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Assessing the annual changes in the *primary* production of Choghakhor International Wetland using Landsat and (O.E.C.D)

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Abstract

Today, many satellites over land cover and land water produce high-quality images of different uses. The conditions for access to these images are such that it can be used for several years to study the phenomena of aquatic ecosystems, such as wetlands, and at the same time identify their changes. Length- The temporal and spatial distribution pattern of primary production is useful for studying global climate change. In this study, using Landsat images from 1985 to 2017 and their initial processing, the average initial production (based on O.E.C.D) for Choghakhor International Wetland was determined. The results show that the wetland is in terms of chlorophyll-a and *secchi disk* depth (SDD) in the middle of mesotrophic and towards eutrophication.

Keywords: Primary production, O.E.C.D, satellite Imagery

1. Introduction

In aquatic ecosystems, phytoplankton are the mainstay of food chains; these producers are the main source of food for primary consumers (Lurling et al., 2006). Since light energy is absorbed by chlorophyll in photosynthetic organisms, it is important to study this parameter in environmental studies (Mallick et al., 2003). On the other hand, measuring the transparency (turbidity) in aquatic ecosystems is important to study suspended sediments and water quality and manage the subsurface water (Weeks et al., 2012).

Evaluating the pollution of wetlands and lakes is essential for the development and allocation of land use, management, quality monitoring, pollution prevention and biodiversity conservation. One of the most important factors that put wetlands in serious danger and has a very destructive effect on the fauna and flora of the wetland is their enrichment and pollution. Environmental analyzes, especially wetlands, include a wide variety of techniques aimed at determining pollution from land use, environmental monitoring and modeling, and the quality status of wetlands and lakes (Samadi, 2015). Using remote sensing techniques, it is possible to extract water data regionally rather than pointwise (Mueller and Morel, 2002). The aim of this study is to use Landsat images from 1985 to 2017

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and their initial processing, the average primary production (based on O.E.C.D) for Choghakhor International Wetland.

2. Materials and Methods

Choghakhor International Wetland is located in the suburbs of Chaharmahal and Bakhtiari, Borujen city and Baladaji district, between 50° 52´ to 50° 56´E and 31° 54´ to 31° 56´N (Fig.1) (Ebrahimi and Moshari, 2006). The wetland joined the Ramsar Convention Wetlands List in 2010 (Behrouzi-Rad, 2008).

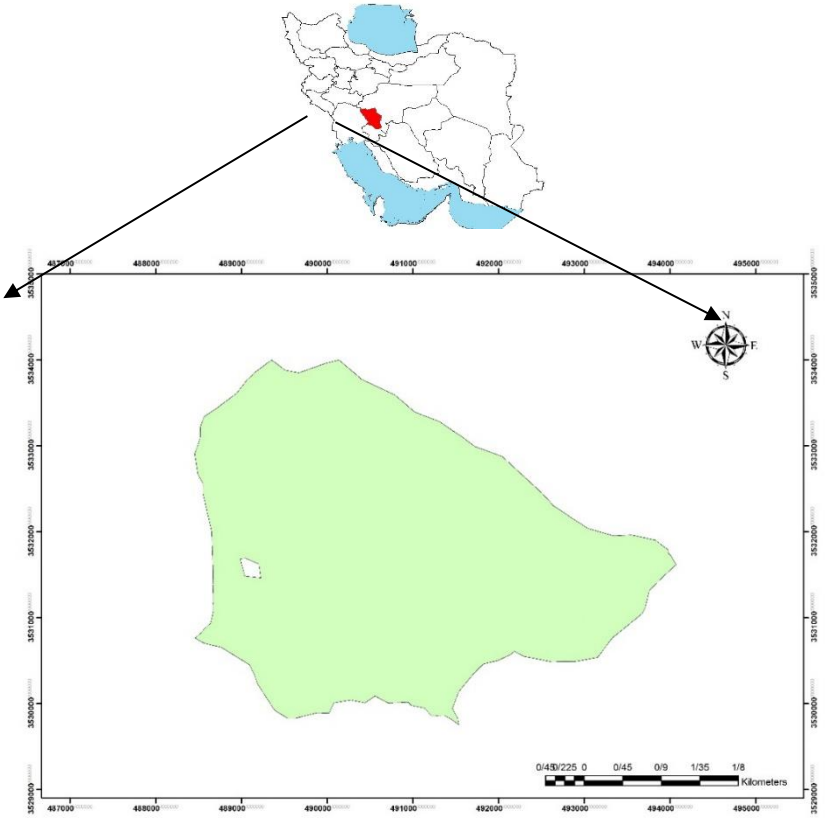

Fig. 1: Map of the study area.

Due to the fact that the use of Landsat satellite images is more common in Iran and due to the good time coverage of these images, in this study of images belonging to Landsat 5, 7 and 8 for Choghakhor Wetland in 1985 to 2017 was used. Then, the information layers of parameters were extracted using image processing and algorithms.

In order to apply this indicator in Choghakhor Wetland, first the chlorophyll-a and *secchi disk* depth (SDD) data of the extraction from the satellite were checked in terms of normality and the data outside the range were removed as discarded data. Then, to determine the probability of different levels of nutritionism and to compare it with the standard curve (O.E.C.D), the normal probability distribution of data (density function of the probability of normal distribution) for each parameter was calculated. Table 1 presents the values of chlorophyll-a and SDD and nutrition levels based on O.E.C.D. All analyzes were performed in R3.4 and Excel, 2016.

Table 1: Average amount of chlorophyll-a and SDD and nutritional levels (O.E.C.D, 1982).

SDD (m)			Chl-a (µg/l)		
Oligo	**Meso**	**Eutro**	**Oligo**	**Meso**	**Eutro**
9.9	4.2	2.45	1.7	4.7	14.3

* The µg/l unit is equal to the extraction unit for chlorophyll-a in this study (mg / m3).

3. Results

Comparison of the normal chlorophyll-a and SDD distribution curves (according to the mean and deviation from the standard of these parameters are drawn in the wetland) can be seen with the standard curve of the above parameters (O.E.C.D standard) in Fig.2 and 3. The results show that the wetland is in terms of chlorophyll-a and SDD in the middle of mesotrophy and towards eutrophication.

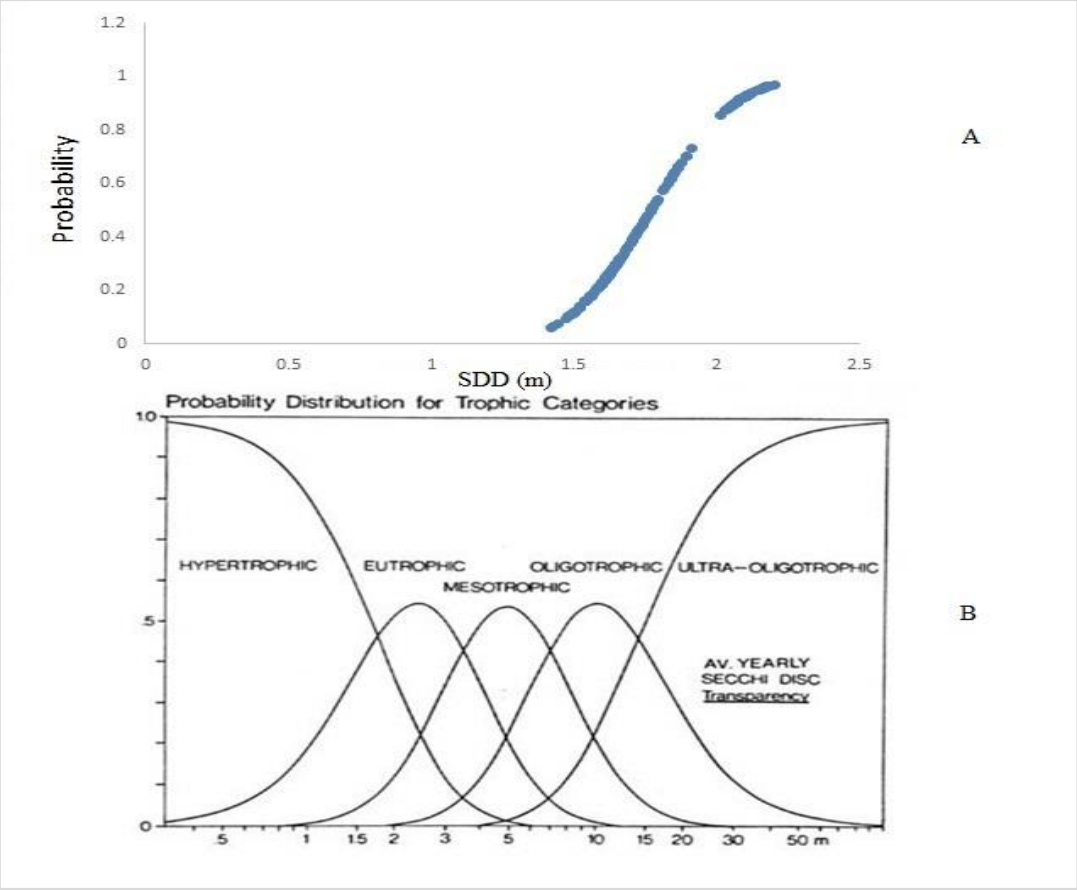

Fig. 2: (a) The normal distribution curve of SDD (meter),
(b) The standard curve (O.E.C.D) of SDD

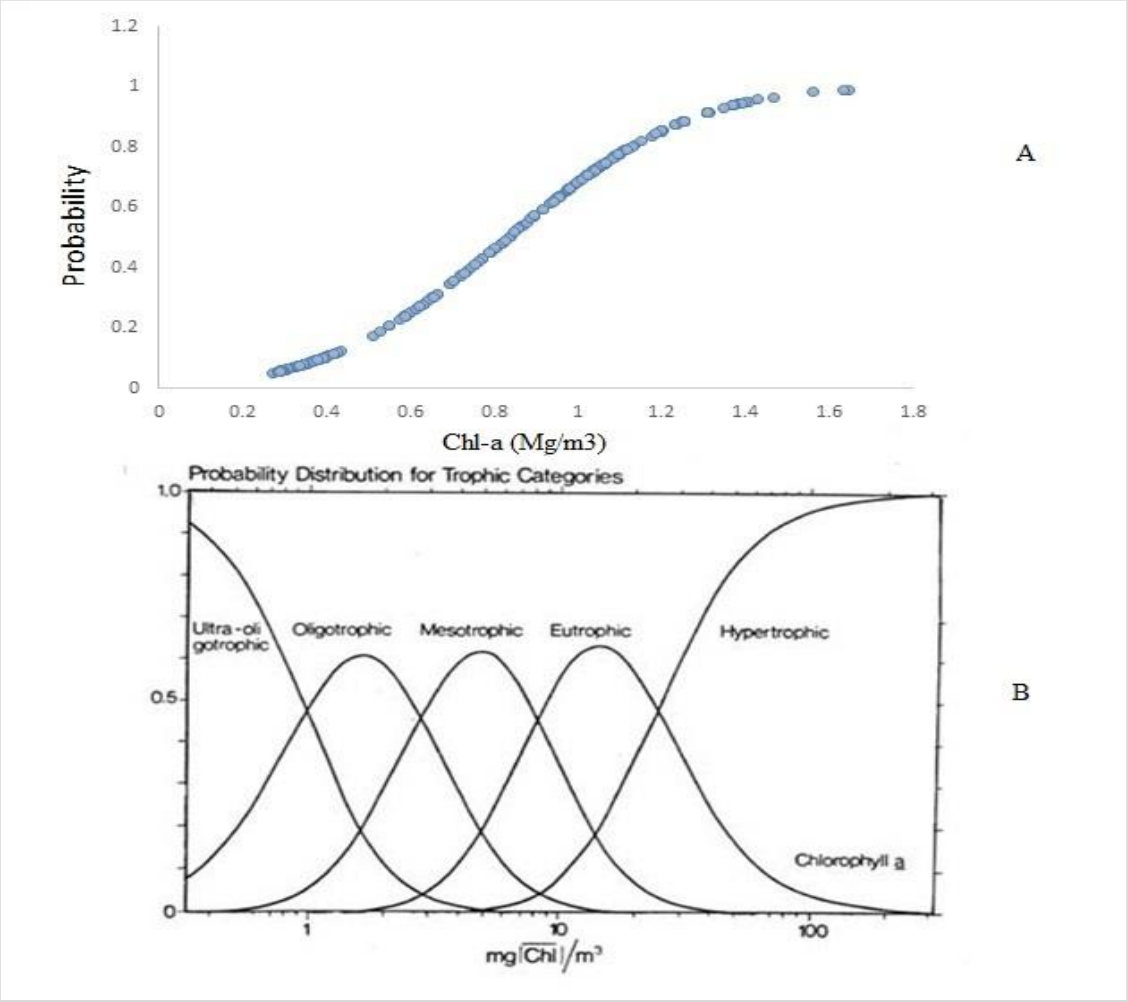

Fig. 3: (a) The normal distribution curve of Chlorophyll-a (mg/m3),
(b) The Standard curve (O.E.C.D) of Chlorophyll-a

4. Discussion

Subsequent changes in chlorophyll-a and SDD levels indicate changes in the number of phytoplankton hams. Today, the population of phytoplankton is heavily influenced by climatic factors such as water temperature and wind. Changes in phytoplankton lead to changes in the life of the aquatic ecosystem that can have economic and food consequences. Therefore, the study of annual changes in *primary* production is one of the important parameters of fisheries.

By continuous measurement in different seasons and generalization of satellite data, in addition to completing the archive of this data, it is possible to achieve newer and more accurate models by evolving the previous methods that can affect the effects of wind and other environmental parameters on chlorophyll-a and identified the transparency of water in wetlands and coastal areas or provided more appropriate models by entering two-dimensional values and factors. On the other hand, valuable results can be obtained by having a larger field data set that covers more comprehensive areas and by linking to satellite data and estimating chlorophyll-a and *secchi* disk depth, especially in wetlands, for different time periods.

References

Behrouzi-Rad, B. 2008. Wetlands of Iran. Tehran: National Geographical Organization Publication. [In Persian].

Ebrahimi S, Moshari M .2006. Evaluation of the Choghakhor wetland status with the emphasis on environmental management problems. Publications of the Institute of Geophysics, Polish Academy of Sciences; E-6(390):8pp.

Lurling, M. and Roessink, I. 2006. On the way to cyanobacterial blooms: Impact of the herbicide metribuzin on the competition between a green alga (*Scenedesmus*) and a cyanobacterium (*Microcystis*). Chemosphere 65:618–626.

Mallick, N. and Mohn, F.H. 2003.Use of chlorophyll fluorescence in metal-stress research: a case study with the green microalga *Scenedesmus*. Ecotoxicology and Environmental Safety 55: 64–69.

Mueller, J. L., & Morel, A., 2002, Fundamental Definitions, Relationships and Conventions 56 pp., Greenbelt.

Samadi, J. 2015. Survey of Spatial-Temporal Impact of Quantitative and Qualitative of Land Use Wastewaters on Choghakhor Wetland Pollution Using IRWQI Index and Statistical Methods, Iranian Water Resources Research, 11, No. 3, 157-191. [In Persian].

Weeks, S., P.J. Werdell, B. Schaffelke, M. Canto, Z.Lee, J.G. Wilding, and G.C. Feldman., 2012, Satellite-derived photic depth on the greatbarrier reef: spatio-temporal patterns of waterclarity, Remote Sens., 4: 3781-3795.

OECD. 1982. Eutrophication of water. Monitoring assessment and control, Paris: OECD Publication.