprises a coastal dune system in northern Gilan Province, Iran, between 48° 52′ 44′′ - 50° 35′ 59′′ E and 38° 26′ 55′′- 36° 56′ 4′′ N. The study area was delimited using a Landsat 7ETM satellite image (Path 166/ Row 34) (Figure 1).The Caspian Sea constitutes the southern limit of the study area. The regional climate is is humid and very humid with cool winter according to Emberger climate classification. Gilan has a humid subtropical climate with by a large margin the heaviest rainfall in Iranreaching as high as 1,900 millimeters in the southwestern coast and generally around 1,400 millimeters. Rainfall is heaviest between September and December because the onshore winds from the Siberian High are strongest, but it occurs throughout the year though least abundantly from April to July. Humidity is very high because of the marshy character of the coastal plains and can reach 90 percent in summer for wet bulb temperatures of over 26 °C. Mean annual temperature is 15.8˚C and annual precipitation is 1506 mm. maximum and minimum temperature is 27.8˚C in August and 4.1˚C in February,respectively. The Alborz range provides further diversity to the land in addition to the Caspian coasts (Zarekar et al., 2012, Abedi et al., 2010)

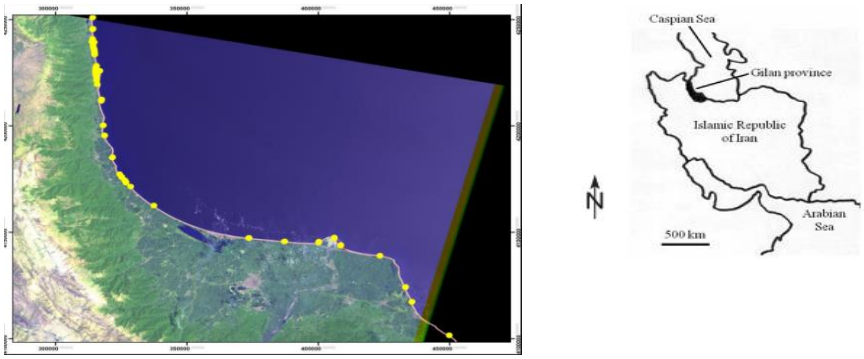

Figure 1. Location of Gilan province in Iran and vegetation sampling in coastal sand dune

Data collection

Data collection was performed from May. 2011 to May. 2012. Voucher specimens were deposited in Gilan University Herbarium (GUH).Vegetation sampling was carried out along 22 shore perpendicular transects, approximately 500-m long. A total of 62 sampling areas were selected in stands of vegetation that were homogeneous to the eye in floristic composition and structure. A plot of 5× 5 m was sampled in each area 29. (Monserrat et al., 2012). In each sampled plot, the cover percentage value of each species was estimated using Bran-Blanquet scales (Braun-Blanquet, 1964).

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. 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). PL (Pluriregional elements) are plants ranging in distribution overthree 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) (NAQINEZHAD et al., 2006).

RESULTS AND DISCUSSION

RESULTS

Inventory of vascular flora

A total of 212 species of native and naturalized vascular plants belonging to 58 families and 148 genera were known from the study area (Table 1). Three families of Pteridophytes and 55 families of Angiosperms (48 dicotyledons and 7 monocotyledon families) constitute the studied flora. Poaceae (30 species), Asteraceae (19 species), Fabaceae (12 species), Caryophyllaceae (11 species) show the highest species richness respectively. Two families are represented by seven taxa, two families with six taxa, three families with nine taxa, 28 families have only one taxon and others consist of 2 to 6 species. Five families including Poaceae (22), Asteraceae (17), Caryophyllaceae (9), Brassicaceae (8) and Apiaceae (7), contain more than seven genera. Six families have five genera, two families have four genera, 10 families have two genera and the rest (35 families) are unigeneric (Fig.2.).

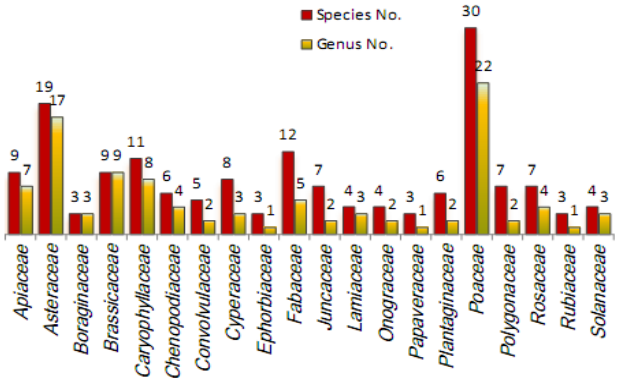

Figure 2. The richest families in terms of number of taxa and genera

As it concerns the species richness of the genus, two genus with seven taxa (*Cyperus*, *Juncus*), three genus with four taxa (*Rumex, Rubus,Trifolium*), 15 genus with three taxa, 18 genus with two taxa, and 110 genera only with a single taxon (Fig. 3.)

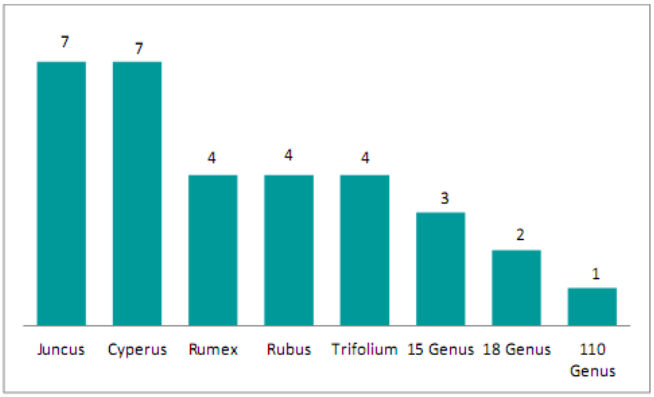

Figure 3. Number of Species of the richest genera and density of species in other genus

Table1.Cheklist of identified plant species in the coastal sand dune of seoutwest of caspian sea.

Symbols and abbreviations used in the table:

Life form: Cha (chamaephyte), Geo (geophyte), Hel (helophyte), Hem (hemicryptophyte), Hyd (Hydrophyte), P (parasite), Pha (phanerophyte), Thr (therophyte(

Chorotype: COS = Cosmopolitan, ES= Euro-Sibirian, IT = Irano- Turanian, M = Mediterranean, PL = Pluriregional, SCOS = Subcosmopolitan.

Taxa	*Life forme*	*Chorotype*	*Hb.No*
Pteridophyta			
Azollaceaea			
Azolla filiculoides Lam.	Hyd	PL	*
Thelypteridaceae			
Thelypteris limbosperma (All) H.P.Fuchs	Geo	PL	4219
Thelyptris palustris Schott	Hem	ES	4220
Equisetaceae			
Equisetum ramosissimum Desf.	Geo	SCOS	4221
Spermatophyta			
Angiospermae			
Dicotyledones			
Adoxaceae			
Sambucus ebulus L.	Geo	ES,IT,M	4222
Amaranthaceae			
Amaranthus Spinosus L.	Thr	PL	4223
Amaranthus retroflexus L.	Thr	PL	4224
Apiaceae = Umbelliferae			
Berula angustifolia (L.) Mertens & W.D. Koch.	Hel	SCOS	4225
Centella asiatica (L.) urban	Hem	ES,IT	4226
Daucus Broteri Ten.	Thr	ES,IT,M	4227
Daucus carota L. subsp. carota	Hem	IT,M	4228
Daucus litoralis Smith subsp. hyrcanus Rech.f.	Hem	ES	4229
Eryngium caucasicum Trautv.	Hem	ES,IT,M	4230
Hydrocotyle Vulgaris L.	Geo	ES,M	4231
Pinpella affinis Ledeb.	Hem	PL	4232
Torilis leptophylla Rchb. f.	Thr	PL	4233
Apocynaceae			
Trachomitum venetum (L.) woods.	Hem	ES,IT,M	4234
Asclepiadaceae			
Peripolica graeca L.	Pha	ES,IT,M	4235
Asteraceae = Compositae			
Artemisia annua L.	Thr	ES,IT,M	4236
Bidens triprtita L.	Thr	PL	4237
Careduus arabicus Jacq. ex Murray	Thr	ES,IT,M	4238
Centaurea iberica Trev. ex sperng.	Thr	PL	4239
Cichorium intybus L.	Hem	PL	4240
Cirsium Vulgare (Savi) Ten.	Hem	PL	4241
Condrilla *juncea L.*	Hem	ES,IT,M	4242
Conyza Canadensis (L.) Cronq.	Thr	COS	4243
Conyzanthus Squamatus (spreng.) Tamamsch.	Hem	SCOS	4244
Crepis foetida L. subsp. foetida	Thr	ES,IT,M	4245
Hedypnois rhagadioloides (L.) F.W.Schmidt subsp. Cretica (L.)Hayek	Thr	PL	4246
Lactula serriola L.	Thr	PL	4247
Mulgedium tataricum (L.) DC.	Hem	PL	4248
Senecio vernalis waldst. & kit.	Thr	ES,IT,M	4249
Sonchus oleraceus L.	Thr	COS	4250

Willematia tuberose Fisch & C.A.Mey.	Hem	ES	4251
Xantium brasilicum Vellozo	Thr	PL	4252
Xantium Spinosum L.	Thr	PL	4253
Xantium Strumarium L.	Thr	PL	4254
Betulaceae			
Alnus glutinosa (L.) Gaertn. Subsp. barbata (C.A.Mey.) Yaltirik	Pha	ES	4255
Alnus Subcordata C.A.Mey.	Pha	ES	4256
Boraginaceae			
Arguzia Siberica (L.) Dandy	Hem	PL	4257
Cynoglossum creticum Miller.	Hem	ES,IT,M	4258
Nonea lutea (Desr.) Reichenb. ex DC.	Hem	PL	4259
Brassicaceae			
Arabidopsis thaliana (L.) Heynh.	Thr	PL	4260
Cakile maritima Scop.	Thr	ES,M	4261
Capsella bursa-pastoris (L.) Medicus	Hem	COS	4262
Lepidium pinnatifidum Ledeb. Fl. Ross. (Ledeb.)	Thr	PL	4263
Raphanus raphanistrom L. subsp. raphanistrum	Thr	PL	4264
Rapistrum rogosum (L.) All.	Thr	ES,IT,M	4265
Rorippa Inslandica (oeder) Borbas	Geo	PL	4266
Sisymbrium officinale (L.) Scop.	Thr	ES,IT,M	4267
Turritis glabra L.	Hem	ES,IT,M	4268
Caesalpinaceae			
Gleditschia Caspica Desf .	Pha	ES	4269
Capparidaceae			
Cleome iberica DC.	Thr	ES,IT,M	4270
Caryophyllaceae			
Arenaria Lepteclaclos (Rchb.) GUSS.	Thr	ES,IT,M	4271
Cerastium glomeratum Thuill.	Thr	COS	4272
Cerastiu semidecandrum L.	Thr	ES,IT,M	4273
Moehringia trinervia (L.) Clairv.	Thr	ES,IT	4274
Petrohagia prolifera (L.) Ball & Heywood	Hem	ES,M	4275
Polycarpon tetraphyllum (L.) L.	Thr	PL	4276
Sagina apetala Arduino	Thr	PL	4277
Silene conica L.	Thr	PL	4278
Silen gallica L.	Thr	COS	4279
Silene latifolia Poir. subsp. eriocalycina (Boiss.) Greuter & Burdet	Hem	ES,IT	4280
Stellaria media (L). Vill.	Thr	PL	4281
Chenopodiaceae			
Agriophyllum minus Fisch. & C.A.Mey.	Thr	ES,IT	4282
Agriophyllum squarrosum (L.) Moq.	Thr	PL	4283
Chenopodium album L. subsp. album	Thr	Cos	4284
Chenopodium botrys L.	Thr	M,IT	4285
Corispermum orientale Lam.	Thr	IT	4286
Salsola kali L. subsp. tragus (L.) Nyman	Thr	PL	4287
Convolvulaceae			
Calystegia Sepium (L.) R.Br.	Geo	SCOS	4288
Calystegia silvestris (willd.) Roem.	Geo	ES,M	4289
Conuolvulus arvensis L.	Hem	COS	4290
Conuolvulus cantabrica L.	Cha	ES,IT,M	4291
Conuolvulus persicus L.	Hem	ES,IT	4292
Crassulaceae			
Sedum stoloniferum S.G.Gmel.	Hem	ES	4293
Ephorbiaceae			
Euphorbia amygdaloides L.	Geo	ES	4294

Euphorbia helioscopia L.	Thr	ES,IT,M	4295
Euphorbia peplus L.	Thr	ES,IT,M	4296
Fabaceae = Papilionaceae			
Lotus corniculetus L. subsp. corniculatus var. corniculatus	Hem	PL	4297
Medicago lupulina L.	Hem	PL	4298
Medicago polymorpha L.	Thr	IT,M	4299
Medicago Sativa L.	Hem	IT	4300
Melilotus albus Medicus	Hem	PL	4301
Melilotus indicus (L.) All.	Thr	PL	4302
Trifolium arvense L. Var. arvense	Thr	Es,M	4303
Trifolium campestre Schreb.	Thr	ES,IT,M	4304
Trifolium repens L. var repens	Geo	ES,IT,M	4305
Trifolium suffocatum L.	Thr	ES,M	4306
Vicia sativa L. var. sativa	Thr	ES,IT,M	4307
Vicia tetrasperma (L) Schreb.	Thr	ES,IT,M	4308
Gentianaceae			
Centaurium pulchellum (Swarts) Druce	Thr	ES,IT,M	4309
Geraniaceae			
Erodium cicutarium (L.)LHer. Ex Aiton	Hem	ES,IT,M	4310
Erodium oxyrrhynchum M.B. subsp. oxyrrhynchum	Thr	IT	4311
Geranium molle L.	Hem	ES,IT	4312
Geranium purpureum Vill.	Hem	ES,IT,M	4313
Hypericaceae			
Hypericum androsaemum L.	Cha	ES	4314
Juglandaceae			
Pterocaria fraxinifolia (Lam.) Spach	Pha	Es	4315
Lamiaceae			
Mentha aquatica L.	Geo	Es	4316
Mentha pulegium L.	Hem	Es	4317
Prunella vulgaris L.	Geo	PL	4318
Scutellarie tournefortii Benth	Geo	Es	4319
Linaceae			
Linum bienne Miller	Hem	M	4320
Lythraceae			
Lythrum Salicria L.	Hem	SCOs	4321
Malvaceae			
Malva neglecta Wallr.	Thr	ES,M,IT	4322
Moraceae			
Morus alba L.	Pha	IT	4323
Ficus carica L.supsp. carica	Pha	IT,M	*
Onograceae			
Epilobium hirsutum L.	Geo	PL	4324
Epilobium minutiflorum Hausskn.	Geo	PL	4325
Oenothera biennis L.	Hem	PL	4326
Oenothera laliniata Hill	Hem	PL	4327
Orobanehaceae			
Orobanche ramosa L.	Par	ES,IT	4328
Oxalidaceae			
Oxalis Corniculata L.	Thr	PL	4329
Papaveraceae			
Papaver arenarium M.B.	Thr	ES,IT	4330
Papaver Chelidoniifolium Boiss. & Bushe	Thr	ES	4331
Papaver pavonicum Fisch & C.A. Mey	Thr	ES,IT	4332
Phytolacaceae			
Phytolacca americana L .	Hem	OL	4333
Plantaginaceae			
plantago lanceolata L.	Hem	ES,M,IT	4334

Plantago major L.	Hem	SCOS	4335
Plantago psyllium L.	Thr	PL	4336
Veronica anagalioides– aquatica L. subsp. oxycarpa	Thr	PL	4337
Veronica Persica Poir.	Thr	SCOS	4338
Veronica Polita Fries	Thr	SCOS	4339
Polygonaceae			
Polygonum patulum M.B.	Thr	ES,IT	4340
Polygonum hydropiper L.	Thr	ES,IT	4341
Polygonum persicaria L.	Thr	PL	4342
Rumex conglomeratus Murr.	Hem	ES,IT	4343
Rumex pulcher L.	Hem	ES,IT,M	4344
Rumex sanguineus L.	Hem	ES	4345
Rumex tuberosus L. subsp. horizatalis (C.Koch. F.) Rech.f.	Hem	ES,IT	4346
Portulaeceae			
Portulaca oleracea L.	Thr	ES,IT,M	4347
Punicaceae			
Punica granatum L.	Pha	PL	4348
Primulaceae			
Anagallis arvensis L. subsp. arvensis var. arvensis	Thr	PL	4349
Samolus valenandi L.	Hem	PL	4350
Raununculaceae			
Ranunculus muricatus L.	Thr	IT,M	4351
Ranunculus scleratus L.	Thr	PL	4352
Rhamnaceae			
Paliurus Spina-christi Miller	Pha	ES,IT,M	4353
Rosaceae			
Cratagus microphylla C.Koch	Pha	ES	4354
Potentilla adscharica Sommier & Levier ex R. Keller	Pha	ES	4355
Potentilla reptans L.	Hem	ES,IT,M	4356
Rubus caesius L.	Pha	PL	4357
Rubus × esfandiarii Gilli	Pha	ES	4358
Rubus × grantii Gilli	Pha	ES	4359
Rubus saxatilis L.	Pha	ES	4360
Rubiaceae			
Galium elongatum C. Presl	Hyd	ES	4361
Galium odoratum Scop.	Geo	ES,M,IT	4362
Galium tricorneutum stokes	Thr	IT,M	4363
Salicaceae			
Populus Caspica Bornm	Pha	Es,IT	4364
Populus deltoids Marsh	Pha	Es,IT	4365
Salix alba L.	Pha	ES,IT,M	4366
Scrophulariaceae			
Rhynchocorys maxima C.Richter	Hem	ES	4367
Verbascum sinuatum L. var adenosepalum Murb.	Hem	ES,IT	4368
Simaroubaceae			
Ailanthus altissima (Mill) Swingle	Pha	PL	4369
Solanaceae			
Datura Stramonium L.	Thr	PL	4370
Physalis alkekengi L.	Geo	ES	4371
Solanum nigrum L.	Thr	SCOS	4372
Solanum Sisymbriifolium Lamk	Thr	ES,IT	4373
Tamaricaceae			
Tamarix ramosissima Ledeb.	Pha	PL	4374
Uriticaceae			
Urtica dioca L. subsp. dioica	Hem	PL	
Verbenaceae			

Phyla nodiflora (L.) Greene	Hem	PL	4375
Verbena officinalis L.	Hem	PL	4376
Violaceae			
Viola sintenisii W.Becker	Geo	ES	4377
Zygophyllaceae			
Tribulus terrestris L. var. terrestris	Thr	PL	4378
Monocotyledones			
Cyperaceae			
Bolboschoenus glaucos (Lam.)S.G.Sm.	Hel	PL	4379
Carex divulsa Stokes subsp. divulsa	Geo	ES,IT,M	4380
Carex extensa Good.	Hel	ES,M	4381
Cyperus distachyos All.	Hel	PL	4382
Cyperus glaber Thou. ex C.B.Clarke	Geo	M,IT	4383
Cyperus odoratus L.	Geo	Es,IT	4384
Cyperus rotundus L.	Geo	COS	4385
Cyperus serotinus Rottb.	Hel	PL	4386
Juncaceae			
Juncus acutus L.	Geo	SCOS	4387
Juncus articulutus L.	Geo	PL	4388
Juncus bufonius L.	Thr	COS	4389
Juncus litolaris C.A. Mey.	Geo	IT,M	4390
Juncus maritimus Lam.	Goe	ES,M	4391
Juncus subulatus Forssk.	Goe	ES,IT,M	4392
Luzula forsteri (Smith) Dc.	Hem	ES,M	4393
Iridiaceae			
Iris pseudacorus L.	Geo	ES	4394
Sisyrinchium exile E.P.Bicknell	Geo	PL	4395
Poaceae			
Aegilops tauschii Cosson	Thr	ES,IT	4396
Alopecurus myosuroides Hudson var. breviaristatus Marchesetti ex Ascherson & Graebner	Thr	PL	4397
Avena sativa L.	Thr	PL	4398
Briza minor L.	Thr	Es,M,IT	4399
Bromus japonicus Thunb Var. japonicus	Thr	PL	4400
Calamagrostis epigejos (L.) Roth	Geo	PL	4401
Calamagrostis Pseudophragmites (Hall.f.)Koel.	Geo	PL	4402
Catapodium rigidum (L).C.E. Hubb.	Thr	ES,IT,M	4403
Cutandia memphitica (Spreng.) K. Richt.	Thr	IT,M	4404
Cynodon dactylon (L.)Pers.	Hem	PL	4405
Digitaria sanguinalis (L.) Scop. subsp. pectiniformis Henrard	Thr	PL	4406
Echinochloa crus-galli (L.) P. Beauv. var. submutica Neilr.	Thr	SCOS	4407
Eragrostis barvelieri Dav.	Thr	COS	4408
Hordeum marinum Huds. subsp. gussoneanum (Parl.) Thell.	Thr	PL	4409
Lolium loliaceum (Bory & Chaub.) Hand.-Mazz.	Thr	ES,M,IT	4410
Lolium perenne L.	Hem	PL	4411
Lolium persicum Bioss & Hohen. ex Boiss.	Thr	ES,IT	4412
Lophochloa phleoides (Vill) R.chb.	Thr	PL	4413
Parapholis incurua (L.) C. E. Hubb	Thr	ES,IT	4414
Phragmites australis (Cav.) Trin.	Hel	COS	4415
Paspalum distichum L.	Geo	COS	4416
Paspalum dilatatum poir.	Geo	PL	4417
Paspalum paspaloieles (Michx.) Scribner	Geo	ES	4418
Phleum paniculatum HudSon Var. ciliantom (Boiss.) Bor	Thr	ES	4419
Poa annua L.	THr	PL	4420

Poa nemoralis Torr.	Thr	SCOS	4421
Poa trivialis L.	Geo	PL	4422
Polypogon monspeliensis (L.) Desf.	Thr	SCOS	4423
Polypogon semiverticillatus (Forssk) Hyl.	Thr	PL	4424
Sorghum halepense (L.) Pers.	Geo	SCOS	4425
Smilacaceae			
Smilax excelsa L.	Pha	ES,M	4426
Thyphaceae			
Thypha Caspica Pobed.	Hel	PL	4427

Life form

Raunkiaer, (1934) proposed a life -form classification system based on the manner in which plants protect their perennating buds during unfavourable seasons. (Raunkiaer 1934; Cain 1950; Muller-Dombois and Ellenberg 1974). The life form of plants is an adaptive response to environment and provides an ecological classification that may be indicative of habitat conditions (Archibold 1995). According to Box (1981), the study of plant life forms is important, because it provides the basic structural components of vegetation stands and explaining vegetation structure. In the assessment of life form spectrum, the dominant life forms are therophytes, which constitute 42.7% of studied flora, followed by the hemicryptophytes (24.4%), geophytes (16.9%) and phanerophytes (9.4%) , Chamephyta and) and parisites (0. 5%) (Figure 4).

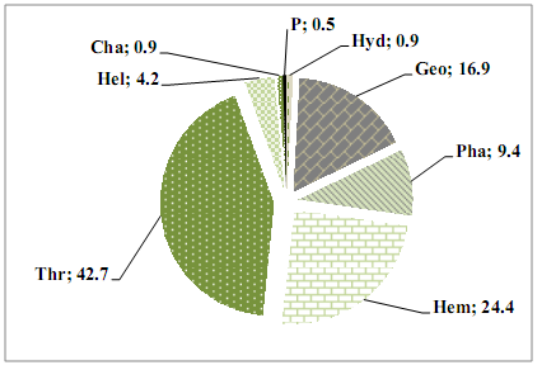

Figure 4. Life form spectrum of studied flora of Gilan Coastal sand dune

Phytogeographical affinities

The flora of the study area is much affected by pluriregional elements due to two reasons. First, the humid and wet habitats dominating the area harbor the bulk of the pluriregional plants adapted to wet places. Second, human activities are responsible for the establishment of widespread weeds. Phytogeographical elements include PL (34.3%), ES, IT, M (19.2%), ES (12.2%), ES, IT (9.4%), Scos(6.6%), Cos(6.1%), ES, M (4.7%), IT, M (4.2%), IT (1.9%), and M (0.5%) (Fig. 5).

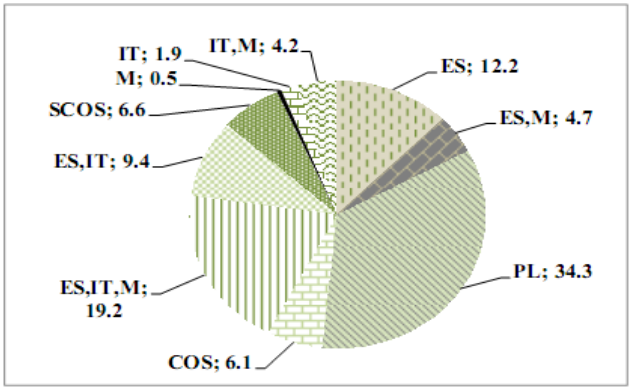

Figure 5. Chorotype spectrum of studied flora of Gilan Coastal sand dune

Discussion

Documenting floristic composition of a habitat is valuable for continuing ecological research, management and conservation of plants and animals. Targeting conservation and management actions toward the species and ecosystems require clearly established priorities such as study of floristic composition as a principle tool in biodiversity which was considered in the study (Ejtehadi et al., 2003). So, in this research, identification of 212 plant species in southwest coastal sand dune of Caspian Sea along with their chorology, plant family and life form are of central importance for further ecological investigation, conservation and management of coastal areas of Caspian Sea in Iran.

Coastal habitats in southern coastal areas of Caspian Sea are very sensitive to destruction and habitat fragmentation due to human settlements, cultivation and private uses. Majority of coastal ecosystems were damaged and converted. There are only a few fragmented places, in Caspian Sea shore which have natural coastline. At least the remained areas are complex ecosystems, which serve as very valuable resting, nesting and wintering places for a wide variety of waterfowls. In spite of applying, some conservational policies in the southern Caspian coasts, the natural sand dunes are under destroying and therefore their plants are very vulnerable to be rare or deleted. *Arguzia sibirica, Convolvuls persicus, Eleocharis caduca, Isolepis cernua, Melilotus polonicus* are of examples vulnerable plants (Ghahreman, 1975; Naqinezhad & Saeidi, 2007) .It is necessary to establish certain laws and regulations in order to protect some of the rare species or sensitive ecosystem (Naqinezhad, 2012).

Life-forms have close relationships with environmental factors (Muller-Dombois and Ellenberg 1974) and can be viewed as strategies for obtaining resources (Crosswhite and Crosswhite 1984; Cody 1986). Also the life form classification is based essentially on plant reaction to climate; the individual spectrum should tell us much about macroclimatic patterns at field sites (Pears, 1985). Although, therophytes occur abundantly in desert areas (Archibold, 1995) a high presence of this life form (42.7 percent) proves destruction pressure in some parts of our studied area. The relation between human activities and disturbance (some anthropogenic and grazing) effects and the increase of therophytes were also reported elsewhere (Solinka et al. 1997 ; Grime, 2001; Naqinezhad et al., 2006; Ravanbakhsh et al. 2007;). Following therophytes, hemicryptophytes and geophytes are next dominant life forms. The high proportion of these life forms is consistent with the results of some floristic studies in other coastal areas in the Hyrcanian district (e.g. Ejtehadi et al.2003; Ghahreman et al., 2004; Naqinezhad et al., 2006; Ghahreman et al., 2006; Khodadadi et al., 2009; Ghahremaninejad et al., 2011; Severoglu et al., 2011).

The chorological studies showed that 34.3% of species belong to the pluriregional zone and 19.2% of species belong to the, Irano- Turanian, Mediterranean (ES, IT, M) and 12.2 % of common species belong to Euro - Sibirian zone (ES). Similar to previous investigations in coastal area of Caspian sea (Ghahreman et al., 2004; Naqinezhad et al., 2006; Ghahreman et al., 2006; Khodadadi et al., 2009; Seighali and Zaker 2010), pluriregional species constitute remarkable portion of the studied flora.

The present study is the first floristic study of coastal sand dune in southwest of Caspian Sea (Gilan province) and showing the importance of the region in term of plant diversity. Although present study tried to record flora of sand dune of southwest of Caspian Sea yet it was a glimpse of the area. It is believed that there is ample opportunity that many plant species were left unrecorded hence need long-term comprehensive study to document.

ACKNOWLEDGEMENT

We are indebted to Dr. SH. Saiedie and Dr. R.Shahi, University of Gilan are thanked for his helps during the field studies.We would also like to thank the Academic Center for education, Cultural Research (ACECR), for their financial Support.

REFERENCES

Abedi R, Pourbabaei H. 2010. Plant diversity in natural forest of Guilan Rural Heritage Museum in Iran. Biodiversitas 11(4): 182-186.

Akhani H. 2003. Notes on the flora of Iran: 4. two new records and synopsis of the new data on Iranian Cruciferae since Flora Iranica. Candollea 58: 369-385.

Archibold OW. 1995. Ecology of world vegetation. Chapman & Hall, London.

Asri Y, Sharifnia F, Gholami T. 2007. Plant associations in Miankaleh Biosphere reserve, Mazandaran province (N. Iran). Rostaniha 8: 1-16.

Asri Y, Eftekhari T. 2002. Flora and vegetation of Siah-Keshim lagoon. J. Environ. studies 28: 1-19.

Assadi M, Massoumi A, Khatamsaz M, Mozaffarian V. 1988-2011. Flora of Iran. Research Institute of Forests & Rangelands Publication, Tehran.

Box EO. 1981. Macroclimate and plant forms: an introduction to predictive modeling in Phytogeography. Tasks for Vegetation Science 1: 1-258. Junk Publ. La Haya.
Braun-Blanquet J. 1964. Pflanzensoziologie: Grundzüge der Vegetationskunde 3. Springer-Verlag, Vienna.
Cain SA. 1950. Life - forms and phytoclimate. Botanical review 16: 1-32.
Carbonia M, Carranzab ML, Acosta A. 2009. Assessing conservation status on coastal dunes: A multiscale approach, Landscape and Urban Plan. 91: 17–25.
Cody ML. 1986. Structural niches in plant communities. In: Diamond J, Case T (ed) Community Ecology. Harper and Row, San Francisco.
Crosswhite F, Crosswhite C. 1984. A classification of life forms of the Sonoran desert with emphasis on seed plants and their survival strategies. Desert plants 5:131-161.
Davis PH. 1965-1988. Flora of Turkey. Vole 1-10. Edinburgh University Press, Edinburgh.
Ejtehadi H, Amini T, Zare H. 2005. Importance of Vegetation Studies in Conservation of Wildlife: A Case Study in Miankaleh Wildlife Refuge, Mazandaran Province, Iran. Environ. Sciences. 9: 53-58.
Ejtehadi H, Amini T, Kianmehr H, Assadi M. 2003. Floristical and Chorological Studies of Vegetation in Myankaleh Wildlife Refuge, Mazandaran Province, Iran. Iranian Int. J. Sci. 4(2):107-120.
Feagin RA, Sherman DJ, Grant WE. 2005. Coastal erosion, global sea-level rise, and the loss of sand dune plant habitats. Front Ecol Environ. 3(7): 359–364.
Frey W, Probst W. 1974. Vegetations analytische Untersuchungen im Dünengebiet bei Babolsar (Kaspisches Meer, Iran). Bot. Jahrb. Syst. 94: 96-113.
Ghahreman A, Attar F. 2003. Anzali wetland in danger of death (an ecologic-floristic research) J. Environ. studies (special issue, Anzali lagoon) 28: 1-38.
Ghahreman A. 1975. The Species eliminated from the native vegetation of Iran. Paper presented at the Proceedings of First seminar on problems of the Natural vegetation of Iran, Annex to Evironmental studies No. 3, Tehran.
Ghahreman A.1994. Iran chromophytes (systematic plant), Volume 4, Tehran University Publication Center, Tehran.
Ghahreman A, Naqinezhad A, Attar F. 2004. Habitats and flora of the Chamkhaleh-Jirbagh coastline and Amirkelayeh wetland. J. Environ. Studies 33: 46-67.
Ghahremaninejad F, Naqinezhad A, Bahari S, Esmaeili R. 2011. A contribution to flora, life form, and distribution of plants in two protected lowland forests, Semeskandeh and Dasht-e Naz, Mazandaran, N. Iran. Taxonomy and Biosystematics 3: 53-70.
Ghahreman A, Naqinezhad A, Hamzehee B, Attar F, Assadi M. 2006. The flora of threatened black alder forests in the Caspian lowlands, northern Iran. Rostaniha 7(1): 5–29.
Grime JP.2001. Plant strategies, vegetation processes and ecosystem properties. John Wiley & Sons, New York.
Khodadadi S, Saedi mehrvarz SH, Naqinezhad A. 2009. Contribution to flora, and habitats of the Estil wetland (Astara) and its surroundings, Nourth west Iran, Rostaniha 10(1) 44-62.
Komarov VL (ed). 1934–1954. Flora of the U.S.S.R., vols: 1-21, Isdatelstvo Akademii Nauk SSSR, Leningrad.
Kukkonen I, Ghahreman A, Naqinezhad A. 2001. Isolepis cernua (Cyperaceae), a new record from north of Iran, Iran. J. Bot. 9(1): 107-110.
Martı nez ML, Psuty NP, Lubke RA. 2004. A perspective on coastal dunes. In: Martı ´nez, ML, Psuty NP (ed) Coastal Dunes. Ecology and Conservation, Ecol. studies 171. Berlin Heidelberg, Germany: Springer-Verlag 3–10.
Monserrat AL, Celsi Cintia E, Sonia L. 2012. Coastal Dune Vegetation of the outhern Pampas (Buenos Aires, Argentina) and Its Value for Conservation, J. Coastal Res. 28(1):23-35.
Muller-Dombois D , Ellenberg H. 1974 : Aims and Methods of vegetation Ecology , John wiley & Sons, new York.
Naqinezhad A. 2012. A Preliminary Survey of Flora and Vegetation of Sand Dune Belt in the Southern Caspian Coasts, N. Iran Research J. Biology 2 (1): 23-29.
Naqinezhad A R , Ghareman A. 2004. New interesting and noteworthy record species for the flora of Cyperaceae in Iran, with the distributional viewpoint. Iran J. Bot. 10(2):185-187.
Naqinezhad A, Saeidi Mehrvaez S. 2007. Some new genera and species record for the flora of Iran and flora Iranica area collected from Boujagh national park, N. Iran. Iran J. Bot. 13(2): 112-119.
Naqinezhad A, Ghahreman A. 2002. Two new records of Cyperaceae from coastal flora of the Caspian sea, Iran. Iran. J. Bot. 9(2):171-175.
Naqinezhad A, Saeidi Mehrvaez S, Noroozi M, Faridi M. 2006.Contribution to the vascular and bryophyte flora as well as habitat diversity of the Boujagh national park, N. Iran. Rostaniha 7(2): 83-105.
Pears N. 1985. Basic biogeography. John Wiley & Sons, New York.
Raunkiar C. 1934. The life forms of plants and statistical plant geography .Oxford. Clarendon Press. London.
Ravanbakhsh M, Ejtehadi H , Pourbabaei H, Ghoreshi-al-Hoseini J. 2007. Investigation on plants species diversity of Gisoum Talesh reserve forest, Gilan province, Iran. Iranian J. Biology 20: 218–229.
Rechinger K H (ed.). Flora Iranica, No. 1-178. Graz: Akademische Druck-und Verlasanstalt (1-174), Wien: Naturhistorisches Museum (175-178) (1963-2010). Sciences, 10: 1723-1727.
Seighali N, Zaker S. 2010. Contribution to the Vascular and Flora as Well as Habitat Diversity of the Langarud and its Environs,(Guilan: IRAN). Adv. bioresearch 1(1): 123 – 136.
Severoglu Z, Altay V, Ilker Oziygit I, Keskin M, Serin M, Yarci C, Yashar U, Demir G. 2011. Some ecological characteristics and the flora of Golcuk District and its environs (Kocaeli- Turkey). Scientific Research and Essays 6 (4): 847-875.

Sharifnia F, Asri Y, Gholami TT. 2007. Plant diversity in Miankaleh Biosphere reserve (Mazandaran province) in North of Iran. Pak J Biol Sci 10 (10):1723-1727.

Shokri M, Ahmadi M, Amiri B. 2004. A second look on biogeographical province of Miankaleh biosphere reserve, AEER 2(1): 105–117.

Solinska, G B, Namura OA, SymonidesE.1997. Long term dynamics of a relict forest in an urban area. Floristica et Geobotanica 42: 423–479.

Takhtajan, A.1986. Floristic regions of the world. University of California Press. California The Ramsar List. 2013. The list of wetlands of International Importance. Switzerland, Ramsar convention Bureau.

Tutin TG, Heywood VH, Burges NA, Moore DM, Valentine DH. 1964-1980. Waltersand Webb, D.A. Flora Europaea. Vol. 1-5. Cambridge University Press. Cambridge. Wiley, New York.

Zarekar A, Vahidi H , Kazemi Zamani B, Ghorbani S, Jafari H. 2012. Forest fire hazard mapping using Fuzzy AHP and GIS, study area: Gilan province of iran, International Journal on “Technical and Physical Problems of Engineering” (IJTPE), 4(3) 47-55 .

Zohary M. 1973. Geobotanical foundations of the Middle East. 2 vols. Fischer Verlag, Stuttgart, Amsterdam.