ASSESSMENT OF THE ENCROACHMENTS IN RURAL WETLANDS AND THEIR IMPACTS ON BIRDS DIVERSITY OF RADHAPURAM TALUK, TIRUNELVELI DISTICT, TAMILNADU, INDIA

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Abstract

In this study, 10 ecological threats of 20 tanks in the Radhapuram Taluk, Tirunelveli District was studied. Degree of encroachment in each tank was assessed based on a ranking system. Out of 10 threats assessed, Agricultural encroachment was more prominent and prime threat followed by wind farms and construction of amenity services for public The hydroperiod of the tanks under study has reduced due to the considerable decline in catchment area and hydrologic alterations pertaining to encroachments. Stringent rules should be enacted in conservation policies of the wetlands to protect the rural tanks.

Introduction

Wetlands are among the most important ecosystems with rich biological diversity of both flora and fauna species, including a variety of species of microbes, plants, insects, amphibians, reptiles, birds, fish, and mammals (Wodrick et. al 2018). Wetlands store this water for varying amounts of time. Some replenish groundwater and some regulate river flows. Some also clean water, removing pollutants and sediment. However, not all wetlands perform all these environmental services. The exact role they play depends on a wide range of site-specific features, including the type and location of the wetland. Wetlands play a vital role in the hydrological cycle. They are natural harvesters of rainwater, acting as sinks into which surface water and/or groundwater flows from the surrounding catchment (Mc Cartney et al. 2010).

Nowadays, development activities that involve excavation (or dredging), filling, clearing, draining, or flooding of wetlands generally have the most significant and permanent impacts on wetlands and the ecological services they provide. Due to the various stressors, now most of the wetlands are under deterioration. In fact, scientific studies show that 64 % of the world's wetlands have disappeared since 1900. Measured against 1700, an estimated 87 % have been lost. So we are under the compulsion of conserving the remaining 13% of wetlands. Less than 3 % of the world's water is fresh, and most of that is frozen. (RFS 1, 2015). In this study, Impacts of encroachment of agricultural land, residence, government centers, cemeteries, roads and bridges across the tanks, public toilets and wind forms on the wetland area was observed and recorded. Along with the study, the impacts of encroachment on the birds also assessed.

Wetlands vary enormously in size and character. They can range from a small neighbourhood pond to lakes, bogs, marshes, rivers, and desert oases. Big or small, north or south, the function of wetlands is much the same: they provide humans with fuel, food, recreation and employment; they support an immense variety of wildlife that would otherwise become extinct; and they protect millions of people from the disastrous consequences of flooding. Healthy wetlands can reduce the damage caused by disasters and make recovery faster. Yet worldwide, wetlands are in alarming retreat; at least 64% of them have disappeared since 1900 (RFS 2017). A better understanding of the benefits and costs of utilising wetland resources will provide important information for understanding and addressing the economic causes of wetland degradation and loss (Kakuru et. al 2013). As a result, many of the wetlands in urban and rural areas are subject to anthropogenic pressures, including land use changes in the catchment; pollution from industry and households; encroachments; tourism; and over exploitation of their natural resources (Bassi et. al 2014). The functional evaluation of wetland is essential for conservation. the main objective of this study was to

assess the various types encroachements and its effect on the bird diversity in the tanks of Radhapuram taluk,Tirunelveli district of Tamilnadu.

Materials and methods

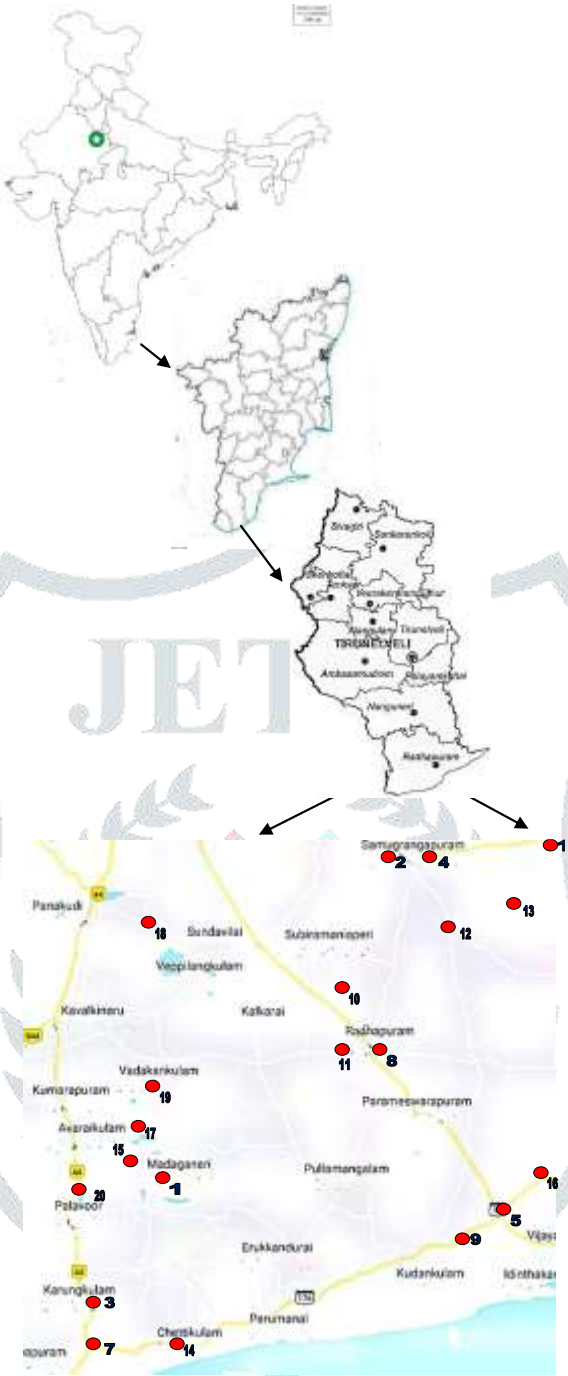
Study area

In this study, 20 tanks of Radhapuram Taluk, Tirunelveli district was selected randomly. All the tanks were rural wetlands which located approximately 67 km away from the district head quarters Tirunelveli. (Table 1 and fig 1) Most of the tanks selected for this study were rainfed. Very few were riverine wetlands. Generally the climate of the both districts was hot and humid. The average annual rainfall was 879.78mm . (DGWB 2009).

Table 1: List of Tanks with their hydroperiod and bird diversity.

Sl. No.	Name of the Tank	Name of Village	Hydroperiod (months)	No of Sps.	No of birds counted
1	Iduvankulam	Mathaganeri	4-5	1	2
2	Karinchakulam	Samugarengapuram	3-4	2	95
3	Karunkulam	Karunkulam South	4-5	3	9
4	Kattanerikulam	Samugarengapuram	3-4	2	9
5	Kodikkulam	Kurinchikulam	2-3	2	6
6	Melakkulam	Seelathikulam	3-4	1	2
7	Nariparai	Visvanathapuram	7-8	6	28
8	Neduvali kulam	Neduvali	3-4	4	12
9	Neeravikulam	Erumbi	3-4	2	5
10	Pandara perungulam	Valkadambu	2-3	3	18
11	Pannaiyarkkulam	Pannaiyarkulam	2-3	3	7
12	Pappankulam	Kasthurirengapuram	2-3	2	15
13	Peelikulam	Nambikurichi	4-5	7	56
14	Periyakulam	Chettikulam	5-6	5	25
15	Pillaiyarkudieruppu kulam	Pillaiyarkudieruppu	3-4	2	43
16	Puthukulam	Ulagaratchakarpuram	2-3	2	9
17	Sivagannapuramkulam	Sivagananapuram	2-3	2	34
18	Thandaiyarkulam	Thandaiyarkulam	2-3	1	2
19	Vadakkankulam	Vadakkankulam	3-4	2	67
20	Vadakkupathukulam	Palavoor	3-4	3	145

Figure 1 Distribution of rural tanks in Radhapuram taluk, Tirunelveli district, Tamilnadu



Assessment Methodology:

Rapid assessment models (Fennessy et al. 2004, WDNR 2014) were adapted following modifications. This methodology is intended as a rapid method for assessing wetland condition and functional values based upon observable characteristics and using best professional judgment to interpret those observations. (WDNR 2014). Each tank was visited separately and their functional values and the stressors were recorded through the visual observation and photographs.(Table 2) **Table 2: List of Encroachment with Code**

Stressor Code	Type of encroachment
S1	Agricultural land
S2	Residence
S3	Industries
S4	Wind Farms
S5	Power Grid Poles

S6	Roads and Bridges
S7	Public Toilets
S8	Government office premises
S9	Temples
S10	Burial and cremation area

Based on pilot survey three types of stressors namely habitat stressor, hydrology stressors and buffer stressor were identified. The buffer stressors were recorded on account of encroachment. Encroachments were noted and categorized based on the size and occupied and thrust on tanks (Table 2). The degree of encroachment on each tank was recorded and assigned with four symbolic codes ('+' indicates less encroachment; '++' indicates moderate encroachment; '+++' indicates High encroachment and '-' indicates no encroachment). For each '+' a score of 1 was given. For '-' sign no marks are given. Thus the degree of encroachment was assessed. The threats of each tank were assessed through the increasing scores decreasing values strategy. Along with the assessment the birds count on each tank was recorded in point count method. Identification and ecological and migrant status of birds were consulted with standard literature (Ali and Ripley 1987; Manakadan and Pittie, 2001)

Results and Discussion

During this study encroachments in tanks of Radhapuram taluk were assessed. The tanks which scored maximum were considered as high risk of encroachment and tank with low score was considered as tank with low risk of encroachment (Table 3).Similarly, the threats that obtained more scores were considered as major threats of the tank. In Radhapuram taluk encroachment of wetland and tanks for agricultural purpose is common practice (Fig 2). The wetland landscape has hence been modified and the habitat of wild animals and the water fowls reduced. The secondary threat noticed was the installation of Wind farms. The threats that scored least (3) in the assessment were the encroachment of industries. As the survey took place in the rural area of Radhapuram Taluk, the threat, industrial encroachment was not focused much (Table 4). Though the encroachment of agricultural land into the tank was the primary threat, the secondary threat could be a major threatening factor in this semi arid area. Because, the construction of the wind farms around the tank area has completely deteriorated the catchment area of the tanks and subjected the tank into dry land by reducing its water inflow and hydroperiod. There was relationship between the hydroperiod and the species count of birds and its diversity. Species diversity and abundance of the birds decreased with decrease in hydroperiod of tanks (Table 1).

Table 4: Scores of the Tanks with respect to the Encroachment

Sl. NO.	Name of the Pond	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	Tot
1	Iduvankulam	++	-	-	+	+	+	-	-	+	+	7
		2	0	0	1	1	1	0	0	1	1	
2	Karinchakulam	++	-	-	+	++	+	-	-	+	+	9
		2	0	0	1	2	1	0	0	1	1	
3	Karunkulam	++	+	-	++	++	++	-	-	+	+	12
		2	1	1	2	2	2	0	0	1	1	
4	Kattanerikulam	++	-	-	-	+	-	-	+	+	+	6
		2	0	0	0	1	0	0	1	1	1	
5	Kodikkulam	++	-	-	++	++	++	-	-	-	-	8
		2	0	0	2	2	2	0	0	0	0	
6	Melakulam	++	++	-	+	+	++	+	+	+	++	13

		2	2	0	1	1	2	1	1	1	2	
7	Nariparai	++	++	+	++	++	++	+	+	-	-	13
		2	2	1	2	2	2	1	1	0	0	
8	Neduvali kulam	++	++	-	+	+	+	+	++	+	++	13
		2	2	0	1	1	1	1	2	1	2	
9	Neeravikulam	+	-	-	+	+	-	-	-	-	-	3
		1	0	0	1	1	0	0	0	0	0	
10	Pandara perungulam	++	-	-	++	+	-	-	-	+	+	8
		2	0	0	2	2	0	0	0	1	1	
11	Pannaiyarkkulam	++	++	-	++	+	-	+	-	+	+	10
		2	2	0	2	1	0	1	0	1	1	
12	Pappankulam	++	-	-	++	+	+	-	+	++	+	10
		2	0	0	2	1	1	0	1	2	1	
13	Peelikulam	++	-	-	+	+	+	-	-	+	-	6
		2	0	0	1	1	1	0	0	1	0	
14	Periyakulam	++	++	-	+	+	++	+	+	+	++	13
		2	2	0	1	1	2	1	1	1	2	
15	Pillaiyarkudieruppu kulam	++	+	-	++	+	+	-	+	+	+	10
		2	1	0	2	1	1	0	1	1	1	
16	Puthukulam	++	-	-	+	-	+	+	-	++	+	8
		2	0	0	1	0	1	1	0	2	1	
17	Sivagannapuramkulam	++	++	-	-	-	++	+	+	-	+	9
		2	2	0	0	0	2	1	1	0	1	
18	Thandaiyarkulam	+	-	-	++	+	+	-	-	-	+	6
		1	0		2	1	1	0	0	0	1	
19	Vadakkankulam	++	++	-	++	+	+	+	++	++	+	14
		2	2	0	2	1	1	1	2	2	1	
20	Vadakkupathukulam	+	+	+	+	+	++	+	+	++	+	12
		1	1	1	1	1	2	1	1	2	1	
Total		37	17	3	27	23	23	9	12	19	19	

The tank with less hydro period showed less number of bird species and their abundance. This reduced number of species and abundance might be due to the height of the fan or turbine sound. It was noted that due to the erection of tall and long leaved fans by the wind farms, there has been considerable deforestation in the vicinity of the assessment area. Though it is said that wind energy source will reduce environmental pollution and water consumption, there are problems like noise pollution, visual interference and negative impacts on wildlife (Saidur 2011). Due to the construction of tall wind farms and deforestation, the birds diversity in the tanks were less. The displacement of birds from areas within and surrounding wind farms due to visual intrusion and disturbance can amount effectively to habitat loss. The scale of direct habitat loss of birds resulting from the construction of a wind farm and associated infrastructure depends on the size of the project but, generally speaking, is likely to be small per turbine base (Allan et al 2006) The avoidance responses of birds to turbines include displacement from habitat and extension of flights, where wind farms act as barriers to movement (Fox *et al*., 2006).

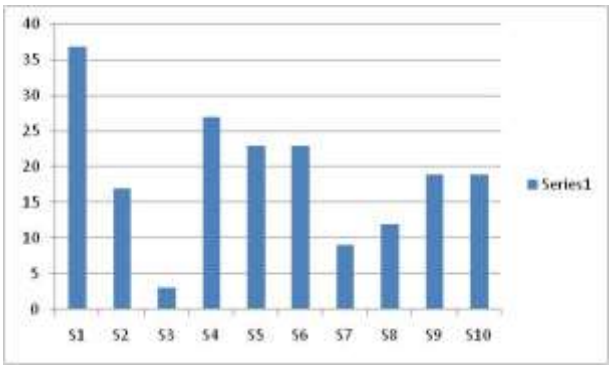


Figure 2 Total Scores for Stressors Vs Types of Stressors

CONCLUSION

When the hydro periods of a tank is less, the tank is automatically subjected to severe anthropogenic activities such as disposal of wastes, construction of roads, government centers, power grid towers, encroachment of agricultural and residential areas etc.. Due to encroachment of the wetland, the number of migratory birds like Asian open bill stork is also decreasing. (Ahidur, 2016). When the hydro period is higher, the tanks are conserved and maintained by the local people. But the tanks under conservation and maintenance are very less while compared to the unconserved and unmaintained tanks. Conservation policies with proper monitoring and management strategies are essential to conserve rural wetlands.

Reference:

1. Ali, S. and S. D. Ripley. 1987. Compact handbook of the birds of India and Pakistan together with those of Bangladesh, Nepal, Bhutan and Sri Lanka. Oxford University Press, Delhi, India.
2. Allan Drewitt and Rowena H.W Langston, 2006. Assessing the impacts of wind farms on birds, The Royal Society for the Protection of Birds, Sandy, Bedfordshire SG19 2DL, UK. Ibis (2006), 148, 29–42
3. Bassi, Dinesh Kumar , Anuradha Sharmac , P. PSaradhi, 2014. Status of wetlands in India: A review of extent, ecosystem benefits, threats and management strategies, Journal of Hydrology: Regional Studies 2 (2014) 1–19
4. DGWB 2009, District Ground Water Brochure, Thoothukudi District, TN, Tech Report Series, 2009 Pg No. 5.
5. Fennessy, M.S, Jacobs A D, and Kentula ME, 2004. Review of rapid methods for assessing wetland condition. EPA/620/R-04/009. U. S. Environmental Protection Agency, Washington, D.C. 45 pp.
6. Fox A. D. Desholm M. Kahlert J. Christensen T. K. Petersen I. K, 2006. Information needs to support environmental impact assessment of the effects of European offshore wind farms on birds, Ibis ,2006, vol.148 (pg.129-144)
7. Hatfield C A, Mokos J T, Hartman J M, 2004. Development of wetland quality and function assessment tool and demonstration, Rutgers University, New Brunswick, NJ. Pg. 9.
8. Kakuru W, Nelson Turyahabwe, and Johnny Mugisha, 2013. Total Economic Value of Wetlands Products and Services in Uganda, The ScientificWorld Journal Volume 2013, Article ID 192656, 13 pages
9. Mallakpour I, Villarini G, 2015. The changing nature of flooding across the central United States. Nature Climate Change 5:250–254
10. Manakadan, R. and A. Pittie. 2001. Standardised common and scientific names of the birds of the Indian subcontinent. Buceros 6: 1-37
11. Mc Cartney, M.P, Rebelo L M, Senaratna Sellamuttu S, De Silva S. 2010. Wetlands, agriculture and poverty reduction. Colombo, Sri Lanka: (IWMI). 39p. (IWMI Research Report 137)
12. WDNR 2014, Wetland Rapid Assessment Methodology – User Guidance Document, Version 2.0 Wisconsin Department of Natural Resources March 2014
13. Mallakpour I, Villarini G, 2015. The changing nature of flooding across the central United States. Nature Climate Change 5:250–254
14. Philemon Wodrick, Julius S. Missanga and Mary Ndimbo, 2018. Socioeconomic Activities and Their Potential Impacts on Sustainable Food Safety and Livelihood Improvement in the Bahi Wetland, Central Tanzania, Archives of Current Research International 12(3): 1-9, 2018; Article no.ACRI.39199 ISSN: 2454-7077, DOI: 10.9734/ACRI/2018/39199
15. Rahman Ahidur. 2016. Impact of Human Activities on Wetland: A Case Study from Bongaigaon District, Assam, India. Int.J. Curr. Microbiol.App.Sci. 5(3): 392-396. doi:http://dx.doi.org/10.20546/ijcmas.2016.503.046
16. RFS 2015, Ramsar Factsheet Series No. 1 - 9, 2015, Fact sheet 1: Wetland; Why should I care?
17. RFS 2017, Ramsar's Factsheet 2017, Ramsar's World Wetland Day, Wetland for disaster risk reduction. Wetlands sustain lives. How can we take care of them?
18. Saidur R, Rahim N A,Islam M R, Solangi K H, 2011. Environmental impact of wind energy, Renewable and Sustainable Energy Reviews, Volume 15, Issue 5, June 2011, Pages 2423-2430