The Study of Mahabad,s Kanibarazan Wetland Biodiversity Indexes, IRAN

Ramin Salmanzadeh[1+], Asra Majidi[2], Hojat Jabbari[1], Hasan Abbasnejad[3],Amir Saket[1]

[1] Msc of Environmental Science, ISLAMIC AZAD UNIVERSITY, Tehran, Iran, SCIENCE AND Research Branch

[2] Bsc of Natural Resources Engineering, Saba Institute of Higher Education of Urmia

[3] Msc of Environmental Planning, ISLAMIC AZAD UNIVERSITY of Iran, BANDAR ABBAS UNIT

Abstract. Kanibrazan wetland one of important sites in ecological zone of Urmia lake that in terms of Kanibarazan's wetland is one of the most important wetland in urmia lake due to ecological significance and it was added to ramsar convention list In 2011.This wetland hosts almost 180 species of birds annully which 75 species are waterfowls and waders. This survey was planned to indicate biological value of wetland by quantifying the indicators based on mid-winter censuses of aquatic and seaside aquatic birds during the years 1996 to 2010.The results demonstrate that the maximum quantity of margalef and menhnick diversity indexes are 2.98 and 1.134 respectively. The simpson and shannon-wiener diversity of index are 0.847 and 2.55 in the best condition.

Keywords: Kanibarazan, Wetland, Semi-winter census, Biodiversity Indexes

1. Introduction

Planet earth underwent a downward trend of biological diversity by the meddle of 80's.Lack of any attention to losing faun and flora sources caused serious damages to agriculture, industrial and medical development and progression(khaledi 1379).

Thus wetlands are one the most noticeable, beneficial and certainly misfortunate piece of nature among others, but still this vital life giving wetlands have no replacement. One of the most reliable reason of the specified importance is to rescue the population of waterfowls and waders birds and generally speaking to help biological diversity to grow. The considerable point is irrational and illogical consequences of man's activity have caused major harm to wetlands and jeopardized biodiversity(Hubbard,1988).

However, to evaluate the wetlands biodiversity and in this case the aquatic and waterfowls and waders, which are the most important indicator among other form of life in the area, we use indexes which estimate species and population diversity related to this zone and alternately the importance of them. Eventually, with this approach, an useful and applicable management about wetlands is expected.

The best way for analyzing ecosystem's safety is acquiring a census of waterfowls and waders birds(ali,2005).

The main goal of this study is to observe different biodiversity indexes including; species richness, species evenness and species diversity of kan barazan's wetland which is a satellite one. Kanibarazan's wetland was added to RAMSAR wetland site on June 17, 2011.Due to national law kanibarazan's wetland is considered as a wildlife sanctuary and as a matter of fact this note illustrates the significance of the study.

2. Materials and Methods

[+] Corresponding author. Tel.: +989143432426
E-mail address: salmanzadehr@yahoo.com

2.1. Study area

Kanibarazan's wetland is 25 kilometers away from north side of Mahabad in West Azarbayjan state with the latitude and longitude of 36°59´N and 45°46´E.The average of height (above mean sea level)is 1270 meter and 950 hectares in area space. The catchment's area of the wetland is about 4010 hectare and this wetland is palustrine type among RAMSAR site's distribution.

According to the last findings 75 species of waterfowls and waders birds-belong to 11 different families have been seen, despite the terrestrial species .All together over 180 species are spotted in this area and this surely highlights the place of wetland more than ever.
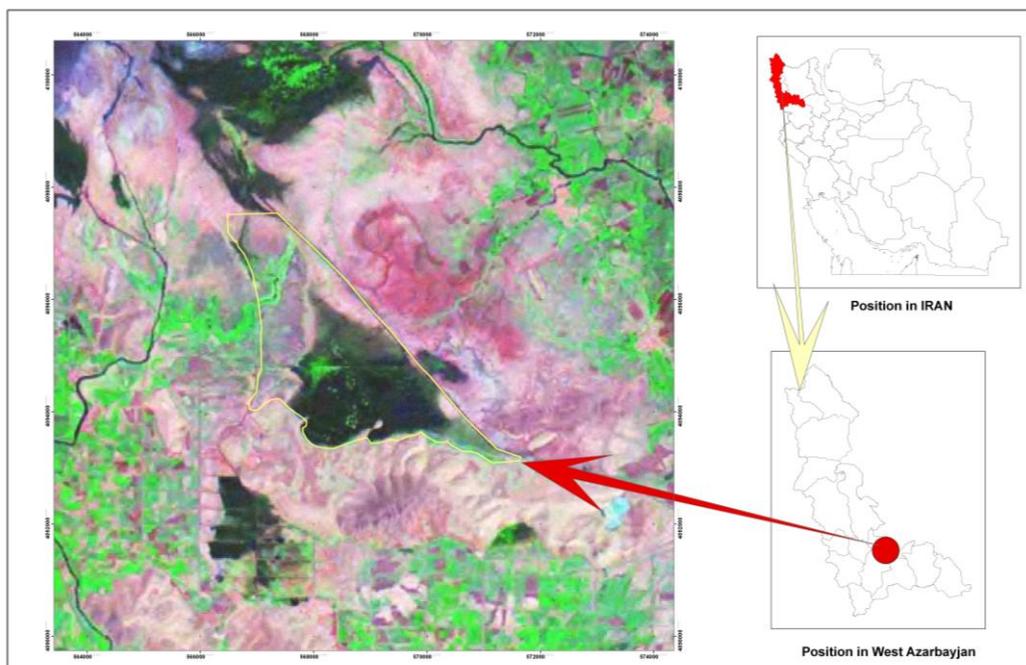

Figure 1: Location of study area in Iran and West Azarbaijan province

2.2. Indices of evaluation

This study was based on statistical observations of birds during the mid-winter yearly census of the wetland. Archive data from the Environmental Protection Agency (official statistics for wildlife) was extracted and indicators over a 14-year period from 1994 till 2010 were reviewed.

Biodiversity Indices of are reviewed three main components:
1- **Species Richness**   2- **Species Diversity**   3- **Species Evenness**

1-Species Richness

This is the oldest concept of Biodiversity and the total number of species in a community called (Krebs, 1999). In fact this indexes are the ratio between the number of species and total number of individuals is observed. Two important indicators of species richness that assess in this study included to:

Margalef Index (1958) $R_1 = (S-1)/LnN$
Menhnick's Index (1964) $R_2 = S/\sqrt{N}$
S= Number of species   N= Total size of population

2-Species Diversity

In fact the Diversity indexes are the same as genetic variation indexes. These indexes are a combination of species richness and species evenness. Shannon-wiener index is more practical and has a better application at the moment.

Shannon- Wiener Index

The basis of this index is the statistic theory. Most of these indexes indicate the two categories of species richness and species evenness as one result. Shannon-wiener index has been established based on random sampling from a big population with an equal chance of presence for individuals.

$$H^{/} = -\Sigma^{s}_{i=1} P_i \ln P_i$$

P_i= Relative abundance of species i

The variation in this index is between 1.5 to 3.5 which in some cases it reaches 5.Number 5 is resulted when each individual belongs to different species and 0 can be achieved when all individuals belong to one species.

Simpson's Index

This index is obtained from probability theory and represents the similarity between two randomly selected individuals from a population with unlimited size Krebs, 1999).

$$\lambda = 1 - \Sigma^{s}_{i=1} [\{ni(ni-1)\}/\{N(N-1)\}]$$

n_i= Number of species i   N= Total size of population

This index gives the maximum scale to common species and the minimum one to rare species.

3-Evenness Index

This defines the relative abundance of species and indicates their domination or absence rating.

$$E = \{(1/\lambda)-1\}/(e^{H^{/}}-1)$$

λ = Amount of Simpson's Index $H^{/}$= Amount of Shannon- Wiener Index   e= Natural logarithm

2.3. Evaluation period

According to annual mid-winter census of aquatic and seaside aquatic birds in Iran simultaneously with other countries around the world, and it's high accuracy, these data were used from June 1996 to June 2010.

2.4. Obtaining the data

In this study which was dedicated to waterfowls and waders birds, the total count method, which is a direct type of observation, due to wetland international guidance was used. In this method only what the researcher can see without any hypothetical estimate is considered. Zavaorowski's telescope has been used in this census.

3. Results

According to graph during the period of survey, 2000 with only 2 species encompasses the minimum quantity and the years 2004, 2006 and 2009 with 25 species contain the maximum amount. From the population point of view 2010 is the most crowded year with 17324 of individuals.Wetland species and population changes during the study period are shown in Figure 2.
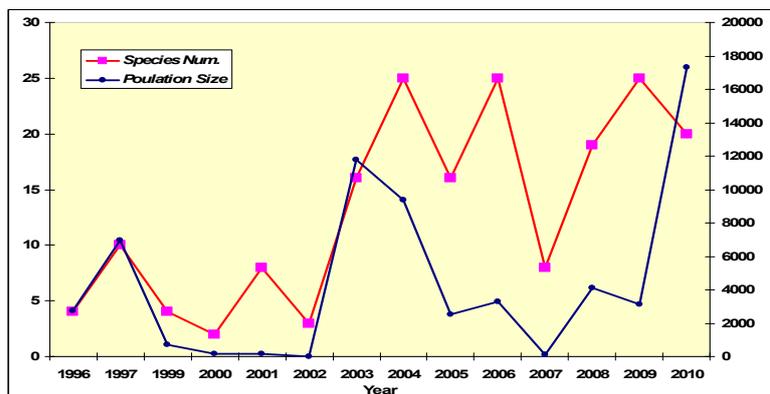

Figure 2: Changes in species and population of kanibarazan wetland from 2010 to 1996

By comparing species richness indexes during the study period, it's been shown that species richness of kanibarazan's wetland according to margalef index in 2009 and menhnick index in 2002 is at the best condition (Fig 3).

Species diversity of simpson and Shannon-wiener indexes of kanibarazan's wetland reached their peak in 2001 and 2009 respectively (Fig 4).

Also according to evenness index which is, in fact, the outcome of Shannon-wiener and simpson's indexes, the maximum value was observed in 2000 (Fig 5).
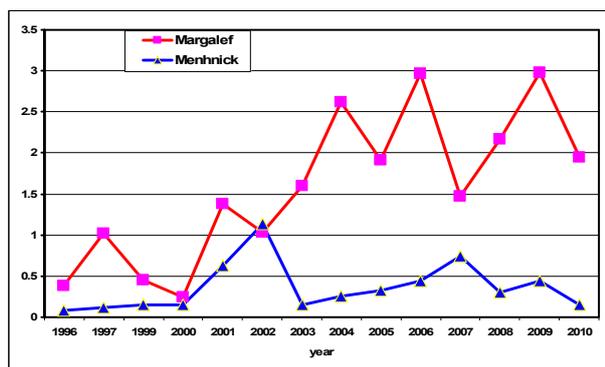

Figure3: Changes in species richness indexes
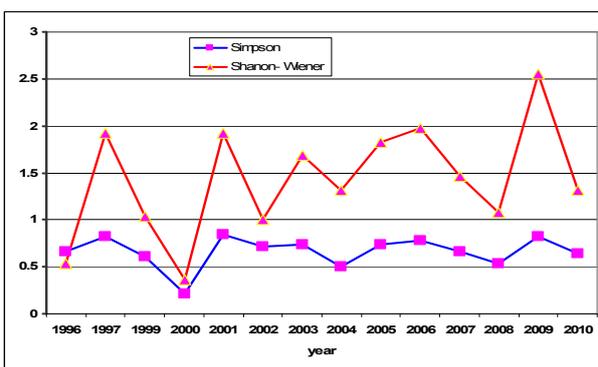Of Kanibarazan wetland, 1996-2010

Figure4: Changes in species diversity indexes
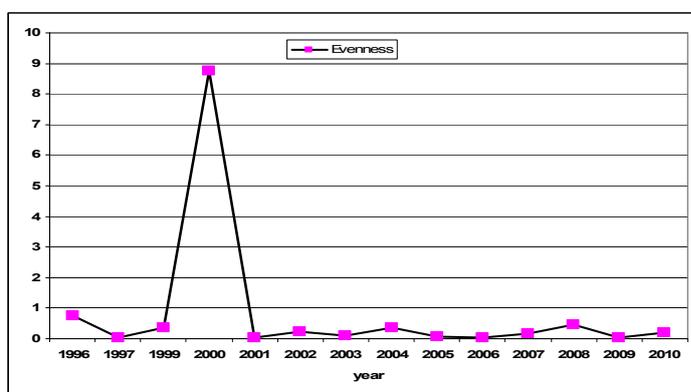of Kanibarazan wetland, 1996-2010

Figure5: Changes in species evenness index of Kanibarazan wetland, 1996-2010

To check the status of wetlands, Shanon- Wiener Index of kanibarazan wetland was compared with some important wetlands in region and Worldwide (Table 1).

Wetland	Shanon-Wiener index	Wetland	Shanon-Wiener index
(Pakistan) Uchalli Wetlands	0.803	(Iran) Hanna Lake	1.472
(Iran) Espand Wetland	1.28	Natural Wetland(Dakota)	3.404
Phewa Lake (Nepal)	2.622	Natural Wetland (Texas)	2.711
Santragachi Lake (India)	0.723	Manmade Wetland (Florida)	2.651
(Iran)Kanibarazan	2.551	(Iran) Selkeh Wetland	1.97

Table1:Compare of kanibarazan Shanon- Wiener Index with some important wetlands in region and Worldwide

4. Conclusion

During the period of study the population of aquatic and seaside aquatic birds experienced multiple fluctuation. As in 14 years 2 to 25 species of aquatic and seaside aquatic birds were seen. According to performed studies, the most important factor in this ups and downs situation is the climate change of the local area. As a reason during the tough winters, by the middle of November to be exact, the surface of wetland begins to freeze which affects on diversity of birds. Studies on species richness index suggest an approximate similarity between fluctuation pattern of margalef and menhnick's index which menhnick's index shows a milder up and down during the period of study. Also by evaluating the simpson and Shannon-wiener species diversity indexes, a harmony of fluctuation pattern is seen. Comparing Shannon-wiener index of the wetland with other important receptive and accessible places for birds in Iran or other parts of the world ,proves the suitability of this wetland to be more concerned about. This is one of the reason that why kanibarazan's wetland was chosen to be on Ramsar list. Also comparing the numeric value of this index with what is expected, from 1.5 to 3.5,clarifies the appropriate position of the wet land. Generally speaking due to

species indexes representing the feature of wetland, we can claim that kanibarazan's wetland is one of the most significant wetland of the area.

Overall as regards these Indexes show the status of wetland can be said Kanibarazan wetland one of the most important wetland in the region.

5. Acknowledgements

6. References

[1] Ali. Z. Ecology, Distribution AND Conservation of migratory birds at UCHALLI wetlands complex, PUNJAB, PAKISTAN, Pakistan Research Repository, 2005

[2] Colwell, M.A.& S.L. Dodd,. Waterbirds communities and habitat relationships in coastal pastures of northern California, Conserv. Biol,1995, Vol. 9(4) :827-834.

[3] Giri, B. and M. K. Chalise, *Seasonal Diversity and Population Status of Waterbirds in Phewa Lake, Pokhara, Nepal*, Journal of Wetlands Ecology, 2008, pp. 3-7

[4] Keylock C. J., Simpson diversity and the Shannon-/Wiener index as special cases of a generalized entropy, OIKOS 109:1, 2005, pp 203-207

[5] Khaledi. Shahriar, *Environmental Principles*, Iran EPA Publications, Tehran, 2000

[6] Krebs,Ch.J. *Ecology, the experimental analysis of distribution and abundance*, Harper & Rows Publishers,1989

[7] Nagendra. H, Opposite trends in response for the Shannon and Simpson indices of landscape diversity, Applied Geography, 22 (2002), pp 175–186

[8] Rocklage, A. M., Giudice, J. H., Garton, E. O., Golner, D. P., **:** Comparison of Avian Communities on Restored and Natural Wetlands in North and South Dakota, The Journal of Wildlife Management, Vol. 65, No. 4., 2001, pp. 676-684

[9] Shams, B. Mansuri, J. and Gasempuri, M. Survey of biodiversity and comparison biodiversity indexes of the Hana lake with several wetland area inside and outside Iran, National Conference on Conservation of Biodiversity and Indigenous Knowledge, 2010, Tehran

[10] Stevens R. D. and Willing M.R., Geographical Ecology at the Community Level: Perspectives on the Diversity of New Words Bats, Ecology, 83(2), 2002, pp. 545–560