A Review of Mangrove Conservation Studies in Maharashtra, India

Nisha R. Mugade, Jagdish B. Sapkale

Abstract— Maharashtra state is having a variety of resources and is one of the developed state in India. Maharashtra state lies in the western and central part of country. The western part of Maharashtra is bordered by Arabian Sea and having a coastline of 720 kms. Coastline of Maharashtra consists of wetlands in terms of marshes and mangroves, which provides food and shelters to the Aquatic Organisms and also protect the coastal settlement and agricultural land from natural calamities. Now a day's mangrove vegetation is more vulnerable due to human interferences and at time vulnerable to natural Climatic Changes too. Authors have highlighted the status and conservation of mangroves in Maharashtra.

Index Terms— Mangrove conservation, Climate change, Human intervention, Mangrove degradation.

I. INTRODUCTION

The coast is narrow overlap zone between the land and sea, where the erosional and depositional processes taken place. Numerous erosional and depositional coastal features come into the existence between land and sea [1], [2]. Cliffs, rocky platform, beaches, sand bars, sand dunes and wetlands are associated with the coasts. Coastal wetlands i.e. marshes and mangroves are economically significant ecosystem on the earth. [3]. These valuable ecosystems are under the threat of increasing population. Coastal tract of Maharashtra is more vulnerable to mangrove degradation. Most of the mangroves patches have been degraded as a result of transforming the wetlands into agricultural fields and prawns' farming [4]. Violations of coastal regulation zone have seen in the coastal areas of Maharashtra. Therefore, mangroves are more prone to degradation in future. The saline water from sea enters through estuaries and small tidal inlets at the time of high tide and inundated most of the mud flats and agricultural land. Under the scheme of kharland (saline land) development, generally earthen bunds are constructing to mitigate from the salinity problem. But in view of the mangrove conservation practices, construction of bunds under the scheme of kharland development may not be suggested at or near to opening of the estuaries, wherever sea water enters into estuary or tidal inlets. There may be a threat to mangrove destruction due to such construction activities. The pioneer works of distinguished researchers revealed that the mangrove vegetation requires continuous monitoring in view of its conservation.

Manuscript received November 23, 2014.

Nisha R. Mugade, Ph.D. Research Student, Department of Geography, Shivaji University, Kolhapur, Maharashtra, India. Mobile No. 07028013939

Jagdish B. Sapkale, Assistant Professor, Department of Geography, Shivaji University, Kolhapur, Maharashtra, India. Mobile No. 09850046453.

II. MANGROVE VEGETATION

Mangrove is a tree or shrub which grows in tidal, chiefly tropical, coastal swamps, having numerous tangled roots that grow above ground and form dense thickets [5]. "Mangrove is large tropical evergreen tree/forest, genus Rhizophora that grows on muddy tidal flats and along protected ocean shorelines. Mangroves produce from their trunks aerial roots that become embedded in the mud and form a tangled network; this serves both as a support for the tree and as a means of aerating the root system. Such roots also form a base for the deposit of silt and other material carried by the tides, and thus land is built up which is gradually invaded by other vegetation.

The mangrove forests also can protect inland coastal areas by absorbing the effects of storm and some tsunami waves, but many mangroves have been harvested destructively on a large scale" [6]. Mangroves are notably tropical plants that grow with their roots relatively submerged in sea water. They are economically significant because the mangroves are a source of timber wood (used mainly as firewood). Mangroves also protect shorelines from wave damage and disastrous events and provide shelters for fishes [7].

Differentiate investigations revealed that mangrove growth and its area is decreasing due to change in climate and human interventions. Global warming is one of the dominant events of climate change which causes sea level rises and tends to reduce the mangrove swamps. Future models and predictions also indicates that sea level is increasing day by day and influences on the growth and health of mangroves [8], [9], [10], [11], [12] [13].

III. MAJOR AREAS OF MANGROVES IN MAHARASHTRA

The mangrove ecosystem in south konkan playing significant role, provide various benefits to the local people. This ecosystem is more or less protected in the wetlands of Mithbav creek. The coastal native do plantation of *Rhizophora*, spp. *Sonneratia* spp. *Avicennia* spp. regularly. *Excoecaria agallocha* can grow naturally all over the coastal line [14]. The various species of mangrove are identified along the coasts of Maharashtra. Table no. 1 shows the major sites of mangroves along the major estuaries and tidal inlets of coastal Maharashtra. Karivane estuary is having various species of mangroves with uneven size (Fig. 1).

Table – 1 : Major Sites of Mangroves in Maharashtra

~				
Sr.	Name of District	Major areas of Mangroves:		
No		Name of		
		Estuary/Creek/River/sites		
1	Thane	Vasai, Vaitarna River, Dandi,		
		Dahanu Creek		
2	Mumbai	Thane Creek, Mahim, Malad		
		Creek, Manori Creek		
3	Raigad	Hareshwar, Shrivardhan,		
	-	Murud		
		Korlai, Uran		
4	Ratnagiri	Vijaydurg, Purnagad, Bhatye,		
	-	Mirya, Jaigad, Dabhol,		
		Anjarle, Kelshi		
5	Sindhudurg	Phanasewadi, Wadatar, Mith		
		Mumbri, Mithbav, Achara,		
		Kolamb, Karli, Vengurla,		
		Kelus, Mochemad, Reddi,		
		Terekhol		

Source : Compiled by Authors.

IV. MANGROVE SPECIES IN MAHARASHTRA

Numerous Studies have been documented in view of the status, biodiversity and distribution of mangroves in south konkan estuaries like Mithbav, Mumbari and Devgad. In the study area few researchers have calculated relative density of Mangroves forest. As per their calculation relative density of *Exoecaria agallocha* (L) is highest in Mithbav estuary and lowest in Devgad estuary. They investigate about 12 genera and 20 species recorded in south konkan estuaries. The distributions of these mangroves were different from mouth of estuary towards inland water. Almost all the species were found in study area [14]. According to the Mangrove Cell [15], Forest Department of Maharashtra there are 20 species of Mangroves that have found in Coastal districts of Maharashtra (Table no. 2).

The new and rare species of mangrove that is Heritiera littoralis Dryand is studied along the coast of Maharashtra. Author's work highlighted on Heritira Littoralis Dryand's morpho-taxomomy, phenology, seedling morphology, habitat and regeneration [16].



Figure 1: Mangroves along Karivane Estuary

Table - 2	2 :	Mangrove	species	in	Maharashtra

No. of Mangrove Instruction 1 Avicennia marina Tivar All over Maharashtra 2 Avicennia officinalis Tivar Widely distributed in Maharashtra but not as common as A. marina 3 Rhizophora mucronata Throughout Maharashtra Throughout Maharashtra 4 Rhizophora apiculata Kandal Raigad, Ratnagiri and Sindhudurg 5 Bruguiera cylindrica Kandal Raigad and Sindhudurg are in Ratnagiri 6 Bruguiera gymnorhiza Kankar, Ekmane Rainagiri and Mumbai Rare in Sindhudurg and Ratnagiri and Mumbai 7 Kandelia candel Kandal-guriya Ratnagiri and Mumbai Sindhudurg and Ratnagiri and Mumbai 9 Sonneratia alba Pandhari chipi Found in all coastal districts of Maharashtra coast 9 Sonneratia apetala Chipi Thane, Mumbai and Raigad 10 Sonneratia granatum Chipi Found in all coastal districts of Maharashtra 11 Sonneratia granatum Chipi Found in Sindhudurg district rare in Ratnagiri Districts 13 Xylocarpus granatum Bhelanda, Sagandha Found only in a few estaries in Sindhudurg<	Sr.	Scientific Name	Common Name	Distribution
1 Avicennia marina Tivar All over Maharashtra 2 Avicennia officinalis Tivar Widely distributed in Maharashtra but not as common as A. marina 3 Rhizophora mucronata Kandal Throughout Maharashtra 4 Rhizophora mucronata Kandal Raigad, Ratmagiri and Sindhudurg District 5 Bruguiera cylindrica Kandal Mumbai, Thane, Raigad and Sindhudurg, Ratnagiri and Mumbai, Thane, Raigad and Sindhudurg, Ratnagiri and Mumbai 7 Kandelia candel Kandal-guriya Rare in Sindhudurg and Ratnagiri district 8 Ceriops tagal Kirkiri All along Maharashtra coast 9 Sonneratia alba Pandhari chipi apetala Found in all coastal districts of Maharashtra 10 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts 11 Sonneratia apetala Chipi Found in Sindhudurg (south of Alibaug) 11 Sonneratia caseolaris Samudraphal Found in Sindhudurg and Ratnagiri Districts 13 Xylocarpus granatum Samudraphal Found only in a few sindhudurg and Ratnagiri 15 Aegiceras corrriculatum Sugandh	No.	of Mangrove		2150110401011
marina Maharashtra 2 Avicennia officinalis Tivar Widely distributed in Maharashtra but not as common as A. marina 3 Rhizophora mucronata Kandal Throughout Maharashtra 4 Rhizophora apiculata Kandal Raigad, Ranagiri and Sindhudurg District 5 Bruguiera cylindrica Kandal Raigad and Sindhudurg rare in Ratnagiri 6 Bruguiera gymnorhiza Kandal-guriya Sindhudurg and Ratnagiri 7 Kandelia candel Kandal-guriya Sindhudurg and Ratnagiri 8 Ceriops tagal Kirkiri All along Maharashtra coast 9 Sonneratia alba Pandhari chipi Found in all coastal districts of Maharashtra 10 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts 11 Sonneratia caseolaris Chipi Found in all coastal districts of Maharashtra 13 Xylocarpus granatum Bhelanda, Sindhudurg and Ratnagiri Districts Sondudurg and Ratnagiri Districts 14 Excoecaria agallocha Huri, Geva, Corniculatum Found only in a few estuaries in Sindhudurg and Ratnagiri Districts of Maharashtra	1	Avicennia	Tivar	All over
2 Avicennia officinalis Tivar Widely distributed in Maharashtra but not as common as A. marina 3 Rhizophora mucronata Kandal Throughout Maharashtra 4 Rhizophora apiculata Kandal Raigad, Ratnagiri and Sindhudurg 5 Bruguiera cylindrica Kandal Ruigad, Ratnagiri and Sindhudurg 6 Bruguiera gymnorhiza Kankar, Ekmane Rare in Sindhudurg and Ratnagiri and Mumbai 7 Kandelia candel Kandal-guriya Sindhudurg and Ratnagiri district 8 Ceriops tagal Kirkiri All along Maharashtra coast 9 Sonneratia alba Pandhari chipi Found in all coastal districts of Maharashtra 10 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts 11 Sonneratia granatum Chipi Found in Sindhudurg (south of Alibaug) 11 Sonneratia caseolaris Samudraphal Found on jin a few estuaries in Sindhudurg and Ratnagiri Districts (Aachra, Vjiaydurg, Purmagar and Jaitapur) 13 Xylocarpus granatum Bhelanda, Samudraphal Found only in a few estuaries in Sindhudurg and Ratnagiri Districts of Maharashtra 15 Aegiceras corniculatum Sundri Found only in few estuaries in		marina		Maharashtra
officinalis in Maharashtra but not as common as A. marina 3 Rhizophora mucronata Kandal Throughout Maharashtra 4 Rhizophora apiculata Kandal Raigad, Ratnagiri and Sindhudurg District 5 Bruguiera cylindrica Kandal Raigad, Ratnagiri and Sindhudurg are in Ratnagiri 6 Bruguiera gymnorhiza Kankar, Ekmane Rare in Sindhudurg, Ratnagiri and Mumbai 7 Kandelia candel Kandal-guriya Sindhudurg, Ratnagiri district 8 Ceriops tagal Kirkiri All along Maharashtra 9 Sonneratia apetala Pandhari chipi Found in all coastal districts of Maharashtra 10 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts 11 Sonneratia apetala Chipi Found in southern districts of Ratnagiri and Sindhudurg (south of Alibaug) 11 Sonneratia granatum Samudraphal Found only in a few estuaries in Sindhudurg and Ratnagiri Districts 13 Xylocarpus granatum Bhelanda, Sugandha Found only in a few estuaries in Sindhudurg district of Maharashtra 14 Excoecaria corniculatum Huri, Geva, yataceea Fo	2	Avicennia	Tivar	Widely distributed
A. marina 3 Rhizophora mucronata Kandal Throughout Maharashtra 4 Rhizophora apiculata Kandal Raigad, Ratnagiri and Sindhudurg 5 Bruguiera cylindrica Kandal Mumbai, Thane, Raigad, Ratnagiri and Sindhudurg rare in Sindhudurg rare in Sindhudurg rare in Sindhudurg and Ratnagiri and Mumbai 7 Kandelia candel Kankar, Ekmane Rare in Sindhudurg and Ratnagiri district 8 Ceriops tagal Kirkiri All along Maharashtra coast 9 Sonneratia apetala Pandhari chipi apetala Found in all coastal districts of Maharashtra 10 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts 11 Sonneratia apetala Chipi Found in souther districts of Ratnagiri and Sindhudurg (south of Alibaug) 11 Sonneratia caseolaris Chipi Found only in Sindhudurg and Ratnagiri Districts 13 Xylocarpus granatum Bhelanda, Sugandha Found only in a few estuaries in Sindhudurg and Ratnagiri Districts of Maharashtra 16 Cynometra iripa Irapu Very rare species found only in a Sindhudurg district of Maharashtra 16 Cynometra iripa Irapu Very rare species found only in Sindhudurg district Sindhudu		officinalis		in Maharashtra but
3 Rhizophora mucronata Kandal Throughout Maharashtra 4 Rhizophora apiculata Kandal Raigad, Ratnagiri and Sindhudurg District 5 Bruguiera cylindrica Kandal Raigad and Sindhudurg rare in Ratnagiri 6 Bruguiera gymorhiza Kankar, Ekmane Rare in Sindhudurg, Ratnagiri 7 Kandelia candel Kankar, Ekmane Rare in Sindhudurg and Ratnagiri 8 Ceriops tagal Kirkiri All along Maharashtra coast 9 Sonneratia alba Pandhari chipi Found in all coastal districts of Maharashtra 10 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts 11 Sonneratia granatum Chipi Thane, Mumbai and Raigad Districts 12 Lumnitzera racemosa — Mostly in Sindhudurg district rare in Ratnagiri 13 Xylocarpus granatum Bhelanda, Sugandha Found only in a few estuaries in ex estuaries in ex estuaries in ex estuaries in ex estuaries in ex sindhudurg districts of Maharashtra 16 Cynometra iripa Irapu Very rare species found only in a licoastal districts of Maharashtra 15 Aegiceras corniculatum Sundri Sindhudurg district (recent report) <tr< td=""><td></td><td></td><td></td><td>A marina</td></tr<>				A marina
Interronata Maharashtra 4 Rhizophora apiculata Kandal Raigad, Ratnagiri and Sindhudurg District 5 Bruguiera cylindrica Kandal Mumbai, Thane, Raigad and Sindhudurg rare in Ratnagiri 6 Bruguiera gymnorhiza Kankar, Ekmane Rare in Sindhudurg, Ratnagiri and Mumbai 7 Kandelia candel Kandal-guriya Sindhudurg, Ratnagiri district 8 Ceriops tagal Kirkiri All along Maharashtra 9 Sonneratia apetala Pandhari chipi Found in all coastal districts of Maharashtra 10 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts 11 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts 11 Sonneratia granatum Chipi Found in Sindhudurg district rare in Ratnagiri Districts 13 Xylocarpus granatum Bhelanda, Samudraphal Found only in a few estuaries in Sindhudurg and Ratnagiri Districts of Maharashtra 15 Aegiceras corriculatum Kajala, Karti, Sugandha Found only in a lcoastal districts of Maharashtra 16 Cynometra iripa Irapu Very rare species found only in Sindhudurg dis	3	Rhizophora	Kandal	Throughout
4 Rhizophora apiculata Kandal Raigad, Ratnagiri and Sindhudurg 5 Bruguiera cylindrica Kandal Mumbai, Thane, Raigad and Sindhudurg rare in Ratnagiri 6 Bruguiera gymnorhiza Kankar, Ekmane Rare in Sindhudurg, Ratnagiri and Mumbai 7 Kandelia candel Kandal-guriya Sindhudurg, Ratnagiri and Mumbai 8 Ceriops tagal Kirkiri All along Maharashtra 9 Sonneratia apetala Pandhari chipi Found in all coastal districts of Maharashtra 10 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts 11 Sonneratia apetala Chipi Found in southern districts of Ratnagiri and Sindhudurg district rare in Ratnagiri 12 Lumnitzera racemosa	-	mucronata		Maharashtra
apiculata and Sindhudurg District 5 Bruguiera cylindrica Kandal Mumbai, Thane, Raigad and Sindhudurg rare in Ratnagiri 6 Bruguiera gymnorhiza Kankar, Ekmane Rare in Sindhudurg, Ratnagiri and Mumbai 7 Kandelia candel Kandal-guriya Rindhudurg, Ratnagiri and Mumbai 8 Ceriops tagal Kirkiri All along Maharashtra coast districts of Maharashtra 9 Sonneratia alba apetala Pandhari chipi Found in all coastal districts of Maharashtra 10 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts 11 Sonneratia granatum Chipi Found in Sindhudurg district rare in Ratnagiri and Sindhudurg district 12 Lumnitzera racemosa — Mostly in Sindhudurg and Ratnagiri Districts 13 Xylocarpus granatum Bhelanda, Samudraphal Found only in a few estuaries in Sindhudurg and Ratnagiri Districts of Maharashtra 14 Excoecaria agallocha Huri, Geva, Phungi Found in all coastal districts of Maharashtra 16 Cynometra iripa Irapu Very rare species found only in Sindhudurg district (recent report) 18 Dolichandrone spathacea Gorshingiah Sindhudurg district (recent report) 19 Acanthus aureum Marandi, Kateri Throughout Maharashtra	4	Rhizophora	Kandal	Raigad, Ratnagiri
5 Bruguiera cylindrica Kandal Mumbai, Thane, Raigad and Sindhudurg rare in Ratnagiri 6 Bruguiera gymnorhiza Kankar, Ekmane Rare in Sindhudurg, Ratnagiri and Mumbai 7 Kandelia candel Kandal-guriya Sindhudurg and Ratnagiri district 8 Ceriops tagal Kirkiri All along Maharashtra coast 9 Sonneratia alba Pandhari chipi Found in all coastal districts of Maharashtra 10 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts 11 Sonneratia caseolaris Chipi Found in all coastal districts of Maharashtra 12 Lumnitzera racemosa Mostly in Sindhudurg district rare in Ratnagiri 13 Xylocarpus granatum Bhelanda, Samudraphal Found only in a few estuaries in Sindhudurg and Ratnagiri Districts 14 Excoecaria agallocha Huri, Geva, Phungi Coastal districts of Maharashtra 16 Cynometra iripa Irapu Very rare species found only in Sindhudurg 17 Heritiera liticifolius Sundri Sindhudurg district recent report) 18 Dolichandrone spathacea Gorshingiah Sindhudurg Sindhudurg 20 Acrostichum aureum Marandi, Kateri Throughout Maharashtra		apiculata		and Sindhudurg
5 Brigguera cylindrica Kandal Mundar, Italie, Raigad and Sindhudurg rare in Rattagiri 6 Bruguiera gymnorhiza Kankar, Ekmane Rare in Sindhudurg, Rattagiri and Mumbai 7 Kandelia candel Kankar, Ekmane Rare in Sindhudurg, Rattagiri district 8 Ceriops tagal Kirkiri All along Maharashtra coast 9 Sonneratia apetala Pandhari chipi Found in all coastal districts of Rattagiri and Sindhudurg district 10 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts 11 Sonneratia caseolaris Chipi Found in southern districts of Rattagiri and Sindhudurg district rare in Rattagiri 12 Lumnitzera racemosa Mostly in Sindhudurg and Rattagiri Districts 13 Xylocarpus granatum Bhelanda, Samudraphal Found only in a few estuaries in Sindhudurg and Rattagiri Districts of Maharashtra 15 Aegiceras corniculatum Kajala, Karti, Sugandha Found in all coastal districts of Maharashtra 16 Cynometra iripa Irapu Very rare species found only in sindhudurg district 17 Heritiera littoralis Gorshingiah Sindhudurg district 19 Acanthus ilicifolius Marandi, K	Ē	D	Kan dal	District Mumbai Thana
Cynnanca Sindhudurg rare in Ratnagiri 6 Bruguiera gymnorhiza Kankar, Ekmane 7 Kandelia candel Kandal-guriya 8 Ceriops tagal Kirkiri 9 Sonneratia alba Pandhari chipi 9 Sonneratia apetala Pandhari chipi 10 Sonneratia apetala Chipi 11 Sonneratia apetala Chipi 12 Lumnitzera racemosa Found in all coastal districts of Maharashtra caseolaris 13 Xylocarpus granatum Bhelanda, Samudraphal 14 Excoecaria agallocha Huri, Geva, Phungi 15 Aegiceras corniculatum Kajala, Karti, Sugandha 16 Cynometra iripa Irapu 16 Cynometra iripa Irapu 17 Heritiera ilitoralis Sundri 18 Dolichandrone spathacea Gorshingiah 19 Acanthus ilicifolius Marandi, Kateri ilicifolius	3	ovlindrica	Kanuai	Raigad and
Bruguiera gymnorhiza Kankar, Ekmane Ratnagiri 6 Bruguiera gymnorhiza Kankar, Ekmane Ratnagiri Sindhudurg, Ratnagiri and Mumbai 7 Kandelia candel Kandal-guriya Sindhudurg and Ratnagiri district 8 Ceriops tagal Kirkiri All along Maharashtra coast 9 Sonneratia alba Pandhari chipi Found in all coastal districts of Maharashtra 10 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts 11 Sonneratia caseolaris Chipi Found in southern districts of Ratnagiri and Sindhudurg (south of Alibaug) 11 Sonneratia caseolaris Chipi Found in Sindhudurg district rare in Ratnagiri 12 Lumnitzera racemosa Mostly in Sindhudurg and Ratnagiri Districts 13 Xylocarpus granatum Bhelanda, Samudraphal Found only in a few estuaries in Sindhudurg and Ratnagiri Districts of Maharashtra 15 Aegiceras corniculatum Kajala, Karti, Sugandha Found only in a few estuaries of Maharashtra 16 Cynometra iripa Irapu Very rare species found only in Sindhudurg Sindhudurg district recer report) 18		cynnarica		Sindhudurg rare in
6 Bruguiera gymnorhiza Kankar, Ekmane Rare in Sindhudurg, Ratnagiri and Mumbai 7 Kandelia candel Kandal-guriya Sindhudurg and Ratnagiri district 8 Ceriops tagal Kirkiri All along Maharashtra coast 9 Sonneratia alba Pandhari chipi Found in all coastal districts of Maharashtra 10 Sonneratia apetala Chipi Thane, Mumbai and Raigad 11 Sonneratia caseolaris Chipi Thane, Mumbai and Raigad 11 Sonneratia caseolaris Chipi Found in Sindhudurg (south of Alibaug) 11 Sonneratia caseolaris Chipi Found in Sindhudurg district rare in Ratnagiri Districts 13 Xylocarpus granatum Bhelanda, Samudraphal Found only in a few estuaries in Sindhudurg and Ratnagiri Districts of Maharashtra 14 Excoecaria agallocha Huri, Geva, Phungi Coastal districts of Maharashtra 16 Cynometra iripa Irapu Very rare species found only in sindhudurg 17 Heritiera littoralis Sundri Sindhudurg 18 Dolichandrone spathacea Gorshingiah Sindhudurg 19 Acanthus ilicifolius Marandi, Kateri				Ratnagiri
gymnorhiza Sindhudurg, Ratnagiri and Mumbai 7 Kandelia candel Kandal-guriya Sindhudurg and Ratnagiri district 8 Ceriops tagal Kirkiri All along Maharashtra coast 9 Sonneratia alba Pandhari chipi Found in all coastal districts of Maharashtra 10 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts 11 Sonneratia caseolaris Chipi Thane, Mumbai and Raigad Districts 11 Sonneratia granatum Chipi Found in southern districts of Ratnagiri and Sindhudurg (south of Alibaug) 12 Lumnitzera racemosa	6	Bruguiera	Kankar, Ekmane	Rare in
1 Names 7 Kandelia candel Kandal-guriya Sindhudurg and Ratnagiri district 8 Ceriops tagal Kirkiri All along Maharashtra coast 9 Sonneratia alba Pandhari chipi Found in all coastal districts of Maharashtra 10 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts 11 Sonneratia caseolaris Chipi Found in southern districts of Ratnagiri and Sindhudurg (south of Alibaug) 11 Sonneratia caseolaris Chipi Found in southern districts of Ratnagiri and Sindhudurg district rare in Ratnagiri 12 Lumnitzera racemosa		gymnorhiza		Ratnagiri and
7 Kandelia candel Kandal-guriya Sindhudurg and Ratnagiri district 8 Ceriops tagal Kirkiri All along Maharashtra coast 9 Sonneratia alba Pandhari chipi Found in all coastal districts of Maharashtra 10 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts rarely found in southern districts of Ratnagiri and Sindhudurg (south of Alibaug) 11 Sonneratia caseolaris Chipi Found in Sindhudurg district rare in Ratnagiri 12 Lummitzera racemosa — Mostaly in Sindhudurg and Ratnagiri Districts 13 Xylocarpus granatum Bhelanda, Samudraphal Sindhudurg and Ratnagiri Districts of Maharashtra 14 Excoeccaria agallocha Phungi Maarashtra 15 Aegiceras corniculatum Kajala, Karti, Sugandha Found in all coastal districts of Maharashtra 16 Cynometra iripa Irapu Very rare species found only in sindhudurg district (recent report) 18 Dolichandrone spathacea Sindhudurg district (recent report) 18 Dolichandrone spathacea Sindhudurg district (recent report) 19 Acrostichum aureum Marandi, Kateri Throughout Maharashtra 20				Mumbai
Ratnagiri district 8 Ceriops tagal Kirkiri All along Maharashtra coast 9 Sonneratia alba Pandhari chipi Found in all coastal districts of Maharashtra 10 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts 11 Sonneratia caseolaris Chipi Thane, Mumbai and Raigad Districts 11 Sonneratia caseolaris Chipi Found in southern districts of Ratnagiri and Sindhudurg (south of Alibaug) 12 Lumnitzera racemosa	7	Kandelia candel	Kandal-guriya	Sindhudurg and
8 Ceriops tagal Kirkiri All along Maharashtra coast 9 Sonneratia alba Pandhari chipi Found in all coastal districts of Maharashtra 10 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts rarely found in southern districts of Ratnagri and Sindhudurg (south of Alibaug) 11 Sonneratia caseolaris Chipi Found in all coastal districts rarely found in southern districts of Ratnagri and Sindhudurg district rare in Ratnagri 12 Lumnitzera racemosa Mostly in Sindhudurg and Ratnagri Districts (Aachra, Vijaydurg, Purnagar and Jaitapur) 13 Xylocarpus granatum Bhelanda, Samudraphal Found only in a few estuaries in Sindhudurg and Ratnagiri Districts (Aachra, Vijaydurg, Purnagar and Jaitapur) 14 Excoecaria agallocha Huri, Geva, Phungi Coastal districts of Maharashtra 16 Cynometra iripa Irapu Very rare species found only in Sindhudurg District 17 Heritiera littoralis Sundri Sindhudurg district (recent report) 18 Dolichandrone spathacea Gorshingiah Sindhudurg district (recent report) 18 Dolichandrone spathacea				Ratnagiri district
9 Sonneratia alba Pandhari chipi Found in all coastal districts of Maharashtra 10 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts rarely found in southern districts of Ratnagiri and Sindhudurg (south of Alibaug) 11 Sonneratia caseolaris Chipi Found in Sindhudurg (south of Alibaug) 12 Lumnitzera racemosa — Mostly in Sindhudurg and Ratnagiri Districts (Aachra, Vijaydurg, Purnagar and Jaitapur) 13 Xylocarpus granatum Bhelanda, Samudraphal Found only in a few estuaries in Sindhudurg and Ratnagiri Districts (Aachra, Vijaydurg, Purnagar and Jaitapur) 14 Excoecaria agallocha Huri, Geva, Phungi Coastal districts of Maharashtra 16 Cynometra iripa Irapu Very rare species found only in Sindhudurg district (recent report) 18 Dolichandrone spathacea Sundri Sindhudurg district (recent report) 18 Dolichandrone spathacea Gorshingiah Sindhudurg district (recent report) 18 Dolichandrone aureum Marandi, Kateri Throughout Maharashtra 20 Acrostichum aureum — Reported from Sindhudurg District, Maharashtra	8	Ceriops tagal	Kirkiri	All along Maharashtra agast
10 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts of Maharashtra 10 Sonneratia apetala Chipi Thane, Mumbai and Raigad Districts 11 Sonneratia caseolaris Chipi Found in southern districts of Ratnagiri and Sindhudurg (south of Alibaug) 11 Sonneratia caseolaris Chipi Found in Sindhudurg district rare in Ratnagiri 12 Lumnitzera racemosa Mostly in Sindhudurg and Ratnagiri Districts (Aachra, Vijaydurg, Purnagar and Jaitapur) 13 Xylocarpus granatum Bhelanda, Samudraphal Found only in a few estuaries in Sindhudurg and Ratnagiri Districts (Aachra, Vijaydurg, Purnagar and Jaitapur) 14 Excoecaria agallocha Huri, Geva, Phungi Coastal districts of Maharashtra 15 Aegiceras corniculatum Kajala, Karti, Sugandha Found in all coastal districts of Maharashtra 16 Cynometra iripa Irapu Very rare species found only in Sindhudurg District 17 Heritiera littoralis Gorshingiah Sindhudurg district (recent report) 18 Dolichandrone spathacea Gorshingiah Sindhudurg Sindhudurg District, Maharashtra 20 Acrostichum aureum	9	Sonneratia alba	Pandhari chini	Found in all coastal
Image: 10Sonneratia apetalaChipiThane, Mumbai and Raigad Districts rarely found in southern districts of Ratnagiri and Sindhudurg (south of Alibaug)11Sonneratia caseolarisChipiFound in southern district rare in Ratnagiri12Lumnitzera racemosaMostly in Sindhudurg and Ratnagiri Districts13Xylocarpus granatumBhelanda, SamudraphalFound only in a few estuaries in Sindhudurg and Ratnagiri Districts14Excoecaria agallochaHuri, Geva, Purnagar and Jaitapur)Coastal districts of Maharashtra16Cynometra iripaIrapu Sundhudurg OriginalisVery rare species found only in sindhudurg District17Heritiera littoralisSundri GorshingiahSindhudurg district recent report)19Acanthus anatumMarandi, Kateri marandi, KateriThroughout maharashtra20Acrostichum aureumReported from Sindhudurg District, Maharashtra		sonnerana aiba	i andnari empi	districts of
10Sonneratia apetalaChipiThane, Mumbai and Raigad Districts rarely found in southern districts of Ratnagiri and Sindhudurg (south of Alibaug)11Sonneratia caseolarisChipiFound in Sindhudurg (south of Alibaug)11Sonneratia caseolarisChipiFound in Sindhudurg district rare in Ratnagiri12Lumnitzera racemosaMostly in Sindhudurg and Ratnagiri Districts13Xylocarpus granatumBhelanda, SamudraphalFound only in a few estuaries in Sindhudurg and Ratnagiri Districts14Excoecaria agallochaHuri, Geva, PhungiCoastal districts of Maharashtra15Aegiceras corniculatumKajala, Karti, SugandhaFound on all coastal districts of Maharashtra16Cynometra iripaIrapuVery rare species found only in Sindhudurg District17Heritiera littoralisSundri GorshingiahSindhudurg district sindhudurg District19Acanthus aureumMarandi, Kateri UltoralisThroughout Maharashtra20Acrostichum aureumReported from Sindhudurg District, Maharashtra				Maharashtra
apetalaand Raigad Districts rarely found in southern districts of Ratnagiri and Sindhudurg (south of Alibaug)11Sonneratia caseolarisChipiFound in Sindhudurg district rare in Ratnagiri12Lumnitzera racemosaMostly in Sindhudurg and Ratnagiri Districts13Xylocarpus granatumBhelanda, SamudraphalFound only in a few estuaries in Sindhudurg and Ratnagiri Districts14Excoecaria agallochaHuri, Geva, PhungiCoastal districts of Maharashtra15Aegiceras corniculatumKajala, Karti, SugandhaFound on all coastal districts of Maharashtra16Cynometra iripaIrapuVery rare species found only in Sindhudurg District17Heritiera littoralisSundri GorshingiahSindhudurg district mathetict (recent report)18Dolichandrone spathaceaGorshingiahSindhudurg district sindhudurg District20Acrostichum aureumReported from Sindhudurg District, Maharashtra	10	Sonneratia	Chipi	Thane, Mumbai
Districts rarely found in southern districts of Ratnagiri and Sindhudurg (south of Alibaug)11Sonneratia caseolarisChipiFound in Sindhudurg (south of Alibaug)12Lumnitzera racemosaMostly in Sindhudurg and Ratnagiri Districts13Xylocarpus granatumBhelanda, SamudraphalFound only in a few estuaries in Sindhudurg and Ratnagiri Districts14Excoecaria agallochaHuri, Geva, PhungiCoastal districts of Maharashtra15Aegiceras corniculatumKajala, Karti, SugandhaFound only in all coastal district of Maharashtra16Cynometra iripaIrapuVery rare species found only in Sindhudurg District17Heritiera littoralisSundriSindhudurg district (recent report)18Dolichandrone spathaceaGorshingiahSindhudurg district (recent report)20Acrostichum aureumReported from Sindhudurg District		apetala		and Raigad
InterpretationSouthern districts southern districts of Ratnagiri and Sindhudurg (south of Alibaug)11Sonneratia caseolarisChipiFound in Sindhudurg district rare in Ratnagiri12Lumnitzera racemosaMostly in Sindhudurg and Ratnagiri Districts13Xylocarpus granatumBhelanda, SamudraphalFound only in a few estuaries in Sindhudurg and Ratnagiri Districts13Xylocarpus granatumBhelanda, SamudraphalFound only in a few estuaries in Sindhudurg and Ratnagiri Districts (Aachra, Vijaydurg, Purnagar and Jaitapur)14Excoecaria agallochaHuri, Geva, PhungiCoastal districts of Maharashtra15Aegiceras corniculatumKajala, Karti, SugandhaFound in all coastal districts of Maharashtra16Cynometra iripaIrapuVery rare species found only in Sindhudurg District17Heritiera littoralisSundriSindhudurg district (recent report)18Dolichandrone spathaceaGorshingiah Sindhudurg DistrictSindhudurg district Maharashtra20Acrostichum aureumReported from Sindhudurg District				rarely found in
of Ratnagiri and Sindhudurg (south of Alibaug)11Sonneratia caseolarisChipiFound in Sindhudurg district rare in Ratnagiri12Lumnitzera racemosa				southern districts
Image: Sindhudurg (south of Alibaug)11Sonneratia caseolarisChipiFound in Sindhudurg district rare in Ratnagiri12Lumnitzera racemosa				of Ratnagiri and
11Sonneratia caseolarisChipiFound in Sindhudurg district rare in Ratnagiri12Lumnitzera racemosa				Sindhudurg (south
11Somerand caseolarisChipiFound in Sindhudurg district rare in Ratnagiri12Lumnitzera racemosaMostly in Sindhudurg and Ratnagiri Districts13Xylocarpus granatumBhelanda, SamudraphalFound only in a few estuaries in Sindhudurg, Purnagar and Jaitapur)14Excoecaria agallochaHuri, Geva, PhungiCoastal districts of Maharashtra15Aegiceras corniculatumKajala, Karti, SugandhaFound in all coastal districts of Maharashtra16Cynometra iripaIrapuVery rare species found only in Sindhudurg District17Heritiera littoralisSundri GorshingiahSindhudurg district (recent report)18Dolichandrone spathaceaGorshingiah JistrictSindhudurg district marashtra20Accostichum aureumReported from Sindhudurg District, Maharashtra	11	Componatia	Chini	of Alibaug)
Lumnitzera racemosa	11	caseolaris	Chipi	Sindhudurg district
12Lumnitzera racemosaMostly in Sindhudurg and Ratnagiri Districts13Xylocarpus granatumBhelanda, SamudraphalFound only in a few estuaries in Sindhudurg and Ratnagiri Districts (Aachra, Vijaydurg, Purnagar and Jaitapur)14Excoecaria agallochaHuri, Geva, PhungiCoastal districts of Maharashtra15Aegiceras corniculatumKajala, Karti, SugandhaFound in all coastal districts of Maharashtra16Cynometra iripaIrapuVery rare species found only in Sindhudurg District17Heritiera littoralisSundri GorshingiahSindhudurg district (recent report)18Dolichandrone spathaceaGorshingiah Marandi, KateriSindhudurg district maharashtra20Acrostichum aureumReported from Sindhudurg District, Maharashtra		cuscolulis		rare in Ratnagiri
racemosaSindhudurg and Ratnagiri Districts13Xylocarpus granatumBhelanda, SamudraphalFound only in a few estuaries in Sindhudurg and Ratnagiri Districts (Aachra, Vijaydurg, Purnagar and Jaitapur)14Excoecaria agallochaHuri, Geva, PhungiCoastal districts of Maharashtra15Aegiceras corniculatumKajala, Karti, SugandhaFound in all coastal districts of Maharashtra16Cynometra iripaIrapuVery rare species found only in Sindhudurg District17Heritiera littoralisSundri (recent report)18Dolichandrone spathaceaGorshingiah Marandi, KateriSindhudurg district (recent report)20Acrostichum aureumReported from Sindhudurg District, Maharashtra	12	Lumnitzera		Mostly in
13 Xylocarpus granatum Bhelanda, Samudraphal Found only in a few estuaries in Sindhudurg and Ratnagiri Districts (Aachra, Vijaydurg, Purnagar and Jaitapur) 14 Excoecaria agallocha Huri, Geva, Phungi Coastal districts of Maharashtra 15 Aegiceras corniculatum Kajala, Karti, Sugandha Found in all coastal districts of Maharashtra 16 Cynometra iripa Irapu Very rare species found only in Sindhudurg District 17 Heritiera littoralis Sundri Sindhudurg district (recent report) 18 Dolichandrone spathacea Gorshingiah Marandi, Kateri Sindhudurg district Maharashtra 20 Acrostichum aureum — Reported from Sindhudurg District		racemosa		Sindhudurg and
15 Aytocurpus Sintranda, Foundada, granatum Samudraphal Saturies in Samudraphal Sindhudurg and Ratnagiri Districts (Aachra, Vijaydurg, Purnagar and Jaitapur) 14 Excoecaria 14 Excoecaria Huri, Geva, <i>agallocha</i> Phungi Coastal districts of 15 Aegiceras Kajala, Karti, corniculatum Sugandha Found in all coastal districts of Maharashtra 16 Cynometra iripa Irapu 17 Heritiera Sundri 18 Dolichandrone Gorshingiah spathacea Marandi, Kateri Throughout 19 Acanthus Marandi, Kateri aureum Reported from Sindhudurg	13	Xylocarpus	Bhelanda	Found only in a few
SynthaminSummer of an adjustSindhudurg and Ratnagiri Districts (Aachra, Vijaydurg, Purnagar and Jaitapur)14Excoecaria agallochaHuri, Geva, PhungiCoastal districts of Maharashtra15Aegiceras corniculatumKajala, Karti, SugandhaFound in all coastal districts of Maharashtra16Cynometra iripaIrapuVery rare species found only in Sindhudurg District17Heritiera littoralisSundriSindhudurg district (recent report)18Dolichandrone spathaceaGorshingiah Marandi, KateriSindhudurg district Maharashtra20Acrostichum aureumReported from Sindhudurg District, Maharashtra	15	oranatum	Samudraphal	estuaries in
Ratnagiri Districts (Aachra, Vijaydurg, Purnagar and Jaitapur)14Excoecaria agallochaHuri, Geva, PhungiCoastal districts of Maharashtra15Aegiceras corniculatumKajala, Karti, SugandhaFound in all coastal districts of Maharashtra16Cynometra iripaIrapuVery rare species found only in Sindhudurg District17Heritiera littoralisSundri (recent report)18Dolichandrone spathaceaGorshingiah Marandi, Kateri Maharashtra20Acrostichum aureum Marandi, Kateri District, Maharashtra		81 anatan	Sumuruphu	Sindhudurg and
14 Excoecaria agallocha Huri, Geva, Phungi Coastal districts of Maharashtra 15 Aegiceras corniculatum Kajala, Karti, Sugandha Found in all coastal districts of Maharashtra 16 Cynometra iripa Irapu Very rare species found only in Sindhudurg District 17 Heritiera littoralis Sundri Sindhudurg district (recent report) 18 Dolichandrone spathacea Gorshingiah Sindhudurg district Maharashtra 19 Acanthus aureum Marandi, Kateri Throughout Maharashtra				Ratnagiri Districts
14 Excoecaria agallocha Huri, Geva, Phungi Coastal districts of Maharashtra 15 Aegiceras corniculatum Kajala, Karti, Sugandha Found in all coastal districts of Maharashtra 16 Cynometra iripa Irapu Very rare species found only in Sindhudurg District 17 Heritiera littoralis Sundri Sindhudurg district (recent report) 18 Dolichandrone spathacea Gorshingiah Sindhudurg district Maharashtra 19 Acanthus aureum Marandi, Kateri Throughout Maharashtra				(Aachra, Vijaydurg
Jaitapur) 14 Excoecaria agallocha Huri, Geva, Phungi Coastal districts of Maharashtra 15 Aegiceras corniculatum Kajala, Karti, Sugandha Found in all coastal districts of Maharashtra 16 Cynometra iripa Irapu Very rare species found only in Sindhudurg District 17 Heritiera littoralis Sundri Sindhudurg district (recent report) 18 Dolichandrone spathacea Gorshingiah Sindhudurg district Maharashtra 19 Acanthus aureum Marandi, Kateri Throughout Maharashtra 20 Acrostichum aureum Reported from Sindhudurg District, Maharashtra				Purnagar and
14 Excoecaria agallocha Huri, Geva, Phungi Coastal districts of Maharashtra 15 Aegiceras corniculatum Kajala, Karti, Sugandha Found in all coastal districts of Maharashtra 16 Cynometra iripa Irapu Very rare species found only in Sindhudurg District 17 Heritiera littoralis Sundri Sindhudurg district (recent report) 18 Dolichandrone spathacea Gorshingiah Sindhudurg district maharashtra 19 Acanthus aureum Marandi, Kateri Throughout Maharashtra				Jaitapur)
agallochaPhungiMaharashtra15Aegiceras corniculatumKajala, Karti, SugandhaFound in all coastal districts of Maharashtra16Cynometra iripaIrapuVery rare species found only in Sindhudurg District17Heritiera littoralisSundriSindhudurg district (recent report)18Dolichandrone spathaceaGorshingiah Marandi, KateriSindhudurg district Maharashtra20Acrostichum aureumReported from Sindhudurg District, Maharashtra	14	Excoecaria	Huri, Geva,	Coastal districts of
15 Aegiceras corniculatum Kajala, Karti, Sugandha Found in all coastal districts of Maharashtra 16 Cynometra iripa Irapu Very rare species found only in Sindhudurg District 17 Heritiera littoralis Sundri Sindhudurg district (recent report) 18 Dolichandrone spathacea Gorshingiah Sindhudurg district Maharashtra 19 Acanthus ilicifolius Marandi, Kateri aureum Throughout Maharashtra 20 Acrostichum aureum Reported from Sindhudurg District, Maharashtra		agallocha	Phungi	Maharashtra
corniculatum Sugandha districts of Maharashtra 16 Cynometra iripa Irapu Very rare species found only in Sindhudurg District 17 Heritiera littoralis Sundri Sindhudurg district (recent report) 18 Dolichandrone spathacea Gorshingiah Sindhudurg district Maharashtra 19 Acanthus ilicifolius Marandi, Kateri Throughout Maharashtra 20 Acrostichum aureum	15	Aegiceras	Kajala, Karti,	Found in all coastal
16 Cynometra iripa Irapu Very rare species found only in Sindhudurg District 17 Heritiera Sundri Sindhudurg district (recent report) 18 Dolichandrone spathacea Gorshingiah Sindhudurg district (recent report) 19 Acanthus ilicifolius Marandi, Kateri Throughout Maharashtra 20 Acrostichum aureum Reported from Sindhudurg District, Maharashtra		corniculatum	Sugandha	Maharashtra
Image: spathacea Image: spathacea found only in Sindhudurg District 17 Heritiera littoralis Sundri Sindhudurg district (recent report) 18 Dolichandrone spathacea Gorshingiah Sindhudurg district (recent report) 19 Acanthus ilicifolius Marandi, Kateri Throughout Maharashtra 20 Acrostichum aureum Reported from Sindhudurg District, Maharashtra	16	Cynometra iripa	Irapu	Very rare species
Sindhudurg District 17 Heritiera littoralis Sundri Sindhudurg district (recent report) 18 Dolichandrone spathacea Gorshingiah Sindhudurg district 19 Acanthus ilicifolius Marandi, Kateri Throughout Maharashtra 20 Acrostichum aureum Reported from Sindhudurg District, Maharashtra		, r	· T · ·	found only in
Image: Instruct District 17 Heritiera littoralis Sundri Sindhudurg district (recent report) 18 Dolichandrone spathacea Gorshingiah Sindhudurg district 19 Acanthus ilicifolius Marandi, Kateri Throughout Maharashtra 20 Acrostichum aureum Reported from Sindhudurg District, Maharashtra				Sindhudurg
17 Iterniera Sundri Sundri 11 littoralis (recent report) 18 Dolichandrone spathacea Gorshingiah Sindhudurg district 19 Acanthus Marandi, Kateri Throughout Maharashtra 20 Acrostichum aureum Reported from Sindhudurg District, Maharashtra	17	Havitiana	Sundri	Sindhudurg district
18 Dolichandrone spathacea Gorshingiah Sindhudurg district 19 Acanthus ilicifolius Marandi, Kateri Throughout Maharashtra 20 Acrostichum aureum Reported from Sindhudurg District, Maharashtra	1/	littoralis	Sului	(recent report)
spathacea Southingth Submittee 19 Acanthus Marandi, Kateri Throughout ilicifolius Marandi, Kateri Maharashtra 20 Acrostichum aureum Sindhudurg District, Maharashtra	18	Dolichandrone	Gorshingiah	Sindhudurg district
19 Acanthus ilicifolius Marandi, Kateri Throughout Maharashtra 20 Acrostichum aureum Reported from Sindhudurg District,	10	spathacea	Constitution	district
ilicifolius Maharashtra 20 Acrostichum Reported from aureum Sindhudurg District, Maharashtra Maharashtra	19	Acanthus	Marandi, Kateri	Throughout
20 Acrostichum Reported from aureum Sindhudurg District, Maharashtra		ilicifolius	,	Maharashtra
aureum Sindhudurg District, Maharashtra	20	Acrostichum		Reported from
District, Maharashtra		aureum		Sindhudurg
in an a start a				District, Maharashtra

International Journal of Engineering and Technical Research (IJETR) ISSN: 2321-0869, Volume-2, Issue-11, November 2014

V. CONSERVATION OF MANGROVES

Conservation of any natural resource means the proper management and systematic use of available resources. Natural resources full fill the human needs by different ways, but over exploitation of natural resources gives rise to ill effects on the resource and surrounding environments. To control over the degradation of resources, conservation is much essential. Considering mangrove as a natural resource also needs some kind of conservation practice to reduce the degradational rates. The increasing population in the areas of coastal Maharashtra has forcefully reducing the area of mangroves. Some areas of coastal Maharashtra reflect the deterioration of such wetlands.



Figure 2: Mangrove destruction along Vaghotan estuary



Figure 3: Mangrove seedling in Anjanvel tarf- Guhagar

Degradational rate of coastal wetlands have increasing rapidly, more or less 25-50% of the world's coastal wetlands have been lost due to conversion of marshes and mangroves into agricultural lands aquaculture [3] [17], [18], [19]. Some degradational sites have been observed along some estuaries of Maharashtra (Fig 2). Such sites may be rehabilitating by re planting the mangroves seedling in the degraded areas, mostly such practices under conservation of mangroves are carried out through various Government scheme (Fig 3).

When attempted for the conservation of mangroves, "First priority should be given to conserving the remaining areas of natural mangrove forest, especially areas supporting mature, seedling-bearing trees. Particularly valuable wetland habitats from an ecological and biodiversity perspective, can be conserved most effectively by assigning to them special status which is clearly recognized nationally, or internationally. This would include a designation as e.g. a national park, nature reserve, gazetted forest at national level, or e.g. Biosphere Reserve, Ramsar site, or World Heritage Site at the international level" [20].

Some researchers have concluded that Ramsar has maintained its balanced ecosystem, by introducing the restoration of wetlands in public awareness [21], [22]. There is significant awareness of Ramsar and mangrove protection and rehabilitation efforts at multiple levels. The effectiveness of Ramsar depends not only on the raising of public awareness, but also in quantifiable results such as the health and status of mangroves and the well-being, employments , and occupations of the people who depend on the resource [22].

In Mumbai, about 37 sq km of area is covered by mangroves. Maharashtra Nature Park located at left bank of Mithi river near dharavi Slum area, Mumbai and it is surrounded by Mangroves. Before two decades Maharashtra Nature Park was a city garbage area. The park occupies about 0.14 sq. km that is 37 acres. Maharashtra Nature Park is great achievement for conservation of biodiversity in India. Acanthus ilicifolius, Thespesia populnea, Salvadora persica, Ipomoea sps, Avicennia marina, Avicennia officinalis these mangroves species found in Maharashtra Nature Park [23]. Periphery of the Maharashtra Nature Park supports a lush and evergreen mangrove forest. Surrounding mangrove area is resting spot for birds which migrate during winter season in Indian subcontinent therefore famous for bird watching [24]. Mangroves plantation in the Maharashtra has been reducing because of human interference. Industrial developments, including power plants have been taken place. Therefore it is essential to undertake assessment of mangrove habitat and aware about the conservation of mangroves. "Specific education programmes should be conducted. Similarly, meetings with stake holders and Village Governing Bodies should be conducted to create platform for sharing their experiences and problems encountered in conservation of mangroves"[25].

Urbanization is one of the important factor which influenced on all natural resources. In view of mangrove ecosystem, the urban areas and its growths affects on the mangrove health. Waste water and sediment discharge from urban areas directly or indirectly added to mangrove swamps through river and estuaries. Some studies have been documented in terms of mangrove conservation in Thane Creek and Ulhas River Estuary of Maharashtra. An approach towards conservation measures such as sewage treatment, urban drainage management; mangrove plantation and dredging have been attempted in same area [26]. A holistic approach must at the time of planning to minimize the direct or indirect of urbanization on mangroves. In respect of this, Thane Municipal Corporation has implemented various conservative measures to protect the mangroves from sewerage [26]. Therefore, it is necessary to take serious initiate to protect mangroves through proper management scheme and conservation programme.

VI. CONCLUSIONS

The Mangrove ecosystem is affected by climatic factors as

well as by human interferences. Directly or indirectly, climatic change influences on mangrove growth. Many studies determined that variations in sea level, storm, cyclones, uneven distribution of rainfall, temperature variations are the climatic factor that effects on mangrove. In context with the present status of mangroves, it is necessary to protect such natural resources by conducting the awareness programme; and implementing strict rules and regulation. Violations of coastal regulation zone have seen in the coastal areas of Maharashtra. Therefore, Government and stakeholders should attempt the continuous evaluation and monitoring of mangrove ecosystem at micro level.

REFERENCES

- Clowes, A., Comfort, P., "Process and Landform- Conceptual Framework in Geography", Oliver and Boyd, Longman Group Ltd, pp 335,1987
- [2] Sapkale, J.B., "Degradation of Coastal Sand Dunes in Mithmumbari and Kunkeshwar of Devgad Coasts, Maharashtra", International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET), 3, (9), pp 16097-16103, 2014.
- [3] Kirwan, M. L; Megonigal, J. P, "Tidal wetland stability in the face of human impacts and sea-level rise", Nature, 502, 53-60, 2013.
- [4] Sapkale, J.B., Rathod, B. L., "Kharlands-An Agrarian Disaster in Coastal Areas of Southern Ratnagiri, Maharashtra: A Study Using Remote Sensing and GIS", International Refereed Journal of Engineering and Science (IRJES), 3(6), 71-78, 2014.
- [5] http://www.oxforddictionaries.com/definition/english/mangrove
- [6] Mangrove; The Columbia Encyclopedia, 6th ed.. 2014. Encyclopedia.com. 24 Nov. 2014, http://www.encyclopedia.com.
- [7] Tomlinson, P. B.; "The Botany of Mangroves", Cambridge University Press, 1994 - Science - 419 pages, 1994.
- [8] IUCN, (1989). "The impact of climatic change and sea level rise on ecosystems". Report for the Commonwealth Secretariat, London, 1989.
- [9] Nichols, R., Hoozemans, F., Marchand, M., 'Increasing flood risk and wetland losses due to sea-level rise: regional and global analyses". GlobalEnviron. Change 9, S69–S87, 1999.
- [10] Ellison, J., Stoddart, D., "Mangrove ecosystem collapse during predicted sea level rise: Holocene analogues and implications". J. Coast. Res. 7, 151–165, 1991.
- [11] McLeod, E., Salm, R., Managing Mangroves for Resilience to Climate Change. IUCN, Gland, Switzerland, 2006.
- [12] Gilman, E., Ellison, J., Coleman, R., "Assessment of mangrove response to projected relative sea-level rise and recent historical reconstruction of shoreline position". Environ. Monit. Assess. 124, 112–134, 2007.
- [13] Gilman, E.L., et al., "Threats to mangroves from climate change and adaptation options, Aquat. Bot. doi:10.1016/j.aquabot.2007.12.009, 2008.
- [14] Yeragi, S. S., Yeragi, S. G., "Status, Biodiversity and distribution of Mangroves in South Konkan, Sindhudurg District, Maharashtra State India An overview", Int. J. of Life Sciences, Vol. 2 (1), 67-69, 2014.
- [15] The Mangrove Cell Maharashtra Forest Department, Government of Maharashtra, India. http://www.mangrovecell.org/role_importance_ecosystems.aspx
- [16] Shaikh, S. S., Gokhale, M. V., Chavan, N. S., "A Report on the Existence of Heritiera Littoralis Dryand. On the Coast of Maharashtra", An International Quarterly Journal of Life Sciences, The Bioscan, 6(2), 293-295, 2011.
- [17] Huang, Y. et. al. "Marshland conversion to cropland in northeast China from 1950 to 2000 reduce the greenhouse", Glob. Change Biol. 16, 680-695, 2010.
- [18] Pendleton, L. et. al. "Estimating global "blue carbon" emission from conversion and degradation of vegetated coastal ecosystem", PloS ONE 7, e43542, 2012, In: Kirwan, M. L; Megonigal, J. P; "Tidal wetland stability in the face of human impacts and sea-level rise", Nature, 502, 53-60, 2013.
- [19] Kirwan, M. L. et. al. "Limits on the adaptability of coastal marshes to rising sea level", Geophys. Res. Lett. 37, L23401, 2010.
- [20] Macintosh, D. J., Ashton E. C. (2002); "A Review of Mangrove Biodiversity Conservation and Management", Report, Centre for

Tropical Ecosystems Research (cenTER Aarhus), University of Aarhus, Denmark 2002

- [21] Bowman, M., "The Ramsar Convention on Wetlands: has it made a difference? In: Stokke, O.S., Thommessen, Ø.B. (Eds.), Yearbook of International Co-Operation on Environment and Development 2002/2003. Earthscan, London, p. 352.,2003.
 [22] Seto, K. C., Fragkias M., "Mangrove conversion and aquaculture
- [22] Seto, K. C., Fragkias M., "Mangrove conversion and aquaculture development in Vietnam: A remote sensing-based approach for evaluating the Ramsar Convention on Wetlands", Global Environmental Change, 17, 486–500, 2007.
- [23] Walmiki, N., Awsare, V., Karangutkar, S., Wagh, V., Yengal, B., Pillai, R., "Harpetofauna of Maharashtra Nature Park, Mumbai, Maharashtra(India)", World Journal of Environmental Biosciences, 1(2), 90-99, 2012.
- [24] http://www.da-is.org/3syrs/about_maharashtranaturepark.html
- [25] Prabhu, S; "Ecological Assessment and Education for Conservation of Mangrove Community in Ratnagiri District Of Maharashtra", MFF (INDIA) Small Grant Project Final Report, 2014.
- [26] Nikam, V. S., Kumar, A., Lalla, K., Gupta, K., "Conservation of Wetlands and Mangroves in Thane Creek and Ulhas River Estuary, India", Proceeding of Tall2007: The 12th World Lake Conference, 1635-1642, 2008.



Miss. Nisha R. Mugade is a research student in Shuvaji University, Kolhapur and doing Ph.D. under the guidance of Dr. Jagdish B. Sapkale, Kolhapur, Maharashtra, India. Ph. No. 7028013939



Dr. Jagdish B. Sapkale is working as an Assistant Professor in the Department of

Geography, Shivaji University, Kolhapur, Maharashtra, India. He has a research experience of over 20 years in the field of Fluvial Geomorphology, Coastal Geomorphology, Man and Environment relationship and Applications of Remote Sensing and GIS in various Geographical studies