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Impacts of Habitat Destruction on Wetland Biodiversity

Mahmoud soufi and Abbas jafari

Department of Environment &Energy,
Islamic Azad University Science and Research Branch, Tehran, Iran

Abstract: As more human demand on water resources impacts all part of the world, these ecosystems have been always being damaged by human. This study was carried out during Aug- 2010 between Suloukli and Shormast wetlands in the north of Iran to assess the degree of water pollution via contrasting biodiversity of wetlands. In this study 31 and 16 species macrofauna andspecies macrophytes were identified in Suloukli and Shormastwetlands respectively. The Shannon –Wiener index (H= 3.737 Bit. per ind) calculated for Suloukli that was more than value (H=2.773) of Shormast and rarefaction statistical method stimated in these areas that showed the values of expected number of species of the Shormast was lower than Suloukli wetland. It was concluded that Shormast wetland was stressed with physical pollutions of tourism such as infusion of solid garbages and yachting.

Key words: Suloukli · Shormast · Biodiversity · Human effects · ShannonWinner index · Rarefaction

INTRODUCTION

Species richness is the simplest way to describe communityand regional diversity [1] and this variable ±number of species ± forms the basis of many ecologicalmodels of community structure [2]. Quantifying species richness is important, not only for basic comparisons among sites, but also for addressing the saturation of local communities colonized from regional s ource pools [3].Maximizing species richness is often an explicit or implicitgoal of conservation studies (May 1988) and current and background rates of species extinction are calibrated againstpatterns of species richness [4, 5]. Therefore, itis important to examine how ecologists have quantifified this fundamental measure of biodiversity and to highlight some recurrent pitfalls. Even the most recent reviews of biodiversity assessment [6]. Although species richness is a natural measure biodiversity, it is an elusive quantity to measure properly [7].

Using organisms to assess the health of aquatic environment date back to the nineteenth century [8]. Quantifying species richness is important, not only for basic comparisons among sites, but also for addressing the saturation of local communities colonized from regional source pools [9]. Benthic macroinvertebrate species are differentially sensitive to many biotic and abiotic factors in their environment. Consequently, macroinvertebrate community structure has commonly been used as an indicator of the condition of an aquatic system [10].

In ponds, macroinvertebrates and macrophytes have been chosen as the most practical and effective taxa for quality assessment. plants and animal groups span a complementary range of sensitivities to potential degradation factors. macro invertebrates are likely to be thebest single choice of organisms for assessing overall waterbody quality [11]. Pollution is a semi-nebulous term used to describe changes in the physical,chemical or biological characteristics of water, aire or soil, that can effect the helth, survival, or activities of living entities [12]. Submerged, floating and emergent macrophytes represent animportant.mesohabitat. [10]. or.functional habitat. [13]. inaquatic ecosystems.a Species richness is a fundamental measurement of community and regional diversity and it underlies many ecological models and conservation strategies.Ecological coefficients such as relative abundance may be used to providean estimate of how the community is structured [14, 15]. These involved estimating the abundance of individual species, as a function of the total number of individuals gathered in a particular zone or season.

Corresponding Author: Mahmoud soufi, Department of Environment &Energy,
Islamic Azad University Science and Research Branch, Tehran, Iran.

MATERIAL AND METHODS

Study Area: The investigations were carried out in two wetlands; Suloukli ((36°29' 64" N - 55°46' 22" E)and Shormast (36°51' 51" N- 53°2' 49" E), situated in the north of Iran The Shormast wetland is (2.5/ha)with maximum depth of (4 m) and situated in county Savad Kouh in Mazandaran province.This Wetland is infested with effects of human and is subjected to various anthropogenic interferences. The main macrophyt found in the water body is Alnus glutinosa, Golestan National Park is a mauntainous area that which located in end of eatern north forests. this Park in between countrys Gonbad-Kavus and Bujnourd, The Suloukli is located in northwest of the Golestan National Park (GNP) on Byli Kuoh mountain and North of Ghorghon cliffs in adjacent Zav and Totli Tamak villages with (2.7/ha) area and maximum depth of (110 cm).

We used different stages in this present study, first we selected areas sampling in tow water body(Suloukli & Shormast) randomly. then recorded being aquatic plant in each wetland. Second, we used quadrat method for attaining specimens, in this method was sampled with hand net (30×30cm – 200 μm mesh size), in during each sampling approximately 2 minute for sampling. the specimens caught in the net and brushed from surface, were fixed with%75 alcohol solution. in the lab, macrofauna were identified and count ed the 10× magnification binocular microscope.

Dataset analysis were calculated by ecological methodology software and to assessing the biodiversity index used from Shannon-wiener index, also compaired community samples in both sites by rarefaction statistical method for meaningful standardization and dataset and processes in are expressed by transfer function:

Table 1: The Following taxa have been recognized in during Ast-2010

Taxa	Number of indiv.Suloukli	Number of indivi.Shormast	Ralative frequeny	Ralative frequency
Order-ColeopteraFamily- Dytiscidae				
Laccophilus minutes L.	19	-	0.02	-
Agabusconsprsus (Marsham).	2	-	0.002	-
Acilius sulcatus L.	6	-	0.008	-
Eretes sticticus L.	1	-	0.001	-
Graphoderus cinereus L.	4	-	0.005	-
Hygrotus inequalis (Fabricius).	6	-	0.008	-
Hydroglyphus geminius (Fabricius).	20	-	0.002	-
Hydaticus transversalis (Pontippidian).	5	-	0.006	-
Family-Hydrophilidae				
Hydrochara dichroma	2	-	0.002	-
Helophorus siryacus	4	-	0.005	-
Helochares sp.	-	2	-	0.007
Order-Hemiptera				
Family-Corixidae				
Sigara sp.	3	-	0.004	-
Corixia punctata (Illiger).	59	74	0.08	0.29
Family-Gerridae				
Gerris thorasicus (Schummel)				
Family-Notonectidae	19	1	0.02	0.003
Notonecta gluca				
Family-Nabidae				
Nabis sp.	91	16	0.12	0.06
Family- Pleoidae				
Plea minutissima	1	-	0.001	-
	74	-	0.1	-
Order-Hirudinea				
Family-Hirudidae				
Hirudo sp.	7	-	0.009	-
Family-Glossiphonidae				
Helobdella stagnalis L.	4	10	0.005	0.03
Plecobdella costata	-	1	-	0.003
Family-Erpobdellidae				
Erpobdella sp.	7	-	0.009	-
Order-Diptera				
Family-Chironomidae				
Chironomus sp.	23	14	0.03	0.05
Family-*Culicidae*				
Culex sp.	170	87	0.23	0.34
Family-Stratiomidae				
Stratiomys sp.	1	-	0.001	-

Order-Odonata				
Coenagrionidae				
Ischnura elegans (Schmidt).	4	2	0.005	0.007
Libellolidae				
Libellula depressa L.	4	-	0.005	-
Sympetrum sp.	4	-	0.005	-
Family-Aeshnidae				
*Anax imperator*Leach.	2	1	0.002	0.003
Order-Ephemeroptera				
Family-Beatidae				
Beatis sp.				
Order-Arachnidea	25	16	0.03	0.06
Argyronetidae				
Argyroneta aquatic	2	-	0.002	-
OrderGastropoda				
Planorbis				
planorbis	76	10	0.1	0.03
Physa sp.	-	11	-	0.04
Order-Bivalvia				
Psidium casertanum	56	-	0.077	-
Order Crustacea				
Potamidae				
Potamon ibericum	-	2	-	0.007
Order-Cypriniformes				
Family-Cyprinidae				
Cyprinus caprio	-	7	-	0.02
Order-Salientia				
Family-Ranidae				
Rana ridibunda	24	1	0.03	0.003
S of species	725	255	0.924	0.946

Table 2: Dataset estimated for two way Shannon -Winner & Rarefation method, Exp=Expected, Num spe= Number of species,Var = Variance, SD= Standard deviation, bpr/ ind= bit per individual

Indices	Suloukli	Shormast
Shannon-winner (H) bpr/ind	3.737	2.773
Exp - Num of spe	12.028	8.503
Var :	2.942	1.788
S.D	1.715	1.337

Equation of rarefaction statistical method; (Sanders, 1968).

$$E\left(\hat{S}_n\right) = \sum_{i=1}^{s}\left[1 - \frac{\binom{N - N_i}{n}}{\binom{N}{n}}\right] \quad (1)$$

Equation of Shannon- winer index; (Shannon-winner, 1949).

$$H' = \sum_{i=1}^{s}\left(p_i\right)\left(\log_2 p_i\right) \quad (2)$$

RESULT AND DISCUSSION

The results of the study showed that during the entire study period, 48 species were founded in two waterbody The fauna of in both water body was composed of twelve Benthic order ; Coleoptera, Hemiptera, Diptera, Odonana, Ephemeroptera, Gastropoda, Bivalvia, Arachnidea, Hirudinea, Crustacea,Cypriniformes, Salientia, among these, Diptera dominated 39/60% of the fauna in Sulukli wetland and Hemiptera 35.68% of the fauna Shormast, respectively. a total number of 980 individuals were sampled, in the Sulukli coleopterans, belonging to 8 species from 3 family and on contrary the Shormast only one species was collected. Abundance analysis calculated for the two Place showed that were most abundant species (Culex ; 34.11% in Shormast and 23.44% in Sulukli) the Number of Odonata, Hemiptera, Arachnidea, Bivalvia, Coleoptera families in Sulukli were more than Shormast.in the present investigation we estimated species diversity index Shannon- Winner and ultimately we compaired dataset with Rarefaction statistical methods in each site, that were given in (Table 2). The Rarefaction compairing showed that expected number of species for Sulukli ;SD= 1.715, Var = 2.942, 12.028 > 8.503 SD = 1.337, Var = 1.788 were more than Shormast and also the calculated Shannon –Winner were ; 3.737bit/ indiv > 2.773 in respectively.

No study was previously carried out heretofore. the bed of the Sulukli covered with organic matter and many of submerged and floated aquatic macrophytes such as *Shoenoplectus lacustris., Carex Pseudocyperus. Eleocharis palustris. Utricularia neglecta Ceratophyllum submersum, Callitriche palustris, Elatine hydropripe.Batrachium tricophyllum, Ranunculus sceleratus. Ranunculus Lingua, Salix cf.capra.Alnus glutinosa. Lemna minor., Lemna trisulca., Spirodella polyrhiza, Marsillea quadrifoliaL.Poa golestanensis,*and also the macrophytes were founded in Shormast wetland as;*., Carex sp., Lythrum salicaria,., Sambacus ebulus.*

The Shormast bed constitutes small sized gravel (Mean diameter = 11.5 mm) and fine sand at the base. Aquatic flora is restricted to *Alnus glutinosa*. and *Lythrum salicaria*., poorly inhabiting the wetland, but There are some trees on the stream margins, which macrofauna can be most probably found among their free roots in water, as well as inside the decaying leaves trapped in them.

CONCLUSIONS

In order to provide baseline information for future monitoring of impacts and to analyse which are the most important physical factors affecting diversity, high species diversity indicates that such community has their resources more finely distributed among individuals of many species [16]. Diversity index can also be used to measure environmental stress [17]. Consequently,the ordering of communities may differ when ranked by species richness vs. species density [18].

Species diversity (Shannon winner) and rarefaction were compared (Table 2) it was noted that these were maximum in Sulukli and minimum in Shormast, The fauna of both reservoirs was most composed of followed benthic groups, (Coleoptera, Hemiptera, Hirudinea,Diptera, odonata,Ephemeroptera, Bivalvia, Gastropoda, Crustacea, Cypriniformes, Salientia), among which, Cypriniformes(Cyprinidae=2.74%), (Bivalvia &Arachnidea = 0), (Hemiptera = 35.68%),(Diptera = 39.60), superlative frequency of the fauna in Shormast wetland. in contrast the orders of (Gastropoda = 10.48%), (Coleoptera=9.51%),(Hemiptera=33.51%),(Ephemeroptera = 3.44%), (Odonata = 1.93%),(Crustacea & Cypriniformes = 0) were maximium of relative frequency in Sulukli wetland, the most represented species belong to the Dytiscidae family (eight species) and Hemiptera (five species). In the whole collection of Shormast specimens were represented by the Hemiptera and Diptera family (Figure 1). The hemiptera are capable of utilizing virtually all aquatic habitats and seem to be ecologically adabtable to a wide range of environmental conditions. These insect have to surface periodically in order to replenish the external air stors [19].

The number of submerged and emergent plant species in Sulukli with (12 family) that showed have a higher diversity from Shormast (4 family) and also we observed rarity species (*Poa golestanensis*) that described by Akhani & Scholz, 1998.

The invasion of exotic species is another pervasive and damaging impact on freshwater systems that is generally induced by humans [20]. the species of *Cyprinus caprio* within the Shormast is as an exotic species that introduced by human intentionally.

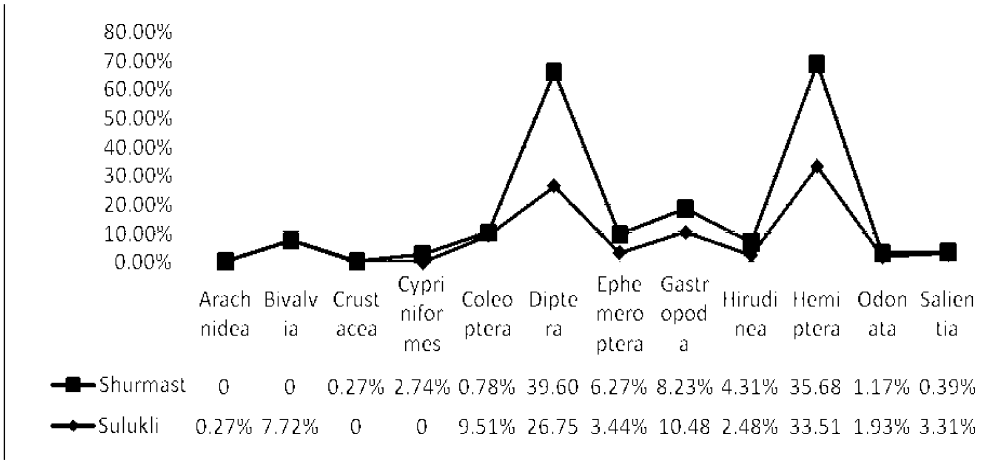

Fig. 1: Relative frequency (%) of individual macrofauna taxa in both site (Sulukli & Shormast).

Aquatic macrophytes play an important role in the structure and function of aquatic ecosystems by altering water movement regimes (flow and wave impact condition) providing shelter and refuge, serving as a food source and altering water and sediment quality [21]. they provide a structurally complex environment over spatial scales ranging from millimeters (e.g;foliage structure of macrophytes: Dibble *et al* ; 2006) to hundreds of meters (e.g; distance between weed beds in a lake; [22]. This environmental heterogeneity can increase numbers and types of niches and can uncouple interacting predators and prey [23]. In addition to their important role in maintaining aquatic biodiversity, divers macrophyte communities also contribute to the maintenance of aquatic ecosystem functioning [24].

According to our observations the Shormast wetland was stressed with physical pollutions of tourism such as infusion of solid garbages and yachting. In fact, this wetland, particularly degraded and heavily impacted during summer months, probably attracted, through nonremoval of trash,rubbish, a great number of species that generally did not occur within Shormast wetland. this activities were reasons for elimination of floating or emergent macrophytes. So it may be concluded that, the water body under investigation was under stress and perturbed. In the present sites (Shormast) were used for washing automobiles and hence were more polluted and perturbed. our results that showed many of coleopteran and hemipteran species diversity such as (Dytiscidae, Hydrophillidae, Pleoidae, Notonectidae, Nabidae), were lowest in the Shormast, also in contrast these families within Sulukli were most abundance and striking. of living insect species it is estimated that about 50% are herbivores mostly associated with vascular plant [25]. All the typical water beetle families are included here. ecologically, they are mostly true water beetles like predaceous diving beetles (Dytiscidae),water scavenger beetles (Hydrophilidae). any environmental influence (Water pollution, power plant, drought) effecting the truly aquatic species will have more or less the same effect on the shore beetle although they hardly get into contact with water activity [26].

One of the reasons lack some species of Odonata order in Shormast, that it is because the absence of submerged or floating macrophytes. This sheltered groups, which possibly use the vegetable as a support, or refuge, as it is the case of the nymphs of Odonata and of the larvae of Ceratopogonidae and Tanypodinae. The small contribution of the shredders is in agreement with other studies [27]. Macrophytes constitute a major component of fresh water biodiversity ecosystem functioning and species richness [28, 22]. in our contry there are not any protection program for species of vernal temporary pools. furthermore Among the 145 butterflies recorded, 24 species come under the protection category as per the Indian Wild Life protection Act 1972. [30] We purpose that be consider to polluted habitats with human activities.

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