

Clean *Mandovi* Campaign to Nurture Mangroves and to Strengthen the Future of Estuarine Ecosystem at Vengurla, Sindhudurg

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Abstract: *Mandovi estuary is in the vicinity of Vengurla, which is selected by Mangrove foundation, Mumbai to encourage the local fisher Women for Mangrove restoration. Mangrove safari is run by Swamini self help group which is success story of community involvement through scientific training about ecosystem studies for community development. Global problem of waste management and ecosystem restoration needs involvement of Scientists, Academicians, Researchers and community in vicinity of sensitive ecosystems. Swamini self help group in collaboration with Br. Balasaheb Khardekar College, Vengurla, Retracted Midtown, Vengurla Nagarparishad-Municipal corporation, has started Clean Mandovi Campaign to encourage waste collection, segregation, quantitative assessment and waste management ways. Present paper involves the monthly data of waste collection throughout the year 2021-22. Involvement of youth and community participation can solve the problem of Waste management in sustainable way. Plastic bottles, clothings, foot wear, glass bottles are the major part of non-degradable garbage collected and considered during campaign. Biodiversity is studies by the team and recorded. 7 Mangroves species, Mangrove species and butterflies are mainly enlisted in this paper. 27 species of butterflies which are sensitive indicators of healthy ecosystem are recorded. 587 kilogram of non-degradable waste is collected through 14 visits in 14 months and awareness about waste management was effectively done among community and youth. Similar campaigns, supporting all these biotic factors can be sustainable solution for biodiversity conservation and ecosystem restoration.*

Keywords: Waste management, Mangroves, Ecosystem restoration, community involvement.

I. INTRODUCTION

Waste management is Worldwide problem. Earth is unique ecosystem and needs to be taken care of sustainably. Ecosystems all over the World are continuously disturbed by anthropological activities. Major role of waste management should be understood by communities. Awareness about waste generation, assessment, management is to be understood and systematic involvement of communities to handle the waste and segregate it for further management is necessary to achieve the goal of pollution free Earth. Waste management is discussed amongst society, research institutes, academic institutes, municipal corporations as well as government organizations. Many NGOs and individuals are taking sincere efforts to management the waste for better future of mankind and ecosystem. Major role is to create awareness amongst society and to sensitize them about ecosystem restoration. Waste is basically classified into solid waste, liquid waste and gaseous waste. Sources of waste generation are house hold domestic waste, industrial waste, agricultural waste, commercial waste, demolition and construction waste and mining waste. (Ebikapade and Jim, 2016).

Waste management in India is primarily considered the responsibility of Municipal corporation in cities. During the recent past initiative is taken in India about solid waste management by Central and State government and local authorities. National Solid Waste Association of India, NSWAI, is the only non profit organization in the field of Solid waste management, formed in January 25, 1996 There are various private companies providing complete solutions like Subhash projects and marketing limited Cross country pipe lines, Ports and SEZs etc. (Agarwal, et al, 2015). Though Coastal and rural India which has rich biodiversity, does not get proper guidance and assistance. Estuarine ecosystems like Mandovi has uniqueness of Mangrove species and associated detritus food chains. Coastal economy basically depends upon Fishing. Mangrove localities are the nurseries for egg laying and hatching of many fish species. Conservation of Mangroves is necessary to protect coastal communities economically and socially. Waste generation and

disposal in water bodies is the major threat to mangrove ecosystems. 80 percent of the waste is domestic non-degradable waste like plastic bags bottles, Sustainable management of mangroves needs involvement of society.

1.1 Mandovi -Mangrove Ecosystem

Mandovi is in vicinity of Vengurla city towards light house and port. & Mangroves species are found in the area, *Avicennia officinalis* L., *Avicennia marina* (Forsk.) Vierh., *Sonneratia alba* J. Smith, *Sonneratia caseolaris* (L.) Engler, *Brugera cylindrical*, *Rhizophora mucronata* Lamk., which are least concerned species while *Exocaria agalocha* L. is threatened species (Table :1) These mangroves are nurseries for breeding of prawns, crabs and many Crustaceans as well as nesting sites of birds and niches of migratory birds. Detritus food chain shelters many faunal factors like Otters and turtles. 27 species of butterflies were identified along the Mandovi estuary from which 5 are threatened. *Cigaritis vulcanus*, *Papilio polytes*, *Pareronia valeria*, *Rathinda amor*, *Athyma perius* *Papilio polymnestor* (IUCN. 2021.), K.S. Sudhi (21 June 2012), is red listed threatened. Rest are least concerned. (Table 2. Butterflies are sensitive faunal component and indicates the rich biodiversity of the area. Indian Foundation for Butterflies. URL: <http://www.ifoundbutterflies.org>. Milind Bhakare and Hemant Ogale (2018),

1.2 Mangrove Safari run by Swamini self help group

Sindhudurg, the southernmost district in Maharashtra, covers only 3.8 percent of the total mangrove vegetation in the state. However, with occurrences of some rare and endangered species, it is the richest in terms of its biodiversity. The 'Swamini' self-help group, a group of ten individuals led by Shweta Hule, have been organising 'mangrove safari' for tourists in the Mandovi creek of Vengurla taluka in Sindhudurg, since 2017. The mangrove safari programme by Swamini has been recognised as a model for community-led conservation through ecotourism and the State Forest Department has made efforts to replicate the model in other parts of coastal Maharashtra. Shweta Hule and the other members of the Swamini Group were encouraged by the staff from the Mangrove Cell under the Maharashtra Forest Department and a small team who worked alongside the Cell on a UNDP project funded by the Global Environment Facility, to take up this activity as an alternative livelihood. The project team helped them learn more about the mangroves so that they may in turn raise awareness among the villagers and the tourists. (Sneha Pillai, 2020) (<http://youtu.be/ME8YadL4y7M>)

Swamini team took a step forward to lead clean mangrove campaign at Mandovi. They row the boats on every month's 15th Day and accepted the challenge of cleaning the estuary to restore the ecosystem.

Action project : Clean Mangrove campaign :

"Clean Mangroves Campaign" held on the 15th of every month jointly organized by **Br. Balasaheb Khardekar College, Vengurla, NSS Department and Rotaract Club of Vengurla Midtown**. The main purpose of this program is to understand the importance of cleanliness and explain to people, to create awareness among the people and to prevent them from dumping garbage in the river basin.

The first campaign conducted on Monday, 15th February 2021 at 8:00 am. Total 15 green soldiers were present for the first campaign. At this time some of the participants went from the boat to clean the river basin. Some even cleaned the river Area. Collected waste included various types of waste such as plastics, textiles, glass, stones, etc.

Waste segregation: (Plate 1) Table 3: Fishing nets, plastic bottles, glass bottles were much in quantity which create biggest threat to the ecosystem.





Plate 1: Waste collection and segregation

Table 1. Mangrove species found along Mandovi creek

Sr. No.	Scientific Name	Common Name	IUCN Status
1	<i>Avicennia officinalis</i> L.	Tivar	Least Concern
2	<i>Avicennia marina</i> (Forsk.) Vierh.	Tivar	Least Concern
3	<i>Sonneratia alba</i> J. Smith	Pandhari Chipi	Least Concern
4	<i>Sonneratia caseolaris</i> (L.) Engler	Chipi	Least Concern
5	<i>Brugera cylindrica</i>	Chipi	Least Concern
6	<i>Rhizophora mucronata</i> Lamk.	Kandal	Least Concern
7	<i>Exocaria agalocha</i> L.	Hura	Threatened

Table 2. List of butterfly species found along the Mangrove estuary.

Sr. No.	Scientific Name	Common Name	IUCN Status
1.	<i>Danaus chrysippus</i>	Plain Tiger	Least Concern
2.	<i>Junonia iphita</i>	Chocolate Pansy	Not Evaluated
3.	<i>Catopsilia pomona</i>	Common Emigrant	Not Evaluated
4.	<i>Cigaritis vulcanus</i>	Common Silverline	Threatened
5.	<i>Luthrodes pandava</i>	Plain Cupid	Least Concern
6.	<i>Eurema hecabe</i>	Common Grass Yellow	Least Concern
7.	<i>Papilio polymnestor</i>	Blue Mormon	Red Listed Threatened
8.	<i>Papilio polytes</i>	Common Mormon	Threatened
9.	<i>Delias eucharis</i>	Common Jezebel	Least Concern
10.	<i>Pareronia valeria</i>	Common Wanderer	Threatened
11.	<i>Catopsilia pyranthe</i>	Mottled Emigrant	Least Concern

12.	<i>Zizula hylax</i>	Tiny Grass Blue	Not Evaluated
13.	<i>Freyeria trochylus</i>	Grass Jewel	Not Evaluated
14.	<i>Castalius rosimon</i>	Common Pierrot	Not Evaluated
15.	<i>Talicauda nyseus</i>	Red Pierrot	Not Evaluated
16.	<i>Rathinda amor</i>	Monkey Puzzle	Threatened
17.	<i>Euploea core</i>	Common Crow	Least Concern
18.	<i>Danaus genutia</i>	Striped Tiger	Not Evaluated
19.	<i>Euthalia aconthea</i>	Common Baron	Not Evaluated
20.	<i>Athyma perius</i>	Common Sergeant	Threatened
21.	<i>Neptis hylas</i>	Common Sailer	Not Evaluated
22.	<i>Melanitis leda</i>	Common Evening Brown	Not Evaluated
23.	<i>Phalanta phalantha</i>	Common Leopard	Not Evaluated
24.	<i>Junonia atlites</i>	Grey Pansy	Not Evaluated
25.	<i>Junonia almanac</i>	Peacock Pansy	Least Concern
26.	<i>Hypolimnys misippus</i>	Danaid Eggfly	Not Evaluated
27.	<i>Hypolimnys bolina</i>	Great Eggfly	Not Evaluated

Table 3: Quantitative analysis and waste segregation

Sr. No.	Month	Waste Segregation in Kilogram				
		Plastic	Glass	Clothes and footwear	Thermo coal	Total
1.	15 th Feb.2021	20	36	16	3	75
2.	15 th March 2021	25	31	06	7	69
3.	14 th April 2021	16	16	10	3	45
4.	15 th May2021	17	24	16	8	65
5.	15 th June 2021	Not possible to collect waste due to heavy rains but tonnes of plastic waste from Sea reverts over the river surface at estuarine zones				
6.	15 th July2021					
7.	17 th Aug 2021	21	15	2	0	38
8.	15 th Sept 2021	15	19	11	3	48
9.	15 th Oct. 2021	15	15	14	2	44
10.	15 th Nov.2021	09	14	11	0	34
11.	15 th Dec 2021	13	16	07	2	38
12.	15 th Jan 2021	11	14	12	1	38
13.	15 th Feb2021	12	11	12	0	35
14.	15 th March 2021	05	04	01	1	11
15.	15 th April2021	11	16	10	2	39
16.	15 th May 2021	04	02	02	0	08
Total waste collected in 14 months : 587Kilogram						

Tables 4 : Institutes and organizations involved : Total Outreach

Sr. No.	Name of the institutes	Role	Members involved	Total outreach
1.	Mangrove foundation, Mumbai	Funds for cleaning campaign	15	162 actual members involved plus publicity of activity through out Maharshttra
2.	Br. Balasaheb Khardekar College, Vengurla, .	Volanteers and experts	35	
3	Rotaract Club of Vengurla Midtown.	Volanteers	20	

4.	Swamini Self Help group	Rowing the boat and leading the teams, cleaning	10	and Academic institutes, wats app group created positive impact.
5.	Vengurla Municipality Council	Provision of Hand gloves and pluckers etc.	30	
6.	SPK College, Sawantawadi	Research students	2	
7.	Indian Women Scientists' Association	NGO supporting ecotourism and awareness	50	

II. SUGGESTIONS AND RECOMMENDATIONS

Various researchers and community members concluded with suggestions about mangrove ecosystem waste management and sustainable restoration to conserve unique biodiversity.

1. Steps taken by municipal council helps to minimize waste generation.
2. Making rules should be followed by community involvement in through socio-economically beneficial projects like Mangrove Safari and ecotourism in which local communities and academicians can be involved.
3. Youth involvement leads to develop sustainable solutions for wise development for future of nurturing nature in productive way. Encouraging NGOs and community for waste collection and segregation in team builds up sense of responsibility and awareness about ecosystem restoration for future development.
4. June –July manual cleaning is not possible due to heavy rains but lot of non-degradable waste comes on water surface. Mechanical models can be designed to collect waste from Oceans in tones, is possible during these months

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