A PRELIMINARY STUDY ON THE FLORAL DIVERSITY AND PERCEPTIONS OF LOCAL RESIDENTS ABOUT MANGROVE FORESTS IN RIVER TIRUR MALAPPURAM DISTRICT, KERALA STATE

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Abstract: Mangroves are halophytic species and help stabilise the coasts and river lines, protecting them from tides, waves, and heavy wind. It also functions as a breeding and feeding ground for several aquatic species. India represents the world's 5% mangrove forest cover. The River Tirur originates from the Athavanad village and flows into the Arabian Sea through the coastal town of Ponnani. The main threat to mangrove forests is anthropogenic activities compared to natural phenomena. The majority of these ecosystems are converted into farmlands, resorts, aquaculture, and other building activities. A transect measuring 8Km (4Km from urban and 4 Km from the suburban area) was selected to study the mangrove diversity and existing threats to the mangrove forests of the river Tirur. A 100m line transect was laid in each of the 1 Km for studying vegetation. A total of 8 species were identified and 286 individuals recorded. In the urban area, we could locate two species, namely Sonniratia caseolans (n=1) and Avicennia officinalis (n=23). In the rural area, we identified 6 species, of which the species Sonniratia caseolans (189) and Bruguiera gymnorrhiza (36) were observed in high numbers. The least recorded species were Bruguiera sexangula (n=5) and Kandella candel (n=6). The study revealed the highest density of Sonniratia caseolans and Avicennia officinalis. The local residents reported that, over a period of time, the mangrove forest patches have undergone a considerable decrease. Residents are aware of the important functions of the mangrove ecosystem, and the identified services are prevention from soil erosion, supporting bird diversity, providing fodder for cattle, and protection from heavy wind. The identified threats to the mangrove forest were river beautification activities, encroachment along the riverside, and the Koottayi regulator cum bridge**.**

Index Terms **– Mangorve species, diversity, environmental awareness, conservation.**

I. INTRODUCTION

Mangroves are salt-tolerant plants and are distributed globally in tropical and subtropical intertidal areas of the world, mainly between 25° N and 25° S latitudes (Kurien et al., 1994, Neethu and Harilal 2018). Mangrove forest patches were found in nearly 120 countries around the world. Indian mangrove vegetation accounts for about 5 to 7 % of the world's mangrove vegetation (Mooney et al., 1995, Krishnamurthy et.al. 1987). Biodiversity is prevalent in the tropical estuarine system, particularly in the intertidal forested vegetation known as mangrove. The mangrove habitat of India is classified into three categories: deltaic, estuarine, backwater, and insular mangroves (Mandal and Naskar 2008). The mangrove forest cover is overall expected to be 47,40 km2, of which about 58% is along the east coast, 29% along the west coast, and the remaining 13% on the Andaman and Nicobar Islands (FSI 2015). In the Kerala scenario, we specifically own mangrove vegetation along the banks of estuarine water bodies as a narrow continuous strip or patch. Kerala has 590 km of long, narrow coastal line, and the regular tidal flooding and fresh water supply from the 41 perennial rivers create an apt environment for the mangroves (Basha 1991 & 2016, Anupama and Sivadasan 2004). Kannur and Kasaragod districts own the maximum area of mangrove forests (George et al., 2017). The floral diversity of mangroves in Kannur is very rich as compared to other districts of Kerala (Vidyasagaran et al. 2011). Previous records related to the mangrove forest of Kerala mention that once it had 700 km2 of mangrove forests but has currently declined to 17 km2 (Basha 1991). Different factors, such as biotic and abiotic features like tide, salinity, geomorphology, and species interaction, are the defining factors for the survival of different mangrove forests (Khaleel 2005, Alongi 2002 & 2008). The Tirur River has a length of around 48 km. There is a gap in recording the mangrove diversity of the forest patch in the

area. The current study envisages documenting the species diversity and abundance of mangrove species, community perceptions, and the existing threats of river Tirur.

II. METHODOLOGY

Study Area Tirur is one of the important municipalities in Malappuram district, near the banks of the Arabian Sea. The river Tirur has a length of 48 km from Athavanadu to the Kootayi river mouth.

Fig 1: The study area (Source: www.googlemap.com)

Nearly 8 kilometers of the river Tirur flow through the Tirur municipal area. First, we conducted a pilot survey along the urban and rural stretches of the Tirur River to fix an 8 Km transect (4Km, each from urban and suburban area). For the species identification, we selected 100m line transects in each one Km of the 8 Km transect (Fig. 1). In total, we laid eight 100 m line transects along the riverside to identify the mangrove tree species. The species-level identification was done with the help of pertinent keys to the area and photographs. We conducted a questionnaire survey among 60 local residents from both urban (30) and rural (30) stretches of the river to study their perceptions about the mangrove species and its important ecological services. Nine questions were included in the questionnaire. The questionnaire consisted of both open and closed questions.

III. RESULTS AND DISCUSSION

3.1 Mangrove species composition

In the study, we monitored total 8 species and 286 individuals of mangrove trees (Table 1). Two species of mangroves were recorded from the 4 Km urban stretches, and total 24 individuals were recorded. In an urban area, we could locate one species of *Sonniratia caseolans* and 23 numbers of *Avicennia officinalis*. Along the rural stretch, we could locate six species and total 262 individuals. The highest recorded species were *Sonniratia caseolans* (189) and *Bruguiera gymnorrhiza* (36). The least recorded species were *Bruguiera sexangula* and *Kandella candel*. These two species are confined to 5 and 6 individuals, respectively, from the study site. The current study revealed the highest density of *Sonniratia caseolans* and *Avicennia officinalis*. Kiran et al. (2015) conducted a study on mangrove species in Malappuram district and recorded a high density of *Sonniratia caseolans* and *Avicennia officinalis. Bruguiera sexangula* is also found in a few places where their population is facing considerable degradation (Mini 2014). The district also has many other small patches of mangroves, which are also under considerable threat. Rao (1986) revealed that the composition of mangrove species and the agents causing maximum destruction depend on the localities.

Table 1: The diversity of mangrove species in the study area

Sl. No	Species	Number	Area
1	*Sonniratia caseolans*	1	Urban
2	*Avicennia officinalis*	23	Urban
3	*Sonniratia caseolans*	189	Rural
4	*Avicennia officinalis*	12	Rural
5	*Rizophora mucronata*	14	Rural
6	*Bruguiera gymnorrhiza*	36	Rural
7	*Bruguiera sexangula*	5	Rural
8	*Kandella candel*	6	Rural

3.2 Questionnaire Survey

We surveyed a total of 60 local residents from an urban to rural gradient of the river Tirur. The age category of those selected for the survey was 45–65. The first question was whether the number of mangrove forest patches had increased or decreased over a period of 10 years. A total of 48 people reported that the mangrove patches had decreased considerably. Of the 30 people surveyed from the urban area, 20 and 18 from the rural area reported that the area of the mangrove forest was reduced considerably. To understand the perception of the local residents about the mangrove forest, we inquired whether these forest patches are advantageous to human beings or not. Out of 60 people surveyed, 63% agreed that these forest patches are advantageous to human society. In total, 66% of people from the urban area and 60% from the suburban area supported this view.

The local residents identified five major mangrove patches located in the Tirur River. Out of 30 people from the suburban area, 20 identified the best mangrove patch as Pulluni (11 people), followed by Vakkadu (7 people) and Ettrikadavu Bridge Region (2 people). In urban areas, out of 30 respondents, 22 identified Vakkad (10 people), followed by the Illathappadam bridge (9 people), and Ettrikkadavu bridge (3 people). To identify the existing threats to mangroves, 26 out of 60 residents gave river restoration activities such as tourism activities, beautification, clearing vegetation, tiled pavements, etc. as the main threat, followed by land encroachment along the riverside (20) as the major threat. In the urban area, 18 out of 30 respondents responded that river restoration activities, land encroachments, and Koottayi regulator cum bridge were the main reasons for the decreasing of mangroves. In suburban area 8 out of 30 responded that Koottayi regulator cum bridge is the major threats to the existing mangroves (Figure 2).

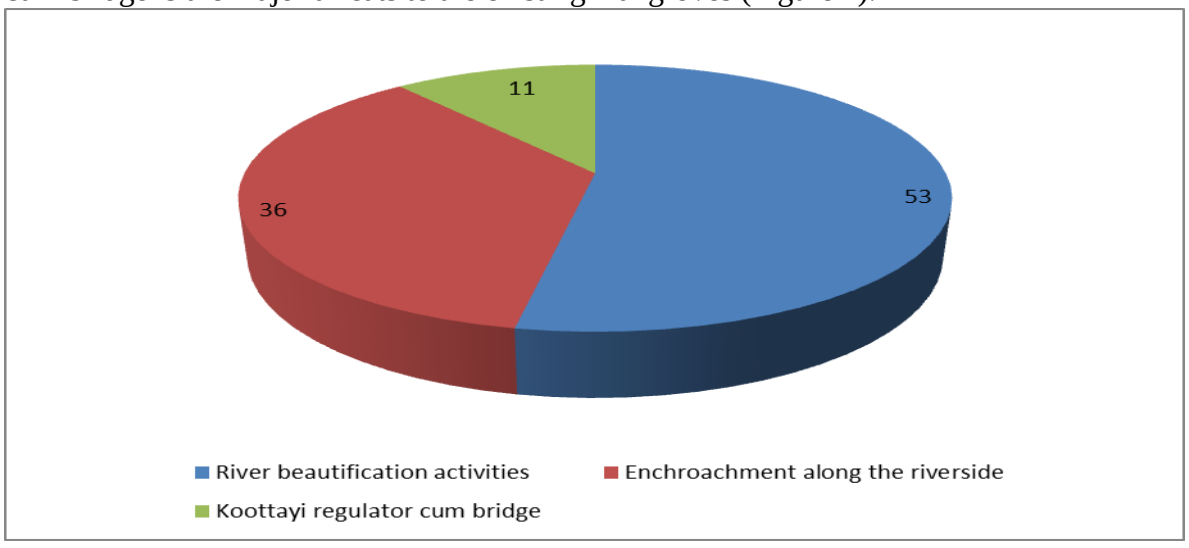

Fig 2: Threats to the mangrove forests (%)

To identify the different services provided by mangroves, 30 out of 60 reported that the mangroves are protecting the river banks, and 8 reported that mangroves are helping them to prevent soil erosion from river banks. A total of 40 people were informed that the mangrove supports the bird diversity in the area. In the urban area, 18 out of 30 people reported that mangroves are protecting river banks from soil erosion, and 5 informed that mangroves are used as fodder for cattle. Of the 30 residents, 18 responded that it supports bird diversity. In the suburban area, 12 out of 30 people informed me that mangroves are protecting river banks from soil erosion, and one informed me that mangroves are helping to prevent heavy wind. Of the 30 residents, 12 responded that it supports bird diversity (Fig. 3). Muraleedharan et. al. (2009) and Kurian et.al. (1994) also studied the ecological services of mangrove forests in Kerala.

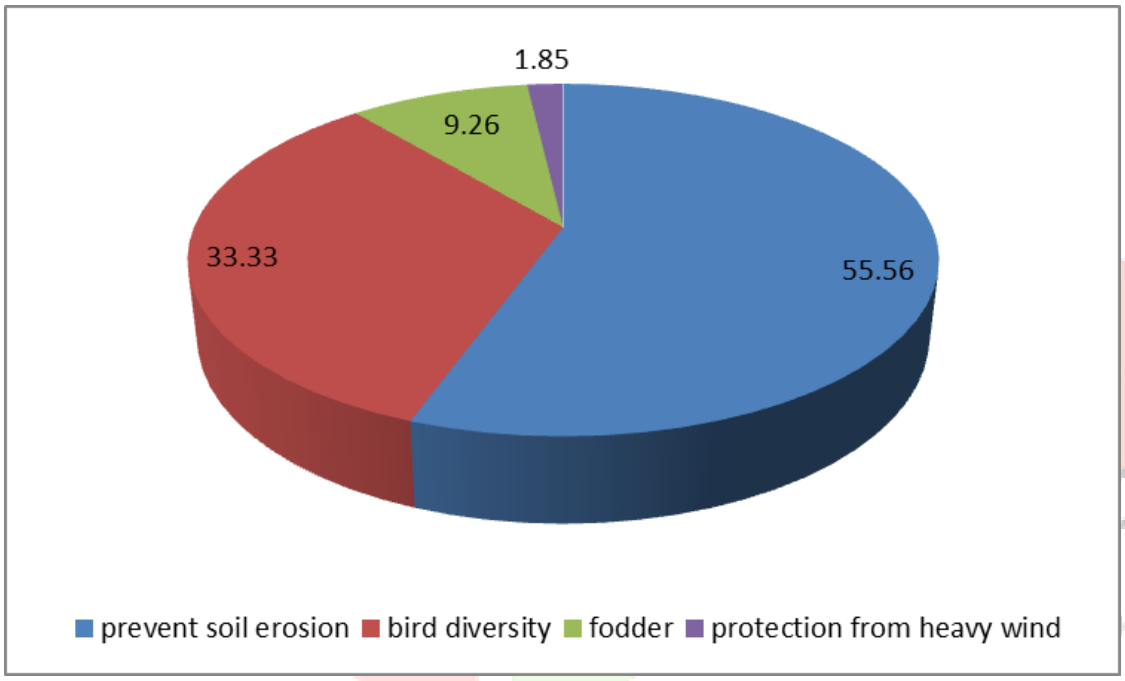

Fig 3: The services of mangrove forests (%)

In order to identify the major threat to conserving mangroves, 34 out of 60 said that the Koottayi regulator cum bridge was the main reason for the destruction, and 14 people did not respond well. In urban areas, 20 out of 30 and in suburban areas, 14 out of 30 were informed that the establishment of the Koottayi regulator cum bridge was the main reason for the disruption of mangrove species in the river Tirur. Hakkim et. al. (2013) revealed a study on the adverse impact of the Koottayi regulator cum bridge on the aquatic ecosystem of the Tirur River.

Conclusion

A total of eight species and 286 individuals were identified in the study area. The current study reported the distribution of *Bruguiera sexangula*, a species reportedly facing major threats. The local residents reported that, over a period of time, the mangrove forest patches have undergone a considerable decrease. Local residents are aware of the important functions of the mangrove ecosystem, and the identified services are prevention from soil erosion, supporting bird diversity, providing fodder for cattle, and protection from heavy wind. The identified threats to the mangrove forest were river beautification activities, encroachment along the riverside, and the Koottayi regulator cum bridge. In order to effectively conserve the existing mangrove patches along the riverside, local self-government departments, research institutes, universities, and NGO's participation would be incorporated. A detailed management plan should be framed to restrict encroachments and beautification activities related to tourism. The municipal and panchayath governing bodies should implement tourism promotion activities based on the Tirur River by offering priority to conserve the riparian vegetation. In order to increase awareness about conserving mangroves among residents and officials, a detailed conservation awareness campaign should be initiated by research institutes, universities, and NGO's.

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