



A preliminary checklist of vascular aquatic plants of Iran

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Abstract

A first checklist of vascular aquatic macrophytes of Iran is presented with data on their life forms, distributions, and the frequency of their occurrence in geographical parts of the country, via a complete literature survey as well as herbarium specimens examination and field observations. As the results, there are about 284 species of vascular aquatic and semi-aquatic macrophytes belonging to 127 genera and 57 families in Iran among them 80.3% of the species are helophytes, 13.9% submerged, 3.5% floating leaved and 2.3% free floating. Twenty seven of the families are also true hydrophytes families. Distributional points of view, the highest number of the aquatic species is found in the north and the lowest amount of them is found in the east of the country.

Keywords: Aquatic plants; checklist; Iran.

Introduction

The vast country of Iran, in South–West Asia, constitutes a peculiar geographical unit which displays a remarkable biodiversity and various ecosystems with specific biological contents. Although much of Iran is extremely dry, the country possesses a great diversity of wetland ecosystems among which about 22 sites have been recorded in Ramsar Convention as wetlands of international importance^{1,2}. These ecosystems are comprised of a multitude of aquatic habitats in which a variety of aquatic plants may be found. Recently, many attentions have been devoted to the survey of these natural water ecosystems and several studies on their flora have been published³⁻⁵. Meanwhile, a major checklist of the aquatic plants had not been accomplished to date for Iran and there was an urgent need for providing such a list. Therefore, providing a preliminary checklist of aquatic vascular plants of Iran with data on their distribution and life forms was the goal of this work. According to Chamber *et al*⁶, the aquatic macrophytes are a diverse group of aquatic photosynthetic organisms, all large enough to see with the naked eye and are classified into Macroalgae, Bryophyta, Pteridophyta and Spermatophyta. The aquatic macrophytes belonging to Pteridophyta and Spermatophyta were investigated in the present work.

Material and Methods

This work was based on a detailed literatures survey as well as on a taxonomical study of some herbarium specimens followed by field observations and many collections done by students during several semesters in Natural Resources Faculty, Isfahan University of Technology. The recently new records for the flora Iran were also added⁷⁻¹⁰. Nomenclatures were adopted from the Flora Iranica^{11,12} and the scientific names were also checked with the International Plant Name Index

The life forms of the mature plants were classified according to the system of Rankiaer¹³, as modified by Archibald¹⁴. Descriptive statistical method was also applied for analyses of the obtained data.

Results and Discussion

The results showed that a total of 284 species belonging to 127 genera and 57 families of aquatic or semi-aquatic vascular plants are indigenous in Iran (table-1), among them, 8 species (2.9%) are Pteridophyta (3 horsetails and 5 ferns) and 276 species (97.1%) are Spermatophyta (101 species (33.7%) dicotyledonous and 175 species (63.4%) monocotyledonous. The largest true hydrophytes family is Potamogetonaceae with 2 genera and 14 species, followed by Typhaceae with one genus and 12 species. The largest true hydrophytes genera are also *Potamogeton* (with 13 species) and *Typha* (with 12 species). Roughly 59.8% of species are obligate aquatic species and 40.2% are facultative wetlands (figure-1).

So far, about 8000 species of vascular plants have been recorded from Iran¹⁵. From them, 284 species (about 3.4%) are aquatic or semi-aquatic macrophytes according to our results. Indeed, almost 1.9% of them are obligate and 1.3% is facultative aquatic species). Tiner¹⁶ stated that the obligate and facultative wetland species have the greatest affinity to aquatic ecosystems and wetlands, and are the best vegetative indicators of wetlands.

There are about 167 vascular plant families in the flora of Iran^{11,15} among which 57 families (ca. 34%) included the aquatic species (table-1), but when considering only hydrophytes families, only 27 families (about 16%) of them are true hydrophytes.

Table-1

List of vascular aquatic macrophytes of Iran. Abbreviations: LF=Life Form; H=helophytes; F=floating leaved; f=free floating; S=submerges species. GD=Geographical Distribution; N=North; S=South; E=East; W=West; C=Central; TH=Throughout. The sequence of the families, genera and species follows alphabetic order. The true aquatic families are marked with an asterisk.

A. Cryptogames			Callitrichaceae*		
Equisetaceae			<i>Callitriche brutia</i> Petagna	S	N
<i>Equisetum fluviatile</i> L.	H	N	<i>C. palustris</i> L.	S	N
<i>E. palustre</i> L.	H	N	Caryophyllaceae		
<i>E. telmateia</i> Ehrh.	H	N	<i>Myosoton aquaticum</i> (L.) Moench	H	N
Marsileaceae*			<i>Spergularia diandra</i> (Guss.) Heldr. and Sart	H	W, E, S
<i>Marsilea strigosa</i> Willd.	F	N	<i>S. marina</i> (L.) Griseb.	H	N, W, C
<i>M. quadrifolia</i> L.	F	N	Ceratophyllaceae*		
Salviniaceae*			<i>Ceratophyllum demersum</i> L.	S	TH
<i>Azolla filicoides</i> Lam.	F	N	<i>C. submersum</i> L.	S	N
<i>Salvinia natans</i> (L.) All.	F	N	Chenopodiaceae		
Thelypteridaceae			<i>Beta vulgaris</i> L. subsp. <i>maritima</i> (L.) Arcangeli	H	N, S
<i>Thelypteris palustris</i> Schott	H	N	<i>Salicornia europaea</i> L.	H	TH
B. Dicotyledones			Elatinaceae*		
Amaranthaceae			<i>Bergia ammannioides</i> Heyne ex Roth.	H	N
<i>Alternanthera sessilis</i> (L.) Br.	H	N	<i>B. aquatica</i> Roxb.	H	W
Apiaceae			Gentianaceae		
<i>Apium nodiflorum</i> (L.) Lag.	H	W, S	<i>Gentiana aquatica</i> L.	H	N, E
<i>Berula angustifolia</i> (L.) Mertens and W. D. Koch	H	N, C, S	<i>Lomatogonium carinthiacum</i> (Wulfen) A. Br.	H	N
<i>Centella asiatica</i> (L.) Urban	H	N	Haloragaceae*		
<i>Hydrocotyle ranunculoides</i> L.	f	N	<i>Myriophyllum spicatum</i> L.	S	TH
<i>H. vulgaris</i> L.	H	N	<i>M. verticillatum</i> L.	S	N
<i>Oenanthe aquatica</i> (L.) Poir.	H	N	Hippuridaceae*		
<i>O. fistulosa</i> L.	H	W	<i>Hippuris vulgaris</i> L.	S	N, C, S
<i>O. silaifolia</i> M. B.	H	N	Lamiaceae		
Asteraceae			<i>Lycopus europeus</i> L.	H	N, W, C
<i>Aster tripolium</i> L.	H	N	<i>Mentha aquatica</i> L.	H	N, C
<i>Bidens tripartita</i> L.	H	N, C	<i>M. longifolia</i> (L.) Huds.	H	TH
<i>Eclipta alba</i> (L.) Hasskn.	H	N	<i>M. pulegium</i> L.	H	N
<i>E. prostrata</i> (L.) L.	H	N, S	<i>M. spicata</i> L.	H	N
<i>Sonchus maritimus</i> L.	H	N	<i>Prunella laciniata</i> L.	H	N
<i>S. palustris</i> L.	H	N	<i>Scutellaria galericulata</i> L.	H	N
<i>Tussilago farfara</i> L.	H	N, C	Lentibulariaceae*		
Avicenniaceae			<i>Utricularia australis</i> R. Br.	S	W
<i>Avicennia marina</i> (Forssk.) Vierh.	H	S	<i>U. minor</i> L.	S	W
Boraginaceae			<i>U. ochroleuca</i> R. Hartman	S	N
<i>Myosotis palustris</i> (L.) Nath.	H	N, W	<i>U. vulgaris</i> L.	S	N
Brassicaceae			Lythraceae		
<i>Nasturtium microphyllum</i> Boenn. ex Reichenb.	H	W, C	<i>Ammannia auriculata</i> Willd.	H	W, C
<i>N. officinalis</i> (L.) R. Br.	H	N, W, C, S	<i>A. baccifera</i> L.	H	N
<i>Rorripa amphibia</i> (L.) Besser	H	C	<i>A. multiflora</i> Roxb.	H	S
<i>R. islandica</i> (Oeder) Borbas	H	N, W	<i>A. verticillata</i> (Ard.) Lam.	H	W
<i>R. kurdica</i> (Boiss. and Hausskn.) Hedge.	H	C	<i>Lythrum salicaria</i> L.	H	N, W, C, E
<i>R. sylvestris</i> (L.) Besser	H	C	<i>Rotala densiflora</i> (Roth.) Koehne	H	N

Malvaceae		
<i>Althaea officinalis</i> L.	H	N, W, C
<i>Kosteletzkya pentacarpus</i> (L.) Ledeb.	H	N
Menyanthaceae*		
<i>Menyanthes trifoliata</i> L.	H	N
<i>Nymphoides indicum</i> (L.) O. Kuntze.	S	N, W
<i>N. peltatum</i> (Gmel.) O. Kuntze.	H	N
Nelumbonaceae*		
<i>Nelumbo nucifera</i> Gaertn.	H	N
Nymphaeaceae*		
<i>Nuphar lutea</i> (L.) Smith	F	W, S
<i>Nymphaea alba</i> L.	F	N, S
Onagraceae		
<i>Epilobium hirsutum</i> L.	H	TH
<i>E. minutiflorum</i> Hausskn.	H	N, C
<i>E. palustre</i> L.	H	N, C
<i>Ludwigia palustris</i> (L.) Elliott	H	N
Parnassiaceae		
<i>Parnassia palustris</i> L.	H	N
Polygonaceae		
<i>Polygonum amphibium</i> L.	F	TH
<i>P. hydropiper</i> L.	H	N, C
<i>P. lapathifolium</i> L.	H	S
Primulaceae		
<i>Glax maritima</i> L.	H	E, C
<i>Lysimachia dubia</i> Soland.	H	N
<i>L. vulgaris</i> L.	H	N
Pyrolaceae		
<i>Pyrola rotundifolia</i> L.	H	N
Ranunculaceae		
<i>Batrachium rionii</i> Nym.	S	TH
<i>B. sphaerospermum</i> (Boiss. and C.I.Blanche) Iranshahr	H	N, W, S, C
<i>B. trichophyllum</i> (Chaix) Bosch	S	TH
<i>Caltha alba</i> Jacquem.	H	W
<i>C. palustris</i> L.	H	N, W
<i>Ranunculus lingua</i> L.	H	N
<i>R. muricatus</i> L.	H	N
<i>R. ophioglossifolius</i> Vill.	H	N
<i>R. scleratus</i> L.	H	N
<i>R. trichocarpus</i> Boiss. and Kotschy	S	TH
Rhizophoraceae		
<i>Rhizophora mucronata</i> Poir.	H	S
Scrophulariaceae		
<i>Baccopa monnieri</i> (L.) Pennell	H	S
<i>Gratiola officinalis</i> L.	H	N
<i>Limosella aquatica</i> L.	H	W, C
<i>Lindernia procumbens</i> (Krock.) Philcox	H	N, S
<i>Veronica anagalis – aquatica</i> L.	H	TH
<i>V. beccabunga</i> L.	H	N, C
<i>V. peregrina</i> L.	H	N
<i>V. serpyllifolia</i> L.	H	N

Solanaceae		
<i>Solanum dulcamara</i> L.	H	N, W, C
Sphenocleaceae*		
<i>Sphenoclea zeylanica</i> Gaertn.	H	S
Trapaceae*		
<i>Trapa natans</i> L.	f	N
Verbenaceae		
<i>Phyla nodiflora</i> (L.) Greene	H	TH
C. Monocotylednes		
Alismataceae*		
<i>Alisma gramineum</i> Lej.	S	N
<i>A. lanceolatum</i> With.	H	N, C, S
<i>A. plantago-aquatica</i> L.	H	N
<i>Damasonium alisma</i> Miller	H	N, S
<i>Sagittaria sagittifolia</i> L.	H	N
Butomaceae*		
<i>Butomus umbellatus</i> L.	H	N, C, S
Cymodoceaceae*		
<i>Halodule wrightii</i> Ascheris.	S	S
<i>Thalassodendron ciliatum</i> (Forssk.) Den Hartog	S	S
Cyperaceae		
<i>Blysmus compressus</i> (L.) Panzer ex Link	H	N, W, C, S
<i>Bolboschoenus affinis</i> (roth) Drob.	H	W, C
<i>B. glaucus</i> (Lam.) S. G. Smith	H	TH
<i>B. maritimus</i> (L.) Palla	H	W, C
<i>B. planiculmis</i> (F. Schmidt.) T.V. Egorova	H	N
<i>B. schmidii</i> (Raymond) Holub	H	N, W
<i>Carex acuta</i> L.	H	N, C
<i>C. acutiformis</i> Ehrh	H	N, W
<i>C. cuprina</i> (Sandor ex Heuff.) Nendtv. Ex A. Kern.	H	N, W
<i>C. distans</i> L.	H	W
<i>C. divisa</i> Huds.	H	N, W, E
<i>C. elata</i> All.	H	W
<i>C. flava</i> L.	H	N, W
<i>C. extensa</i> Good.	H	N
<i>C. melanantha</i> C. A. Mey	H	N
<i>C. panacea</i> L.	H	N, W
<i>C. pseudocyperus</i> L.	H	N
<i>C. pycnostachya</i> Kar. and Kir.	H	N
<i>C. riparia</i> Curt.	H	N
<i>C. rostrata</i> stokes	H	N
<i>C. serotina</i> Merat	H	N, C
<i>C. tomentosa</i> L.	H	N
<i>Cladium mariscus</i> (L.) Pohl	H	N, W, C, S
<i>Cyperus arenarius</i> Retz.	H	S, E
<i>C. difformis</i> L.	H	N, C, S
<i>C. distachyos</i> All.	H	TH
<i>C. dives</i> Delile	H	N
<i>C. esculentus</i> L.	H	N

<i>C. fuscus</i> L.	H	TH
<i>C. glomeratus</i> L.	H	N
<i>C. imbricatus</i> Retz.	H	N
<i>C. iria</i> L.	H	S
<i>C. longus</i> L.	H	TH
<i>C. malaccensis</i> Lam.	H	S
<i>C. michelianus</i> (L.) Delile	H	N
<i>C. odoratus</i> L.	H	N
<i>C. pannonicus</i> Jacq.	H	N
<i>C. pygmaeus</i> Rottb.	H	N, W, S
<i>C. rotundus</i> L.	H	TH
<i>C. serotinus</i> L.	H	N, S
<i>Eleocharis argyrolepis</i> Kierulff	H	N
<i>E. atropurpurea</i> (Retz.) J.Presl and C.Presl.	H	S
<i>E. caduca</i> (Delile) Schult.	H	N
<i>E. geniculata</i> (L.) Roem and Schult.	H	
<i>E. mitracarpa</i> Steud.	H	TH
<i>E. palustris</i> (L.) Roemer and Schultes	H	TH
<i>E. quinqueflora</i> (F. ex Hartmann) O. Schwarz	H	N
<i>E. uniglumis</i> (Lind) Schult.	H	N, E, S
<i>Fimbristylis bisumbellata</i> (Forssk.) Bubani	H	TH
<i>F. dichotoma</i> (L.) Vahl.	H	N, S
<i>F. miliacea</i> (L.) Vahl	H	S
<i>F. squarrosa</i> Vahl	H	N
<i>F. turkestanica</i> (Regel) B. Fdtsch.	H	N, S
<i>Fuirena pubescens</i> (Poir.) Kunth	H	C
<i>Isolepis setacea</i> (L.) M. Br.	H	N, W, C
<i>Pycneus flavescens</i> (L.) Reichenb.	H	N
<i>P. flavidus</i> (Retz.) T. Koyama	H	N, S
<i>P. sanguinolentus</i> (Vahl) Nees	H	N
<i>Schoenoplectus bucharicus</i> (Roshev.) Grossh.	H	N, W
<i>S. juncooides</i> (Roxb.) Palla	H	N
<i>S. lacustris</i> (L.) Palla	H	N, W, C
<i>S. litoralis</i> (Schrud.) Palla	H	THE
<i>S. lupulinus</i> (Nees) V. Krecz.	H	W, S
<i>S. mucronatus</i> (L.) Palla	H	N, W
<i>S. triqueter</i> (L.) Palla.	H	N, W
<i>Schoenus nigricans</i> L.	H	TH
<i>Scirpoides holoschoenus</i> (L.) Sojak	H	TH
Hydrocharitaceae*		
<i>Blyxa octandra</i> (Royb.) Planch. ex Thw.	S	S
<i>Halophila ovalis</i> (R. Br.) Hook.f.	S	S
<i>Hydrilla verticillata</i> (L.f.) Royle	S	N
<i>Hydrocharis morsus-ranae</i> L.	F	N
<i>Vallisneria spiralis</i> L.	S	N, C, S
Iridaceae		
<i>Iris pseudoacorus</i> Grossh.	H	TH
Juncaceae		

<i>Juncus acutus</i> L.	H	N, S
<i>J. alpigenus</i> C. Koch	H	N
<i>J. articulatus</i> L.	H	N, W, C, S
<i>J. bufonius</i> L.	H	N, W, C
<i>J. compressus</i> Jacq.	H	N
<i>J. efusus</i> L.	H	N, C
<i>J. fontanesii</i> Gay	H	N, W, C
<i>J. gerardi</i> Loisel.	H	S
<i>J. heldreichianus</i> Marsson ex Parl.	H	N, C
<i>J. infelexus</i> L.	H	N, C, S
<i>J. littoralis</i> C. A. Mey.	H	N
<i>J. maritimus</i> Lam.	H	W, N, C
<i>J. panctorius</i> L.	H	S
<i>J. rigidus</i> Desf.	H	C, S
<i>J. socotranus</i> (Buchenau.) Snogerup.	H	S
<i>J. sphaerocarpus</i> Nees in Funck	H	C
<i>J. subulatus</i> Forssk.	H	S
<i>J. turkestanicus</i> V. Krecz. and Gontsch.	H	N, W, C
Juncaginaceae*		
<i>Triglochin maritima</i> L.	H	N, W, C
<i>T. palustris</i> L.	H	N, W, C
Lemnaceae*		
<i>Lemna gibba</i> L.	f	N, S
<i>L. perpusilla</i> Torrey	f	S
<i>L. minor</i> L.	f	N, C, S
<i>L. trisulca</i> L.	S	TH
<i>Spirodella polyrhiza</i> (L.) Schleiden	f	N
<i>Wolffia arrhiza</i> (L.) Horkel ex Wimm.	f	N
Liliaceae		
<i>Fritillaria olivieri</i> Baker	H	N, W
<i>F. reuteri</i> Boiss.	H	C
Najadaceae*		
<i>Najas gracillima</i> (A. Braun ex Engelm.) Magnus	S	S
<i>N. graminea</i> Delile	S	S
<i>N. marina</i> L.	S	N, S
<i>N. minor</i> All.	S	N, W, C, S
Orchidaceae		
<i>Epipactis palustris</i> (L.) Crantz	H	N, C
Poaceae		
<i>Alopecurus aequalis</i> Sobol.	H	N, C
<i>A. myosuroides</i> Hudson	H	N, W, C, S
<i>A. pratensis</i> L.	H	W
<i>Arundo donax</i> L.	H	N, S
<i>Beckmannia eurciformis</i> (L.) Host	H	N
<i>Calamagrostis epigejos</i> (L.) Roth	H	N, C
<i>C. pseudophragmites</i> (Hall.f.) Koel.	H	N, W, C
<i>Catabrosa aquatica</i> (L.) P. Beauv.	H	N, W, C
<i>C. capusii</i> Franch.	H	N
<i>Coix lacryma-jobi</i> L.	H	N
<i>Crypsis aculeatua</i> (L.) Aiton	H	N

<i>C. alopecuroides</i> (Piller and Mitterp.) Schrad.	H	W
<i>C. schoenoides</i> (L.) Lam.	H	N, C, S
<i>Deschampsia caespitosa</i> (L.) P. Beauv.	H	N, W, C
<i>Echinochloa colonum</i> (L.) Link	H	W, C, S
<i>E. crus-galli</i> (L.) P. Beauv.	H	N, C
<i>Glyceria arundinacea</i> (M.B.) Kunth	H	N
<i>Leersia oryzoides</i> (L.) Swartz	H	N
<i>Microstegium vimineum</i> (Trin.) A. Camus	H	N
<i>Paspalidium geminatum</i> (Forssk.) Staff in Prain	H	N
<i>Paspalum dilatatum</i> Poir.	H	N
<i>P. distichium</i> L.	H	N
<i>P. paspaloides</i> (Michx.) Scribner	H	N
<i>P. urvillei</i> Steud	H	N
<i>Phragmites australis</i> (Cav.) Trin. ex Steud.	H	TH
<i>Polypogon maritimus</i> Willd.	H	TH
<i>P. monspeliensis</i> (L.) Desf.	H	TH
<i>Puccinella distans</i> (L.) Parl.	H	N, S
<i>Zingeria trichopoda</i> (Boiss.) P. Smirn.	H	W, S
Pontederiaceae*		
<i>Monochoria vaginalis</i> Persl.	H	N
Potamogetonaceae*		
<i>Groenlandia densa</i> (L.) Fourr.	S	N
<i>Potamogeton alpinus</i> Balb.	S	N
<i>P. amblyphyllus</i> C. A. Mey.	S	C, S
<i>P. berchtoldii</i> Fieb.	S	N, W, S
<i>P. crispus</i> L.	S	N, C, S
<i>P. filiformis</i> Pers.	S	N

<i>P. gramineus</i> L.	S	N
<i>P. lucens</i> L.	S	E, S
<i>P. natans</i> L.	F	N
<i>P. nodosus</i> Poir.	S	N, W, C, S
<i>P. pectinatus</i> L.	S	TH
<i>P. perfoliatus</i> L.	S	N, W, C, S
<i>P. pusillus</i> L.	S	N, C, S
<i>P. trichoides</i> Cham. and Schltldl.	S	N
Ruppiaceae*		
<i>Ruppia cirrhosa</i> (Petagna) Grande	S	S
<i>R. maritima</i> L.	S	N, C, S
Sparganiaceae*		
<i>Sparganium erectum</i> L.	H	TH
Typhaceae*		
<i>Typha angustifolia</i> L.	H	N, W, C
<i>T. azerbaijanensis</i> Hamdi and Assadi	H	N
<i>T. caspica</i> Pobed.	H	N
<i>T. domingensis</i> Persl	H	N, W, C, S
<i>T. grossheimii</i> Pobed.	H	N, , C, S
<i>T. kalatensis</i> Assadi and Hamdi	H	N
<i>T. latifolia</i> L.	H	N, C
<i>T. laxmannii</i> Lepechin.	H	N, W, C, S
<i>T. lugdunensis</i> Chab.	H	N, C
<i>T. minima</i> Funk in Hoppe	H	N, C
<i>T. shuttleworthii</i> W. Koch and Sonder	H	N, W
<i>T. turcomanica</i> Pobed.	H	N
Zannichelliaceae*		
<i>Althenia filiformis</i> Petit	S	S
<i>Zannichellia palustris</i> L.	S	TH
Zosteraceae*		
<i>Zostera nolinii</i> Hornem.	S	N

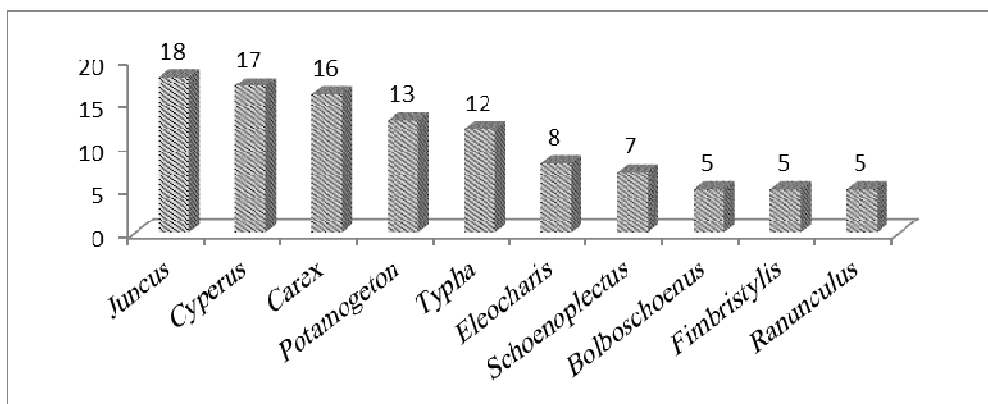


Figure-1
The largest vascular aquatic genera (≥ 5 species) occurring in the Flora of Iran

According to Sculthorpe¹⁷ all true aquatic plant species of the world are classified in 34 families, including 5 cryptogams, 11 dicotyledonous and 18 monocotyledons. Therefore, the occurrence of 27 true aquatic families (about 76.5% of the world families) including 2 cryptogams, 11 dicotyledonous and

14 monocotyledons in Iran indicates the richness of biodiversity in this country.

As table-1 show, in respect to life forms, helophytes with 223 species (80.3% of the all aquatic species) are predominant life

forms among the aquatic macrophytes of Iran and the rest are true hydrophytes of which 45 species (13.9%) are submerged, 9 species (3.5%) are floating leaved and 7 species (2.3%) are free

floating (table-2 and figure-2). The helophytes were treated here according to Archibald method¹³ and includes the marsh and emergent herbs and some hygrophytes.

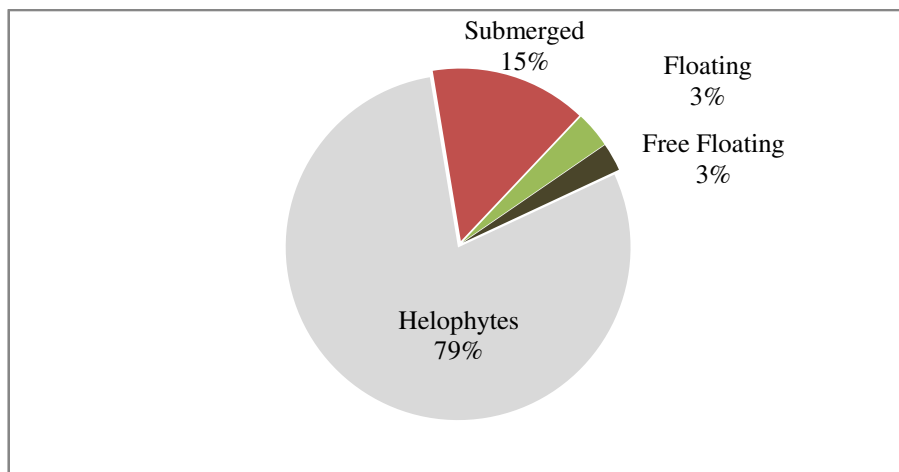


Figure-2
 Life form spectrum in vascular aquatic species occurring in the Flora of Iran

A great number of aquatic and semi-aquatic species (ca. 176), are found in the north parts of Iran (also including NE and NW). However, the west and central of the country are also rich in aquatic species (figure-3). The most wetland ecosystems of Iran could be grouped into six major systems, of which the wetlands of the south Caspian lowlands in Gilan and Mazandaran provinces in northern of the country are of the most important ones^{1,2}. The richness of aquatic species as well as the other life forms in these areas is due to the presence of Caspian Sea and Alburz ranges. In fact, only these parts of the country, receiving 800 to 2000 mm annual rainfall, are most humid parts of Iran^{2,18}. In contrast, the east of the country, due to the arid conditions and receiving with less than 100 mm annual precipitation, has

rather low amount of aquatic plants (ca. 26 species). Nevertheless, some of the species listed here are of special interest from the distributional and geographical points of view; for example *Ceratophyllum submersum* L., *Potamogeton natans* L. and *Carex pseudocyperus* L. are limited to Sulukli lake in Golestan National Park in NE Iran¹⁹, *Zostera noltii* Hornem. is restricted to Anzali marsh in N, *Althenia filiformis* Petit is limited to Neyriz lake in S, *Halodule wrightii* Ascheris. is found only in Bushehr province (South of Iran), *Thalassodendron ciliatum* (Forrk.) Den Hartog is confined to Chahbahar in SE, and *Sphenoclea zeylanica* Gaertn. is restricted to Shadegan marsh in SW Iran²⁰. These species must be lie under protection and conservation laws.

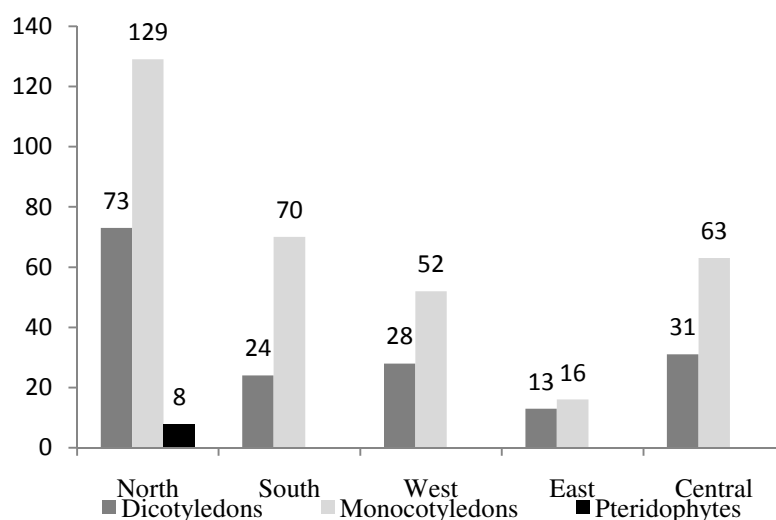


Figure-3
 Geographical distribution of vascular aquatic species in Iran

There was no endemic species among the aquatic plants of Iran. This is not surprising, because a majority of aquatic plants are

cosmopolite^{21,22}.

Iran is rich in plant diversity as a result of the major environmental variation^{1,2,18,15}. The results of our survey are on supporting of this fact. Wetlands in Iran, as elsewhere in the region, are increasingly coming under pressure from man's activities¹. Undoubtedly, the vegetation of these ecosystems is under influence of such pressures. Therefore, the conservation of the rare aquatic plants should be a part of the national development plans.

Conclusion

Iran is the habitat of innumerable plant species including a large variety of vascular aquatic and semi-aquatic plants. According to our findings a total of 284 species belonging to 127 genera and 57 families of aquatic or semi-aquatic vascular plants are indigenous in Iran. Considering aquatic plants as an important part of plant species diversity, Iran is one of rare countries, at least in the Middle East, with a great profusion of such diversity. A great number of aquatic and semi-aquatic species are found in the north parts of Iran (also including NE and NW). However, the west and central of the country are also rich in aquatic species. In contrast, the east of the country has rather low amount of aquatic plants. Wetlands in Iran, as elsewhere in the region, are increasingly coming under pressure from man's activities and the vegetation of these ecosystems is under influence of such pressures. Therefore, by providing the general public with information and education concerning the actual state of the vegetation, the public must be awakened to the importance and sensitivity of this problem and made aware of the importance of conserving the plant species diversity which is a life giving-factor in man's environment.

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