A Study of Invasive Alien Plant Species of Kuttadan Kole Wetlands of Thrissur District, Kerala

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Abstract— An exploratory survey conducted on invasive alien plant species in Kuttadankole wetlands of Thrissur district, Kerala reveals that 46% of the floral components fall under the invasive category. An invasive plant species-rich habitat exhibits a tendency towards steep degradation.

Keywords— Kuttadan, Kole wetlands, Thrissur.

I. INTRODUCTION

Fundamental nature of ecosystem is destroyed by various factors. Biological Invasion is such a natural phenomena and simply refers to range expansion of species into new areas. Such species are named as introduced species, non-indigenous, non-native, invasive, exotic, immigrant, naturalized and alien species. Introduced species are those that have been intentionally or unintentionally transported by human activities in to an area where they did not occur before and where they now reproduce successfully. Invasive alien species are a global issue that requires collaboration among government, economic sectors and non-governmental and international organizations. In this threshold, studies on invasive species in localized habitats have got high relevance.

The Kole wetlands are one of the most threatened wetlands in Kerala. It covers an area of 13,632hectors, are spread over Thrissur and Malappuram Districts, extending from the northern bank of Chalakudyriver in the South to the Southern bank of Bharathapuzha river in the North. These coastal tracts lying 0.5 to 1mbelow MSL, located between $10^0 20$” and 10^0 40” N latitude and 75^0 58” to 76011” E longitude. The fields are geographically distributed in Munkundapuram, Chavakkad and Thrissur taluks of Thrissur district and Ponnani taluk of Malappuram district. The study location is a wetland habitat of kole, where the farming activities were not practicing more than past two decades, in which a detailed study of invasive plant species was carried out with the following objectives.

- To carry out the invasive species impact assessment of plant species within the study area.

- To understand the vegetation structure of invasive alien plant species (IAS) in the study area.

II. METHODOLOGY

The present study focus on invasive alien plant species of Kuttadankole wetland of Thrissur district. The invasive species of the area were worked out for its exact identityusing the floras of Gamble & Fischer (1923), Manickam & Irudayaraj (1992) and Sasidharan & Sivarajan (1996) and are compared with thespecimens deposited in KFRI Herbarium, Peechi, Thrissur, Kerala. The herbarium specimens prepared were deposited in the herbarium of Sree Krishna College, Guruvayur as voucher specimens.

Invasive plants of the area were identified using the key provided by Sudhakar Reddy *et al.,* (2000). Plant specimens encountered within the plots laid were collected, preserved and prepared herbaria by following the method given by Martin (1995). The invasive species assessment protocol by Morse *et al* (2004) was used for assessing, categorizing and listing non-native invasive plant species according to their impact on native species and natural biodiversity in a particular geographical region or habitat. The protocol is used to assign each species an invasive species impact rank (I Rank) of high, medium, low or insignificant to categorize its negative impact on natural biodiversity within the habitat. Twenty questions in four categories are incorporated in this protocol, *viz.* 1) ecological impact 2) current distribution and abundance 3) trend in distribution and abundance and 4) management difficulty. Each question has five answer options: A, B, C, D or U, where A denotes high, B – moderate and C – low significance. D is for insignificant and U for unknown. The answer should be left null if the question has not been considered substantially. The high rank points the role of species which pose severe threat to native species and the ecological communities. Lower the rank denotes lower impact on the ecological communities. Rank and sub rank calculations are done based on the point value assigned to each answer.

In order to study the IAS plants of the area, plot studies were conducted as per the method described by Shailaja and Sudha (1997). Appropriate plot size was determined using species – area graph. In the plots 5 x 5 m quadrats were demarcated and vegetation was analyzed by list-count method. Number of individual species and space utilized by individual species per plot were recorded in order to evaluate their relative frequency, density and abundance.

IVI: Percentage values of relative frequency, relative dominance and relative abundance when added together give the importance value index (IVI) based on which an association of plant species is derived. The plot size determination for conducting the study of vegetation was done initially using Species-Area graph and the size of plot for Kuttadankole was designated as 5 x 5 m.

III. RESULTS AND DISCUSSION

The IAS plant species pose severe threat to the native local plantcommunities and negatively affect the biodiversity of the area. The present study reveals that 46% of the floral components fall under the invasive category. Aninvasive plant species-rich habitat exhibits a tendency towards steepdegradation.It is worth to note the IVI values of vegetation represent speciesdominance in the given habitat. In the study area, the dominant species as perthe IVI values were *Eichhornia crassipes* (IVI =

80.89), *Salvinia molesta* (IVI =60.72) and *Sesbania javanica* (IVI = 32.49). The association of three species is obtained as *Eichhornia – Salvinia – Sesbania,* where all the three are falling under the IAS category. Sudhakar Reddy *et al.,* (2000) has also mentioned the obnoxious nature of these species. The Impact Assessment Protocol was applied to rank theinvasiveness of individual species and the highest ranks were scored by thesame three species, which clearly point to the risk they pose on the ecosystem.All the high and medium ranked species play an important role in thedisplacement of native species by occupying majority of available space as well as maximum nutrient utilization. All these tend the degradation of theecosystem. The study further points the need of managing IAS plants within the habitatand to take effort to save this unique ecosystem and conserving its natural habitat and biodiversity.

IMPACT ASSESSMENT: Out of the 24 species encountered in the plot studies, 11 are identified as invasive and detailed studies of these species were conducted along with the documentation of the local problems posed by them. Detailed score marks are provided for individual IAS species and the ranks were awarded to individual species considering its invasive characteristics (Table 1).

Table.1: Score obtained for invasive plant species in the study area.

	Species*										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
	Score obtained for sub rank levels										
Sub rank *i* intervals	61	6	23	78	40	28	78	78	0	0	51
Sub rank *ii* intervals	23	6	12	33	11	11	26	16	2	6	11
Sub rank *iii* intervals	57	30	32	51	24	24	60	50	23	24	25
Sub rank *iv* intervals	17	10	17	33	16	16	28	39	0	0	12
	Points obtained for rank calculation										
Eco. impact	33	0	0	50	0	0	50	50	0	0	17
Current distribution & abundance	17	0	8	25	0	8	17	8	0	0	8
Trend in distribution & abundance	15	5	5	17	5	5	15	17	5	5	5
Management difficulty	3	0	3	7	3	3	7	10	0	0	0
I Rank intervals	**68**	**5**	**16**	**99**	**8**	**16**	**89**	**85**	**5**	**5**	**30**
I-Rank	Medium	**	**	High	**	**	High	High	**	**	Low

** insignificant

* 1.Alternanthera philoxeroides 2.Azollapinnata 3.Cyperuscephalotus 4.Eichhorniacrassipes 5.Pistiastratiotes 6.Sacciolepisinterrupta 7.Salviniamolesta 8.Sesbaniajavanica 9.Sphaeranthusindicus 10.Spirodelapolyrhiza 11.Utriculariaaurea

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