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## **Climate Change Impact on Plant Diversity of Harni Pond, Vadodara**

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**Abstract** - The geographical location of Vadodara is 22° 20' 16.5" N latitude and 73° 13' 07.8" E longitude. In this district, major water resources are contaminated because of sewage output. In recent years, it has been reported that wetlands in the area have degraded due to small and large scale industries which includes oil refineries, fertilizer, alkali and cyanide plants. In addition to this natural habitat is found to alter rapidly because of anthropogenic activities. This results in irreversible variation in existing vegetal cover in wetlands of Vadodara district. Hence efforts have been made to report loss in plant biodiversity in Harni pond which was one of the major aquatic body supporting the growth of large number of aquatic plants as reported in the past. The plants were documented in the year 2015-16 during winter, monsoon and summer season and the data was compared with the available data of the year 2012-13 of the same wetland. The results showed that 20 plant species have lost their existence in the year 2015-16. The all over impact of climate change due to increasing anthropogenic activities might have resulted in the deterioration of water quality of the pond, accumulation of toxic chemicals and sediment shrinkage of pond area might have resulted in the loss of certain plant species that were surviving earlier.

**Keywords:** Harni, Vadodara, Biodiversity, Climate change.

### **I. INTRODUCTION**

Harni pond was a well-maintained serene pond in the past but in the recent years the pond has got deteriorated both in terms of flora, fauna as well as in its water quality. It is now characterized by high levels of organic contamination. Various anthropogenic activities together with other pollutants have resulted in survival problems of plants and other aquatic organisms. Few studies had been carried out earlier on documentation of aquatic plant species by Phatak and Satakopan [4] who had made extensive studies on Harni pond with particular reference to the phenology of the Angiosperms and Cryptogams.

In 2004, Dave and Krishnayya [2] assessed vegetal cover in and around Harni pond. Thereafter Parikh et al. [5] documented aquatic plant species during winter, monsoon and summer season. In continuation, we have made an effort to list the aquatic plant diversity in the year 2015-16 to evaluate whether any loss in plant species has occurred probably due to climatic and anthropogenic pressure on the pond.

## II. MATERIALS AND METHODS

Aquatic plants were collected in plastic bag that included all available parts of the plant (i.e. all reproductive structures such as fruits, flowers and buds etc). Detailed notes about the plant and its surroundings was also recorded. This is followed by pressing, drying, poisoning, mounting and labeling. For identification of collected plants following key described in "Aquatic and Wetland Plants of India"[1] and "The Flora of Gujarat State" [3] were employed.

Sr. No.	2012-13	2015-16	Missing plant list
1	<i>Pistia stratiotes</i> L.	<i>Alternanthera sessilis</i> (L.) R. Br. Ex Dc.	<i>Ludvigia perrium</i> L.
2	<i>Ipomoea aquatica</i> Forssk.	<i>Azolla pinnata</i> R.Br	<i>Vernonia cinerea</i> (L.) Less.
3	<i>Ceratophyllum demersum</i> L	<i>Capparis decidica</i> (Forssk.) Edgew.	<i>Phyllanthus amarus</i> Schumach. & Thonn.
4	<i>Nelumbo nucifera</i> Gaertn.	<i>Parthenium hysterophorus</i> L.	<i>Pistia Stratiotes</i> L.
5	<i>Spirodela polyrrhiza</i> L. Schleid.	<i>Ipomoea fistulosa</i> Var.nicaraguensis Donn. Sm.	<i>Ceratophyllum demersum</i> L.
6	<i>Azolla pinnata</i> var. <i>imbricata</i> (Roxb. ex Griff.) Bonap	<i>Ipomoea aquatica</i> Forssk	<i>Paspalum vaginatum</i> Sw.
7	<i>Utricularia vulgaris</i> L.	<i>Euphorbia orbiculata</i> Kunth	<i>Ludvigia octavalvis</i>
8	<i>Lemna gibba</i> L.	<i>Hydrilla verticillata</i> (L.f.) Royle	<i>Ipomea aquatica</i> Forssk.
9	<i>Nymphoides indica</i> L. Kuntze	<i>Rhynchosia minima</i> (L.) Dc.	<i>Hygrophila auriculata</i> (Schumach.) Heine
10	<i>Hygroryza aristata</i> (Retz.) Nees ex Wight & Arn.	<i>Cassia tora</i> L.	<i>Alternanthera pungens</i> Kunth.
11	<i>Eichhornia crassipes</i>	<i>Neptunia oleraceae</i> Lour.	<i>Commelina forsskalii</i> Vahl

	(Mart.) Solms		
12	<i>Hydrilla verticillata</i> (L.f.) Royle	<i>Ammannia baccifera</i> L	<i>Chloris barbata</i> Sw.
13	<i>Limnophyton obtusifolium</i> L. Miq.	<i>Sida acuta</i> Burm.f.	<i>Limnophila gratioloides</i> R. Br.
14	<i>Marsilea quadrifolia</i> L.	<i>Corchorus aestuans</i> L.	<i>Utricularia vulgaris</i> L.
15	<i>Caesulia axillaris</i> Roxb.	<i>Nymphoides cristata</i> (Roxb.) Kuntze.	<i>Gomphrena celosioides</i> Mart.
16	<i>Typha angustifolia</i> L.	<i>Nelumbo nucifera</i> Gaertn.	<i>Bergia ammannioides</i>
17	<i>Phyllanthus amarus</i> Schumach. & Thonn.	<i>Nymphaea nouchali</i> Burm.f.	<i>Colocasia esculenta</i> (L.) Schott
18	<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	<i>Cynodon dactylon</i> (L.) Pers.	
19	<i>Paspalum distichum</i> L.	<i>Paspalum distichum</i> L.	
<b>Sr. No.</b>	<b>2012-13</b>	<b>2015-16</b>	<b>Missing plant list</b>
20	<i>Ludvigia Perrinis</i> L.	<i>Eichhornia crassipes</i> (Mart.) Solms	
21	<i>Ludvigia octovalvis</i> L.	<i>Vallisneria Americana</i> Michx	
22	<i>Hygrophila polysperma</i> (Roxb.) T.Anderson	<i>Solanum surattense</i> Brum. F.	
23	<i>Ammannia baccifera</i> L.	<i>Phyla nodiflora</i> (L.) Greene.	
24	<i>Alternanthera pungens</i> kunth.	<i>Scirpus lateriflorus</i> J. F. Gmel.	
25	<i>Commelina benghalensis</i> L.	<i>Marsilea quadrifolia</i> L.	
26	<i>Dactyloctenium aegyptium</i> (L.) Willd		
27	<i>Gomphrena celosioides</i> Mart.		
28	<i>Cressa cretica</i> L.		
29	<i>Phyla Nodiflora</i>		
30	<i>Elaeocarpus variabilis</i> Zmarzty		
31	<i>Eleocharis dulcis</i> (Burm.f.) Trin. ex Hensch.		
32	<i>Cyperus difformis</i> L.		

33	<i>Alhagi pseudalhagi</i> (M. Bieb.) Desv. ex B. Keller & Sh		
34	<i>Scripus articulatus</i> L.		
35	<i>Ischaemum rugosum</i> Salisb.		
36	<i>Xanthium spinosum</i> L.		
37	<i>Sida acuta</i> Burm.f.		
38	<i>Urena lobata</i> L.		
39	<i>Sphaeranthus indicus</i> L.		
40	<i>Solanum tampicense</i> Dunal		
41	<i>Paspalidium geminatum</i> (Forssk.) Stapf		

### III. RESULTS AND DISCUSSION

**TABLE 1 Aqautic plant list of Harni pond**

As depicted in Table 1, the plants recorded for the year 2012-13 were 41 in number. But when the pond was surveyed again during the year 2015-16 only 25 plants were documented. Thus when the data for both the study period was compared it was found that 17 plants were found totally absent and did not show their existence during the year 2015-16. Thus there is a tremendous reduction in the number of plants in 2015-16.

Dave and Krishnayya [2] in their study on documentation of aquatic plants of Harni pond noticed that changes have occurred in the overall floristic composition growing in and around Harni pond due to the impact of anthropogenic pressure.

The all over impact of climate change due to increasing anthropogenic activities might have resulted in the deterioration of water quality (Unpublished data), accumulation of toxic chemicals and sediment shrinkage of pond area. In order to improve the quality of pond water, continuous monitoring of the pollution level is an urgent need which would even help in survival of plant species growing in the pond.

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