International Journal of Biological, Life and Agricultural Sciences
ISSN: 2415-6612
Vol:6, No:9, 2012

Floristic Richness of the Tropical Coast of Northern Andhra Pradesh along Bay of Bengal, a Treasure to be Conserved

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Abstract**—**Coastal zone combines terrestrial, marine and atmospheric factors and gives rise to unique landforms that play an important role in long-term sustainability of the hinterland and economy of maritime nations. World over, efforts have been put forth to understand plants of the seacoasts. In India also, plants of several geographical entities have been well documented, but works devoted to plant communities of the vast tropical coast of India and its States are still insufficient. Therefore, an inventory of plants flourishing in a stretch of ~450km of the Coastal Regulatory Zone I encompassing a total of 84 villages in 6 revenue Districts of northern Andhra Pradesh (15°42'06"N, 80°51'03"E to 19°05'51"N, 84°47'44"E) along Bay of Bengal was carried out. The study revealed presence of a total of 364 species belonging to 225 genera under 71 families. In addition to inventory, zonation pattern, ethnobotany, and certain interesting ecological facts are included.

Keywords**—**Ecology, Ethnobotany, Inventory, Tropical coast, Zonation.

I. Introduction

COASTAL zone is a long, broad and vast geographic area extending from sea edge far inland. This ever dynamic region combines terrestrial, marine and atmospheric factors to give rise to unique land forms such as mud flats, sand dunes, rocky headlands, lagoons, tidal creeks, wetlands and estuaries [16]. These varied land forms support a number of critical ecosystems such as marsh/ sand/ rock strands, salt marshes, mangals, sea grass meadows and coral reefs that harbor a myriad microbial, plant and animal populations. All these ecosystems together form a buffer zone protecting the land from potential impacts of storms, erosion, subsidence (from sea water), inundation (from freshwater), sea level rise, etc. [1]. Thus, coastal zone performs a leading bioengineering role in the long-term sustainability of the adjoining hinterland on one hand and plays a strategic role in the economy of nations with a large shoreline like India on the other [26]. Coastal tracts of four distinct geographical ranges influenced by tides in the country were declared as Coastal Regulatory Zone [17]. Of these, the landward stretch between 0-500m from high tide line is referred to as Coastal Regulatory Zone I (CRZ I).

World over, a good deal of effort has been put forth for a very long time to understand the said plant communities from different perspectives [16], [30], [1]. In India also, plant resources of several geographical entities (that may at times include coastal zone too) including that of Andhra Pradesh have been well documented by several researchers right from Wight [37] to Karthikeyan et al. [13] and Roxburgh [27] to Pullaiah [19], respectively. However, works exclusively dealing with plant communities of the vast sea board of India as well as Andhra Pradesh are rather limited [3], [26].

Of the various ecosystems mentioned above, the strands and mangals occupy a major stretch of the tropical sea coast of India and harbour a mosaic of vegetation variable in structure and composition at each location depending upon a number of factors such as topography, climate, nature and rate of erosion/ deposition and sea level changes [38]. In order to maintain the resilience of the entire coastal area in general and the tropical coastal ecosystems in particular, base line information, especially on indigenous plant communities and their status is highly essential [31], [26]. Therefore, an attempt was made to collect information in this line from the northern half of Andhra Pradesh coast (15°42'06"N, 80°51'03"E to 19°05'51"N, 84°47'44"E) adjoining Bay of Bengal and collate the same with certain interesting facts noticed on the ecology of the area.

II. Material and Methods

As many as 84 localities along the CRZ I ~450km in northern Andhra Pradesh bound by the Bay of Bengal on the east were surveyed (Table I, Fig. 1). After reaching a particular place, 2-3km stretch of the beach was perambulated either way from a central point by two persons each, unless interrupted by geographical barriers; to cover the vegetated CRZ I. In the case of mangals, boats were employed to survey the areas. During the course, habitat, growth form, flowering and fruiting aspects of each plant species and the region of its zonation were recorded while various floral twigs or whole plant specimens were collected simultaneously. All the

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The authors are highly thankful to the Director General, Indian Council of Forestry Research and Education, Dehra Dun for encouragement. Many thanks are due to the Staff/ Research Fellows of the W. B. Centre (Marine), Visakhapatnam and Andhra Pradesh State Forest Department for all the courtesies and Botanical Survey of India for patient inputs in specimen identification.

specimens so collected were poisoned soon after a day's survey [11]. For recording the zonation of strand vegetation and mangal flora, the classifications of [24], [25] were followed, respectively. The classification of the former authors was also taken as the basis for distinguishing different vegetation types existing along the coasst. Information on any end use of the collected plants was obtained from guides/ village elders at each place. On returning to the camp, the specimens were kept open ventiallated for three hours and later segregated, labeled and prepared into herbarium. Subsequently, the voucher specimens were identified with help of standard keys *viz*. [10], [19]-[23], [34]-[36] besides comparison at the Botanical Survey of India, Kolkata. Finally, the herbarium was deposited in Wood Biodegradation Centre (Marine), Visakhapatnam of the Institute of Wood Science and Technology. All plants in the inventory were organized into families as per Bentham and Hooker' [4] classification and into genera/species in ascending order of the English alphabets within each family. Field collection number as well as other details of the first representative specimen of a plant species were cited in the inventory detailed.

TABLE I
LOCALITIES OF CRZ I OF NORTHERN A. P. SURVEYED

Sl.	District	Localities				
I	Srikakulam	1. Lakshmipuram	2. Donkuru	3. Kapasukuddi	4. Battivanipalem	5. Kothavanipalem
		6. Chinakarrivanipalem	7. Pedakarrivanipalem	8. Iddavanipalem	9. Kalingapatnam	10. Ontur
		11. Gollagondi	12. Baruva kothur	13. Battikaluru	14. Donkalapadu	15. Nuvvalarevu
		16. Bhavanapadu	17. Mulapeta	18. Geddalapalem	19. Cheruvugatlapeta	20. Jagannadhapuram
		21. Ummilada	22. Jogampeta	23. Rajarampuram	24. Kalingapatnam (south)	25. Matsyalesam
		26. Mogadalapadu	27. Pukkallapeta	28. Balarampuram	29. Dibbalapalem	30. D. matsyalesam
		31 Kochherla	32. Allivalasa	33. Donupeta	34. Chintapalle	35. Konadapeta
II	Vizianagaram	36. Bhimunipatnam	37. Chepala uppada	38. Thimmapuram		
		39. Kapula uppada	40. Sagara durga	41. Yarada	45. Bangarammapalem	
III	Visakhapatnam	42. Chippada	43. Pudimadaka	44. Kotha kodur	46. Rajayyapeta	47. Pentakota
		48. Kumarapuram	49. Uppada	50. Hope Island	51. Chollangi	52. Raathi kalava
		53. Masanitippa				
IV	East Godavari	54. Matlatippa	55. Kothapalem	56. Sacromento	57. Neelarevu	58. Molletimoga
		59. Siri Yanam	60. Surasani yanam	61. Rameswaram	62. Yedlarevu	63. Komaragiripatnam
		64. Odalarevu	65. Kesanapalli	66. Sankaraguptam	67. Antarvedi	68. Chinamayinivanipalem
		69. Mella pallipalem	70. Mollaparru	71. Perupalem	72. China gollapalem	73. Peda gollapalem
		74. Vorlagonditippa	75. Kruthivennu pallipalem	76. Sathrampadu	77. Pedapatnam	
V	West Godavari	78. Palakayatippa	79. Bandar Fort	80. Malayakaya lanka	81. Divi point	82. Sorlagondi
		83. Nachugunta				
VI	Krishna	84. Yelichetla dibba				

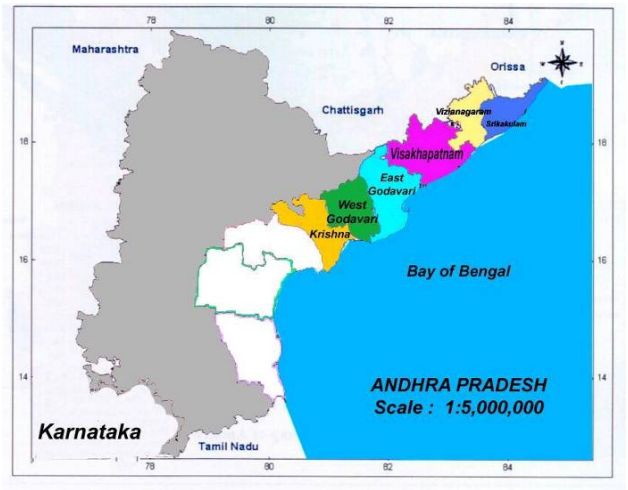

Fig. 1 Coastal Districts of northern A. P. surveyed for flora in CRZ I

III. RESULTS

A. Inventory

Of the total CRZ I surveyed along the northern Andhra Pradesh, vegetation of "Type 4A SS 1 Strand sand" was most dominant while "Type 4A SR 2 Strand Rock" only occasional and "Type 4A SC 3 Strand coral" almost absent. Besides strand sand vegetation, luxurious mangroves were present as tidal forests mainly in Godavari and Krishna deltas in addition to that in 21 hitherto unreported mangals existing as fragmented habitats representing degraded ecosystems in almost all the Districts within the survey area (Table II).

TABLE II
FRAGMENTED MANGAL HABITATS HITHERTO UNREPORTED FROM CRZ I OF NORTHERN A. P.

Sl.	District	Localities			
I	Srikakulam	1. Nuvvula revu	2. Bhavanapadu		
II	Vizianagaram	Nil			
III	Visakhapatnam	3. Port area	4. Gangavaram	5. Kotha koduru	6. Bangarammapalem
IV	East Godavari	7. Raja nagaram	8. Uppada	9. Surasani yanam	10. Rameswaram revu
		11. Yedla revu	12. Odala revu	13. Kesanapalli gollapalem	14. Antarvedi
V	West Godavari	15. Mella pallipalem	16. Perupalem		
VI	Krishna	17. Peda gollapalem	18. Vorlagonditippa	19. Kruthivennu pallipalem	20. Sathrampadu
		21. Pedapatnam			

An inventory of a total of 2148 plant specimens could be made during the entire survey. On identification, the inventory revealed a floristic composition of 364 species belonging to 225 genera under 71 families (Table III). Of these, 279 (75%) species under 179 (80%) genera and 62 (87%) families belong to Dicotyldone and 85 (25%) species under 46 (20%) genera and 9 (13%) families to Monocotyldone (Fig. 2).

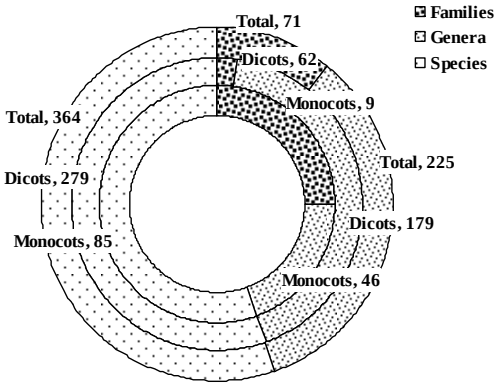

Fig. 2 Floristic composition

TABLE III
INVENTORY OF PLANT COMMUNITIES OF CRZ I OF NORTHERN A. P.

Sl.No.	Species [Local name]	Herbarium No.	Native/ Exotic	Habitat	Growth form	Flowering	Fruiting	Plant part	Used in
	1. MINISPERMACEAE								
1	*Cocculus hirsutus* (L.) Diels [Dusara theega]	322	N	P	L				
2	*Tinospora cordifolia* (Willd.) Hook. f. & Thoms. [Thippa theega]	328	N	P	L			Root paste; Whole plant extract	Blood pressure, Leuco-derma; Snake/Scorpion bite
	2.CAPPARIACEAE								
3	*Capparis zeylanica* L. [Uppi]	339	N	P	L	Nov	Nov		
	3. CLEOMACEAE								
4	*Cleome aspera* Koen. ex DC.	1283	N	P	H		Aug		
5	*C. gynandra* L.	616	E	P	H	Aug	Aug		
6	*C. viscosa* L. [Kukka vaminta]	375	E	P	H	Mar	Mar	Root paste	Blisters, Boils
	4. VIOLACEAE								
7	*Hybanthus enneaespermus* (L.) F. v. Muell. [Ratna purusha]	42	N	P	H	Sep	Sep	Whole plant paste	Snake bite
	5. POLYGALACEAE								
8	*Polygala arvensis* Willd. [Khoto]	1229	N	P	H	Jun		Whole plant extract	Fever, Snake bite
	6. CARYOPHYLLACEAE								
9	*Polycarpaea corymbosa* (L.) Lam. [Rajuma]	415	N	P	H	Mar	Mar	Whole plant extract	Fever
	7. PORTULACACEAE								
10	*Portulaca oleracea* L. [Pappu kura]	364	E	P	H		Nov	Whole plant extract	Burns, Cuts, Wounds
11	*Portulaca quadrifida* L. [Sanna pappu kura]	365	E	P	H	Nov	Nov		
12	*P. pilosa* L. var. *tuberosa* (Roxb.) Sivarajan [Paayila aaku]	12	N	Halo	H	Aug	Aug		
13	*P. wightiana* Wt. & Arn.	1267	N	P	H	Aug	Aug		
	8. MALVACEAE								
14	*Abutilon indicum* (L.) Sweet [Thuthura benda]	1916	N	P	S	Feb			
15	*Hibiscus ovalifolius* (Forssk.) Vahl	1269	N	P	H	Aug			
16	*H. tiliaceus* L. [Atta kanara]	2532	N	MA	T	Dec		Roots	Diuretic, Pimples
17	*Pavonia odorata* Willd.	936	N	P	H	Aug	Aug		
18	*P. zeylanica* (L.) Cav.	663	N	P	H	Aug	Aug		
19	*Sida acuta* Burm. f. [Paraasu kampa]	556	E	P	H			Root paste	Blisters, Boils, Bone fracture
20	*S. cordata* (Burm. f.) Borssum [Gayapu aaku]	32	N	P	H	Sep		Leaf poultice	Cuts, Wounds, Snake bite
21	*S. cordifolia* L. [Chiru benda]	15	N	P	H	Aug	Aug	Root extract	Nerve tonic
22	*Thespesia populnea* (L.) Sol. ex Corr. [Ganga raavi]	1900	N	P	T	Jun		Bark extract; Leaf	Arthritis; Stomach ailments

	9. STERCULIACEAE								
23	*Waltheria indica* L. [Nalla benda]	944	E	P	H	Aug		Whole plant powder	Cuts, Wounds
	10. TILIACEAE								
24	*Brownlowia tersa* (L.) Kosterm.	2529	N	MA	T	Jul	Jul		
25	*Corchorus tridens* L.	522	E	P	H	May	May		
26	*Triumfetta rhomboidea* Jacq.	38	E	P	H	Sep	Sep		
	11. ZYGOPHYLLACEAE								
27	*Tribulus terrestris* L. [Chinna palleru]	428	E	P	H	Mar	Mar		
	12. RUTACEAE								
28	*Glycosmis pentaphylla* (Retz.) DC. [Golugu]	368	N	P	S	Nov		Leaf paste	Diabetes
29	*Toddalia asiatica* (L.) Lam. [Erra gokiri]	1140	N	P	S				
	13. SIMAROUBACEAE								
30	*Ailanthus excelsa* Roxb. [Pedda maanu]	71	N	P	T			Bark	Febrifuge
	14. MELIACEAE								
31	*Azadirachta indica* A. Juss. [Vepa]	2685	N	P	T	Feb	Apl	Leaf extract, Seed oil	Vermicide
32	*Xylocarpus granatum* Koenig [Pedda senuga]	1521	N	M	T	Aug	Aug	Bark; Seed paste	Diarrhoea; Insecticide
33	*X. mekongensis* Pierre [Senuga]	2661	N	M	T	Aug	Aug		
	15. RHAMNACEAE								
34	*Zizyphus oenoplia* (L.) Mill. [Parimi]	329	N	P	S		Nov	Leaf extract; Bark paste	Bone fracture; Eczema
	16. VITACEAE								
35	*Cissus quadrangularis* L. [Nalleru]	961	N	P	L	Aug	Aug	Whole plant paste	Bone fracture
	17. SAPINDACEAE								
36	*Allophylus serratus* (Roxb.) Kurz. [Kaki bira]	29	N	P	S	Sep	Sep	Ripe friuts	Digestion
37	*Dodonaea viscosa* (L.) Jacq. [Adavi bandaru]	937	N	P	S			Leaf poultice	Bone fracture
38	*Sapindus emarginata* Vahl [Kunkudu]	2693	N	P	T			Ripe fruiets	Skin and Hair cleansing
	18. ANACARDIACEAE								
39	*Anacardium occidentale* L. [Jeedi maamidi]	380	E	P	T	Mar	Mar	Bark extract; Ripe fruits	Leprosy sores; Scurvy
	19. FABACEAE								
40	*Abrus precatorius* L. [Guruvinda]	359	N	P	S		Nov	Seed paste	Leucoderma, Snake bite
41	*Aeschynomene indica* L. [Jeeluga]	347	N	P	H	Nov	Nov		
42	*Alysicarpus monilifer* (L.) DC. [Amera]	569	N	P	H	Jul	Jul	Whole plant paste	Bristols, Boils
43	*A. vaginalis* (L.) DC.	954	N	P	H				
44	*Atylosia scarabaeoides* (L.) Benth. [Adavi uluva]	930	N	P	H	Aug			
45	*Clitoria ternatea* L. [Sanku puvvu]	1405	N	P	L	Aug	Aug	Flower extract; Root paste	Diabetes; Filariasis
46	*Crotalaria albida* Heyne ex Roth	459	N	P	H	Mar	Mar		
47	*C. hirsuta* Willd.	1151	N	P	H	Feb	Feb		
48	*C. laburnifolia* L. [Pedda giligichcha]	357	N	P	S	Nov	Nov	Root paste	Scorpion sting
49	*C. medicaginea* Lam.	568	N	P	H	Jul			
50	*C. pallida* Ait.	341	E	P	H	Nov	Nov		
51	*C. prostrata* Rottl. ex Willd. [Sangula gulla]	442	N	P	H	Mar	Mar		
52	*C. retusa* L.	801	E	P	H	Sep	Sep		
53	*C. verrucosa* L. [Chinna giligichcha]	815	N	P	H	Sep	Sep	Leaf poultice	Scabis
54	*Dalbergia spinosa* Roxb. [Chillinga]	1498	N	MA	S	Aug			
55	*Derris scandens* (Roxb.) Benth.	1501	N	MA	L	Aug	Aug		
56	*D. trifoliata* Lour. [Nalla theega]	383	N	MA	H			Bark, Root	Insecticide
57	*Desmodium gangeticum* (L.) DC.	637	N	P	H	Aug	Aug		
58	*Gliricidia sepium* (Jacq.) Kunth ex Wolp. [Seema ganuga]	410	E	P	T	Mar			
59	*Goniogyne hirta* (Willd.) Ali	645	N	P	H	Aug			
60	*Indigofera colutea* (Burm. f.) Merr.	1147	N	P	H	Feb	Feb		
61	*I. glabra* L.	822	N	P	H	Sep	Sep		
62	*I. linifolia* (L. f.) Retz.	943	E	P	H				
63	*I. linnaei* Ali	612	E	P	H	Jul	Jul		
64	*I. oblongifolia* Forssk.	939	N	P	H	Aug			
65	*I. trita* L. f.	462	E	P	H	Mar			
66	*Rothia indica (*L.) Druce	39	N	P	H	Sep	Sep		
67	*Stylosanthes fruticosa* (Retz.) Alston	950	N	P	H	Aug			
68	*Tephrosia pumila* (Lam.) Pers.	416	N	P	H	Mar	Mar		
69	*T. purpurea* (L.) Pers. [Thella vempali]	393	N	P	H			Leaf poultice, Fruit paste; Root paste	Headache, Eczema; Arth-ritis; Snake/ Scorpion bite
70	*T. spinosa* (L. f.) Pers.	602	N	P	H	Jul			
71	*T. villosa* (L.) Pers.	819	N	P	H	Sep	Sep		
72	*Vigna sublobata* (Roxb.) Bairig.	507	N	P	H	May	May		
73	*V. trilobata* (L.) Verdc. [Pilli pesara]	549	N	P	H	May		Leaf extract	Fever
74	*Zornia diphylla* (L.) Pers.	426	N	P	H	Mar	Mar		
75	*Z. gibbosa* Sponoghe [Hunnali]	935	N	P	H	Aug		Whole plant paste	Diarrhoea
	20. CAESALPINIACEAE								

76	*Caesalpinia bonduc* (L.) Roxb. [Gachchakaya]	350	N	P	L		Mar	Leaf powder	Malaria
77	*Cassia auriculata* L. [Thangedu]	952	N	P	H	Aug	Aug		
78	*C. occidentalis* L. [Kasinda]	46	E	P	S	Mar	Mar	Root extract; Root paste	Anti-emetic; Filariasis
79	*C. tora* L.	639	E	P	H	Aug	Aug		
	21. MIMOSACEAE								
80	*Acacia auriculiformis* A. Cunn. ex Benth. [Sarkari thumma]	335	E	P	T	Nov		Leaf extract	Liver problems, Jaundice
81	*A. nilotica* (L.) Delile [Nalla thumma]	809	N	P	T	Sep		Bark paste	Snake bite
82	*Mimosa pudica* L. [Atthi patthi]	373	E	P	H	Nov	Nov	Leaf paste	Filariasis, Ring worm
83	*Pithecelobium dulce* (Roxb.) Benth. [Seema chintha]	340	N	P	T			Root paste	Rabies
84	*Prosopis chilensis* (Molina) Stuntz.	999	E	P	T	Feb	Feb		
	22. RHIZOPHORACEAE								
85	*Bruguiera cylindrica* (L.) Bl. [Urudu]	3	N	M	T	Jun	Jun		
86	*B. gymnorrhiza* (L.) Savigny [Kandriga]	853	N	M	T	Aug	Aug	Fruits	Eye diseases
87	*Ceriops decandra* (Griff.) Ding Hou [Thogara]	847	N	M	S	Mar	Mar		
88	*C. tagal* (Perr.) Robins. [Thogara]	2528	N	M	S	Aug	Aug	Bark extract	Malaria
89	*Rhizophora apiculata* L. [Ponna]	855	N	M	T	Nov	Nov		
90	*R. mucronata* Poir. [Uppu ponna]	1493	N	M	T	Aug		Fruits	Diabetes
	23. COMBRETACEAE								
91	*Lumnitzera racemosa* Willd. [Thanduga]	844	N	M	S	May	May		
	24. MYRTACEAE								
92	*Eugenia bracteata* (Willd.) Roxb. ex DC.	916	N	P	S	Aug			
	25. LYTHRACEAE								
93	*Ammania baccifera* L.	505	N	P	H	May	May		
94	*A. multiflora* Roxb.	480	N	P	H	Mar	Mar		
95	*Rotala densiflora* (Roth ex Roem. & Schult.) Koehne	458	N	P	H				
	26. SONNERATIACEAE								
96	*Sonneratia alba* J. Sm. [Pedda kaalinga]	843	N	M	T	Nov	Nov		
97	*S. apetala* Buch.-Ham. [Kaalinga]	846	N	M	T	Nov	Nov		
	27. ONAGRACEAE								
98	*Ludgwigia perennis* L.	481	E	P	H	Mar	Mar		
	28. TURNERACEAE								
99	*Turnera ulmifolia* var. *angustifolia* (Mill.) Willd.	439	N	P	H	Mar	Mar		
	29. PASSIFLORACEAE								
100	*Passiflora foetida* L. [Thella jumuki]	367	E	P	H	Nov	Nov		
	30. CUCURBITACEAE								
101	*Citrullus colocynthis* (L.) Schard. [Verri putchcha]	540	N	P	L		May	Fruit powder	Helminthicide
102	*Coccinia grandis* (L.) Voigt. [Kaki donda]	305	N	P	H	Nov	Nov		
103	*Cucumis melo* L.	2338	N	P	L				
104	*Momordica charantia* L.	658	N	P	L	Aug			
105	*Mukia maderaspatana* (L.) Roem. [Noogu dosa]	308	N	P	L	Nov	Nov		
	31. CACTACEAE								
106	*Opuntia elatior* Mill. [Bomma jemudu]	2688	N	X	S				
107	*O. stricta* (Haw.) Haw. [Jemudu]	2689	E	X	S				
108	*O. vulgaris* Mill. [Naga jemudu]	2690	N	X	S				
	32. AIZOACEAE								
109	*Gisekia pharnaceoides* L. [Dhanthi koora]	526	N	P	H	May	May		
110	*Sesuvium portulacastrum* (L.) L.	6	N	Halo	H	Jun			
111	*Trianthema portulacastrum* L.[Galijeru]	430	N	P	H	Mar	Mar		
112	*T. triquetra* Rottl. ex Willd.	1969	N	P	H	Feb			
	33. MOLLUGINACEAE								
113	*Glinus oppositifolius* (L.) A. DC.	431	N	P	H	Mar	Mar		
114	*Mollugo cerviana* (L.) Ser.	390	N	P	H	Mar			
115	*M. disticha* (L.) Ser. [Verri chatarasi]	41	N	P	H	Sep	Sep		
116	*M. nudicaulis* Lam.	691	N	P	H	Aug			
117	*M. pentaphylla* L. [Verri chatarasi]	355	N	P	H	Nov	Nov		
	34. APIACEAE								
118	*Centella asiatica* (L.) Urban [Saraswathi aaku]	399	N	P	H	Mar	Mar	Leaf powder; Whole plant extract	Leprosy; Jaundice
	35. ALANGIACEAE								
119	*Alangium salvifolium* (L. f.) Wang [Ooduga]	920	N	P	S			Root bark; Whole plant extract	Dog bite; Fever
	36. RUBIACEAE								
120	*Benkara malabarica* (Lam.) Tirveng. [Pedda malli]	692	N	P	S				
121	*Canthium praviflorum* Lam. [Balusu]	1102	N	P	H			Leaf extract; Root extract	Fever; Diarrhoea
122	*Hedyotis affinis* Roem. & Schult.	445	N	P	H	Mar	Mar		
123	*H. aspera* Heyne ex Roth	404	N	P	H	Mar	Mar		
124	*H. biflora* (L.) Lam.	934	N	P	H	Aug	Aug		
125	*H. herbacea* L.	1443	N	P	H	Aug			
126	*H. puberula* (G. Don.) Arn.	50	N	P	H	Sep	Sep		
127	*H. caerulea* Wight & Arn.	13	N	P	H	Aug	Aug		

128	*H. corymbosa* (L.) Lam.	1442	N	P	H	Aug	Aug		
129	*Hydrophylax maritima* L. f.	18	N	P	H	Sep	Sep		
130	*Morinda pubescens* Sm. [Thogaru]	338	N	P	T	Nov	Nov		
131	*Scyphiphora hydrophyllacea* Gaertn. [Nara Thanduga]	1519	N	M	T	Aug	Aug		
132	*Spermacoce articularis* L. f. [Madana aaku]	24	N	P	H	Sep	Sep	Root extract	Snake bite
133	*S. hispida* L.	45	E	P	H	Sep	Sep		
134	*S. pusilla* Wall. [Pachcha noori]	362	N	P	H	Nov	Nov	Leaf paste	Mouth ulcers
	37. ASTERACEAE								
135	*Ageratum conyzoides* L. [Vishamusti]	382	E	P	H	Mar	Mar	Leaf extract; Poultice	Emetic; Leprosy sores
136	*Blumea solidaginoides* (Poir.) DC.	401	N	P	H	Mar	Mar		
137	*Centipeda minima* (L.) A. Braun & Asch.	446	N	P	H	Mar	Mar		
138	*Eclipta prostrata* (L.) L. [Gunta kalagara]	371	E	P	H	Mar	Mar	Whole plant extract; Whole plant paste	Filariasis; Eczema
139	*Emilia sonchifolia* (L.) DC. [Gayapu aaku]	303	E	P	H	Nov	Nov	Leaf poultice	Blisters, Boils
140	*Epaltes pygmaea* DC.	1988	N	P	H	Feb			
141	*Grangea maderaspatana* (L.) Poir. [Nemali padam]	471	E	P	H	Mar	Mar		
142	*Launaea procumbens* (Roxb.) Ramayya & Rajagopal	1207	N	P	H	Jun			
143	*L. sarmentosa* (Willd.) Schultz-Bip. ex Kuntze	14	N	P	H	Sep	Sep		
144	*Parthenium hysterophorus* L.	585	E	P	S	Jul	Jul		
145	*Sphaeranthus indicus* L. [Boddasaram]	470	N	P	H	Mar	Mar	Leaf paste	Mouth ulcers
146	*Tridax procumbens* L. [Gaddi chaamanthi]	96	E	P	H	Nov	Nov	Leaf extract; Whole plant paste	Ring worm; Cuts, Wounds
147	*Vernonia cinerea* (L.) Less. [Garitiki]	17	N	P	H	Sep	Sep	Leaf/ Flower extract; Seed powder	Malaria; Leucoderma
148	*V. divergens* (Roxb.) Edgew. [Kampu rotta]	378	N	P	H	Mar	Mar		
149	*Xanthium indicum* Koenig	632	N	P	H				
	38. GOODENIACEAE								
150	*Scaveola sericea* Vahl.	991	N	P	S	Nov	Nov		
	39. PLUMBAGINACEAE								
151	*Plumbago zeylanica* L. [Chitra mulam]	344	N	P	S	Nov	Nov	Whole plant paste	Blisters, Boils
152	*Aegialites rotundifolia* Roxb. [Pocha]	2663	N	M	S		Aug		
	40. MYRSINACEAE								
153	*Aegiceras corniculatum* (L.) Blanco. [Guggilam]	811	N	M	S	Mar	Aug	Bark, Seeds	Piscicide
	41. SALVADORACEAE								
154	*Azima tetracantha* Lam. [Uppu kampa]	1683	N	P	S				
155	*Salvadora persica* L. var. *wightiana* (Planch. ex Thw.) Verdc.	1022	N	P	T		May		
	42. APOCYNACEAE								
156	*Carissa carandas* L.	664	N	P	S	Aug			
157	*C. spinarum* L. [Vaka]	945	N	P	S		Aug	Seed powder	Tooth ache
158	*Catharanthus roseus* (L.) G. Don [Billa ganneru]	33	N	P	H	Sep	Sep	Leaf extract; Whole plant extract	Diabetes; Diabetes, Cancer
159	*Rauvolfia tetraphylla* L. [Papata aaku]	337	N	P	S		Nov		
	43. ASCLEPIADACEAE								
160	*Calotropis gigantea* R. Br. [Tella jilledu]	100	E	P	S	Nov		Latex; Leaf paste; Warmed up leaves	Tooth ache; Withlow; Scorpion sting; Body pains sting, Snake bite
161	*C. procera* (Ait.) R. Br. [Jilledu]	2305	E	P	S	Jul		Flower bud/ Root powder	Fever
162	*Pergularia daemia* (Forssk.) Chiov. [Dushtapu theega]	647	N	P	L	Aug		Leaf poultice	Bone fracture, Scabies
163	*Sarcolobus carinatus* Vahl.	1464	N	P	L	Aug			
164	*S. globosus* Vahl.	2679	N	Ma	L				
165	*Hemidesmus indicus* (L.) R. Br.	900	N	P	L	Aug	Aug		
166	*Tylophora indica* (Burm. f.) Merr. [Gorri pala theega]	72	N	P	L	Sep		Tender twigs; Root paste; Leaf extract	Emetic; Vermicide; Asthma
	44. GENTIANACEAE								
167	*Enicostema hissopifolium* (Willd.) Verdoon.	2303	N	P	H	Jul			
	45. BORAGINACEAE								
168	*Coldenia procumbens* L. [Hamsa padu]	472	N	P	H	Mar	Mar	Whole plant paste	Eczema, Psoriasis
169	*Cynoglossum zeylanicum* (Vahl ex Hornem) Thunb. ex Lehm.	536	N	P	H	May			
170	*Heliotropium curassavicum* L. [Neela golividi]	381	N	P	H	Mar	Mar		
171	*H. indicum* L. [Naga danthi]	490	N	P	H	Mar	Mar	Leaf paste	Snake bite, Scorpion sting
172	*H. marifolium* Retz.	609	N	P	H	Jul	Jul		
173	*Heliotropium scabrum* Retz.	672	N	P	H	Aug	Aug		
174	*Trichodesma indica* R. Br.	527	N	P	S				
	46. EHRETIACEAE								
175	*Carmona retusa* (Vahl) Masam.	1000	N	P	H	Feb			
	47. CONVOLVULACEAE								
176	*Argyreia nervosa* (Burm. f.) Boj. [Samudra pala]	352	N	P	S	Nov	Nov	Leaves	Carbuncles
177	*Cressa cretica* L.	363	N	Halo	H	Mar	Mar		

178	*Evolvulus alsinoides* (L.) L. [Vishnu kanthi]	403	N	P	H	Mar	Mar	Whole plant powder; Whole plant paste	Instability, Memory loss; Strengthens gums
179	*E. nummularius* (L.) L. [Sitamma savaralu]	561	E	P	H			Whole plant paste	Blisters, Boils, Burns
180	*Ipomoea pes-caprae* (L.) R. Br. [Beda aaku]	53	N	P	L	Sep		Leaves; Whole plant extract	Rabbit fodder; Sterility in females
181	*I. tuba* (Schlecht.) G. Don [Thella theega]	1445	N	P	L	Aug			
182	*Merremia tridentata* (L.) Hall. f. [Elukachevula aaku]	90	N	P	H	Sep	Sep	Leave extract	Rheumatism, Urinary disorders
	48. SOLANACEAE								
183	*Datura stramonium* L. [Ummaeththa]	1161	N	P	H	Feb			
184	*Physalis minima* L. [Budda busara]	321	N	P	H	Nov	Nov		
185	*Solanum melongena* L. [Chiru vanga]	553	N	P	H	May		Twig extract	Lung troubles
186	*S. melongena* L. var. *insanum* (L.) Prain [Chiru vanga]	56	N	P	S	Sep	Sep		
187	*S. trilobatum* L. [Mulla mushti]	55	N	P	L	Sep	Sep	Root extract	Fever
188	*S. violaceum* Orteg.	519	N	P	H	May	May		
189	*S. virginianum* L. [Verri vanga]	384	N	P	H	Mar		Tender fruit curry	Helminthicide
	49. SCROPHULARIACEAE								
190	*Bacopa floribunda* (R. Br.) Wettst.	444	N	P	H	Mar	Mar		
191	*Centranthera tranquebarica* (Spreng.) Merr.	2302	N	P	H	Jul			
192	*Scoparia dulcis* L. [Dashini]	1768	E	P	H	Nov		Whole plant extract	Fever, Kidney stones
	50. PEDALIACEAE								
193	*Pedalium murex* L. [Pedda palleru]	78	E	P	H	Mar	Mar		
	51. MARTYNIACEAE								
194	*Martynia annua* L. [Puligoru chettu]	618	N	P	H	Aug			
	52. ACANTHACEAE								
195	*Acanthus ilicifolius* L. [Alchi]	4	N	MA	S	Jun		Leaf extract	Rheumatism
196	*Asystasia gangetica* (L.) T. And. [Metta aaku]	306	N	P	H	Mar	Mar		
197	*Barleria prionitis* L. [Mulla gorinta]	997	N	P	H		Feb	Leaf extract	Gum troubles
198	*Blepharis repens* (Vahl) Roth	956	N	P	H				
199	*Dipteracanthus prostratus* (Poir.) Nees	47	N	P	H	Sep	Sep		
200	*Ecbolium viride* (Forssk.) Alston	981	N	P	H	Feb			
201	*Indoneesiella echioides* (L.) Sreemadh. [Potti nelavemu]	361	N	P	H	Nov	Nov	Whole plant paste; Root paste	Snake bite; Skin diseases
202	*Justicia glauca* Rottl. [Konda pindi]	372	N	P	H	Nov	Nov		
203	*J. prostrata* (C. B. Cl.) Gamble	411	N	P	H	Mar	Mar		
	53. VERBENACEAE								
204	*Clerodendrum inerme* (L.) Gaertn. [Yeti pisinika]	345	N	P	S	Nov	Nov		
205	*Lantana camara* L. [Gaju kampa]	66	E	P	S	Sep	Sep	Leaf paste; Seed paste	Cuts, Wounds; Snake bite
206	*Phyla nodiflora* (L.) Greene [Neeti pippali]	84	N	P	H	Sep	Sep	Whole plant paste	Tooth troubles
207	*Vitex negundo* L. [Nalla vavili]	491	N	P	S			Leaf extract	Scrofula
	54. AVICENNIACEAE								
208	*Avicennia alba* Bl. [Gundu mada]	849	N	M	T	Mar	Nov	Bark sap; Seed paste	Contraceptive; Small-pox
209	*A. marina* (Forssk.) Vierh. [Tella mada]	5	N	M	T	Aug		Leaves; Roots	Cattle lactation; Minor fish stings
210	*A. officinalis* L. [Nalla mada]	1026	N	M	T	Jul	Jul	Seed	Ulcers
	55. LAMIACEAE								
211	*Anisochilus cornosus* (L. f.) Wall.	985	N	P	H		Feb		
212	*Anisomeles indica* (L.) Kuntze	482	N	P	H	Mar	Mar		
213	*Hyptis suaveolens* (L.) Poir. [Seema thulasi]	304	E	P	H	Nov	Nov	Root extract	Fever
214	*Lemna polyrhiza* L.	675	N	Hydro	H		Aug		
215	*Leucas aspera* (Willd.) Link. [Tella thummi]	336	N	P	H	Nov	Nov		
216	*L. stricta* Benth.	538	N	P	H	Aug	Aug		
217	*Ocimum canum* Sims. [Kukka thulasi]	369	E	P	H	Nov	Nov	Leaf extract	Epilepsy
218	*O. tenuiflorum* L. [Thulasi]	636	N	P	S	Aug	Aug	Leaf extract	Dandruff
219	*Orthosiphon pallidus* Benth.	484	N	P	H	Mar	Mar		
	56. NYCTAGINACEAE								
220	*Boerhavia diffusa* L. [Atika maamidi]	43	N	P	H	Sep	Sep	Leaf extract; Root powder; Root paste	Fever; Helminthicide; Jaundice, Asthma
	57. AMARANTHACEAE								
221	*Achyranthes aspera* L. var. *aspera* [Uthareni]	37	N	P	H	Mar	Mar	Whole pant; Root paste	Obesity; Scorpion sting
222	*A. aspera* L. var. *porphyristachya* (Wall ex Moq.) Hook. f. [Uthareni]	31	N	P	H	Sep	Sep		
223	*Aerva lanata* (L.) Juss. ex Schultes [Pindi koora]	653	N	P	H	Aug			
224	*A. sanguinolenta* (L.) Bl.	990	N	P	H	Feb	Feb		
225	*Allmania nodiflora* (L.) R. Br. ex Wight var. *procumbens* Hook. F.	35	N	P	H	Sep	Sep		
226	*A. nodiflora* (L.) R. Br. ex Wight var. *roxburghii* Wight	27	N	P	H	Sep	Sep		
227	*Alternanthera paronychioides* St. Hil.	978	E	P	H	Feb	Feb		

228	*Alternanthera pungens* Kunth.	427	E	P	H	Mar	Mar		
229	*A. sessilis* (L.) R. Br. ex DC. [Ponnaganti koora]	99	N	P	H	Mar	Mar	Root extract; Whole plant paste	Emetic; Bone fracture
230	*Amaranthus graecizans* L.	422	N	P	H	Mar	Mar		
231	*A. spinosus* L.	665	N	P	H	Aug	Aug		
232	*A. viridis* L. [Chilaka thotakura]	391	N	P	H	Mar	Mar	Root extract	Kidney stones
233	*Celosia argentea* L. [Gurugu]	464	E	P	H	Mar	Mar	Seed powder	Mouth ulcers
234	*Digera muricata* (L.) Mart. [Chenchali koora]	680	E	P	H	Aug	Aug	Leaf curry	Constipation
235	*Gomphrena celosioides* Mart.	440	N	P	H	Mar	Mar		
236	*Pupalia lappacea* (L.) Juss. var. *lappacea*	44	N	P	H	Sep	Sep		
237	*P. lappacea* (L.) Juss. var. *orbiculata* (Heyne ex Wall) Townsend	620	N	P	H	Aug	Aug		
	58. CHENOPODIACEAE								
238	*Arthrocnemum indicum* (Willd.) Moq.	900	N	Halo	H	Mar	Mar		
239	*Atriplex repens* Roth	1666	N	Halo	H	Feb	Feb		
240	*Salicornia brachiata* Roxb.	9	N	Halo	H	Aug	Aug		
241	*Suaeda fruticosa* (L.) Forssk.	858	N	Halo	H	Nov	Nov		
242	*Suaeda nudiflora* (Willd.) Moq. [Eeela koora]	11	N	Halo	H				
243	*S. maritima* (L.) Dumot [Eeela koora]	8	N	Halo	H	Jun			
244	*S. monoica* Forssk. ex Gmel. [Eeela koora]	10	N	Halo	H	Mar	Mar		
	59. ARISTOLOCHIACEAE								
245	*Aristolochia bracteolata* Lam. [Gadida gadapa]	570	N	P	H		Jul		
246	*A. indica* L. [Gadida gadapa]	48	N	P	L	Nov	Nov	Root paste	Snake bite
	60. LAURACEAE								
247	*Cassytha filiformis* L. [Noolu theega]	330	N	Parasite	L	Nov	Nov	Whole plant paste	Hydrocele
	61. EUPHORBIACEAE								
248	*Acalypha alnifolia* Klein ex Willd.	2	N	P	H	May	May		
249	*A. indica* L. [Kuppi chettu]	667	N	P	H	Aug	Aug	Leaf extract	Emetic
250	*A. lanceolata* Willd. [Muripinda]	1	N	P	H	Nov	Nov		
251	*A. malabarica* Muell.-Arg.	62	N	P	H	Sep	Sep		
252	*Breynia vitis-idaea* (Burm. f.) Fischer [Tella pulichi]	358	N	P	S	Nov	Nov		
253	*Chrozophora rottleri* (Geisel.) Juss.	417	E	P	H	Mar	Mar		
254	*Croton bonplandianum* Baill. [Nakka thulasi]	97	E	P	H	Nov	Nov		
255	*Dimorphocalyx glabellus* Thw.	1849	N	P	S	Mar	Mar		
256	*Euphorbia chamaesyce* L.	941	N	P	H	Aug			
257	*E. hirta* L. [Chukka mokka]	504	E	P	H	May	May	Whole plant paste	Blisters, Boils
258	*E.rbia rosea* Retz.	26	N	P	H	Oct	Oct		
259	*E. serpens* Kunth	630	N	P	H	Aug	Aug		
260	*E. tirucalli* L. [Kada chemudu]	386	E	X	S			Phylloclade extract	Ear pain
261	*Excoecaria agallocha* L. [Thilla]	7	N	M	T	Jun	Jun	Bark extract; Sap	Emetic, Purgative; Fish stings, Tooth ache, Ulcers
262	*Jatropha curcas* L.	2360	E	P	S	Sep			
263	*Jatropha glandulifera* Roxb. [Nepalam]	16	N	P	S	Mar	Mar		
264	*J. gossypifolia* L. [Seema nepalem]	454	E	P	S	Mar	Mar	Leaf paste	Blisters, Boils, Cuts, Wounds
265	*Phyllanthus amarus* Schum. & Thonn. [Nela usiri]	98	N	P	H	Nov	Nov	Whole plant powder	Diabetes
266	*P. debilis* Klein ex Willd.	21	N	P	H	Oct	Oct		
267	*P. fraternus* Webster	523	N	P	H	May	May		
268	*P. maderaspatensis* L. [Nela usirika]	374	N	P	H	Nov	Nov	Whole plant paste	Tooth ache
269	*P. rheedii* Wt.	433	N	P	H	Mar	Mar		
270	*P. reticulatus* Poir. [Nalla pulugudu]	61	N	P	S			Leaf extract	Bleeding gums
271	*P. rotundifolius* Klein ex Willd.	617	N	P	H	Aug	Aug		
272	*P. urinaria* L. [Erra usirika]	85	N	P	H	Sep	Sep		
273	*P. virgatus* Forst. f. [Chiru usirika]	356	N	P	H	Nov	Nov	Bark extract	Body swellings
274	*Ricinus communis* L.	2692	N	P	S				
275	*Sebastiania chamaelea* (L.) Muell.-Arg. [Bepana boora aaku]	1153	N	P	H	Feb	Feb	Whole plant powder	Fever
276	*Securinega leucopyrus* (Willd.) Muell.-Arg.	566	N	P	S				
277	*S. virosa* (Roxb. ex Willd.) Baill. [Suthamantha]	557	N	P	S	Jul			
278	*Tragia involucrata* L. [Doolagondi]	657	N	P	H	Aug	Aug	Root paste	Skin diseases
	62. CASUARINACEAE								
279	*Casuarina equisetifolia* L. [Sarugudu]	351	E	X	T	Nov			
	63. HYDROCHARITACEAE								
280	*Halophila beccarii* Asch. [Samudrapu nachu]	859	N	Hydro	H	Dec	Dec		
	64. AGAVACEAE								
281	*Sansevieria roxburghiana* Schult. & Schult. f. [Nela kithala]	1266	N	P	H	Aug		Leaf paste; Root paste	Mumps; Snake bite
	65. LILIACEAE								
282	*Asparagus racemosus* Willd. [Pilli peechara]	1265	N	P	H	Aug		Leaf poultice; Root extract; Tuber paste	Scabis; Galactagogue; Leprosy sores
283	*Gloriosa superba* L. [Konda nabhi]	88	N	P	L	Sep			

	66. COMMELINACEAE								
284	*Commelina attenuata* Koen. ex Vahl.	348	N	P	H	Nov			
285	*C. benghalensis* L.	485	N	P	H	Mar			
286	*C. diffusa* Burm. f.	307	N	P	H	Nov	Nov	Leaf/ Seed paste	Skin diseases
	67. ARECACEAE								
287	*Borassus flabellifer* L. [Thadi]	2686	E	P	T	Mar	Mar		
288	*Cocos nucifera* L. [Kobbari]	2687	E	P	T	Mar	Mar		
	68. PANDANACEAE								
289	*Pandanus fascicularis* Lam. [Mogali]	2691	E	P	S				
	69. RUPPIACEAE								
290	*Ruppia maritima* L.	872	N	Halo	H	Dec	Dec		
	70. CYPERACEAE								
291	*Bulbostylis barbata* (Roth) Clarke sub. sp. *pulchella* (Thw.) T. Koyama	23	N	P	Se	Sep	Sep		
292	*Cyperus arenarius* Retz.	1163	N	P	Se	Feb	Feb		
293	*C. compressus* L.	1579	N	P	Se	Nov	Nov		
294	*C. conglomeratus* Rottb.	1191	N	P	Se	Jun	Jun		
295	*C. distans* L. f. var.*distans*	685	N	P	Se	Aug	Aug		
296	*C. esculentus* L.	1426	N	P	Se	Aug	Aug		
297	*C. malaccensis* Lam.	315	N	P	Se	Nov	Nov		
298	*C. pangorei* Rottb. [Gangrila mushta]	1908	N	P	Se	Feb	Feb	Root paste	Fever
299	*C. rotundus* L. [Thunga]	1485	N	P	Se	Aug	Aug	Tuber paste	Galactagogue
300	*C. stoloniferus* Retz.	2383	N	P	Se	Sep	Sep		
301	*C. tenuiculmis* Boeck.	588	N	P	Se	Jul	Jul		
302	*C. tenuispica* Steud.	349	N	Hydro	Se	Nov	Nov		
303	*Fimbristylis bisumbellata* (Forssk.) Bubani	2384	N	P	Se	Sep	Sep		
304	*F. cymosa* R. Br.	318	N	P	Se	Nov	Nov		
305	*F. dichotoma* (L.) Vahl sub. sp. *podocarca* (Nees & Meyen) T. Koyama	830	N	P	Se	Sep	Sep		
306	*F. falcata* (Vahl) Kunth	2174	N	P	Se	Jul	Jul		
307	*F. ferruginea* (L.) Vahl	2121	N	P	Se	Jul	Jul		
308	*F. littoralis* Gaudich	1512	N	P	Se	Aug	Aug		
309	*F. ovata* (Burm. f.) Kern.	829	N	P	Se	Sep	Sep		
310	*F. polytrichoides* (Retz.) R. Br.	497	N	P	Se	Mar	Mar		
311	*F. tomentosa* Vahl	499	N	P	Se	May	May		
312	*Juncellus alopecuroides* (Rottb.) Cl.	2157	N	P	Se	Jul	Jul		
313	*Pycreus polystachyos* (Rottb.) Beauv. sub.sp. *polystachyos*	1714	N	P	Se	Nov	Nov		
314	*P. pumilus* L.	421	N	P	Se	Mar	Mar		
315	*P. sulcinus* (Clarke) Clarke	503	N	P	Se	May	May		
316	*Rikliella squarrosa* (L.) Raynal	316	N	P	Se	Nov	Nov		
317	*Schoenotlectus juncoides* (Roxb.) Palla	587	N	P	Se	Jul	Jul		
	71. POACEAE								
318	*Aeluropus lagopoides* (L.) Trin. ex Thw. [Puvvu gaddi]	863	N	P	G	Mar	Mar		
319	*Andropogan pertusus* (L.) Willd.	65	N	P	G	Sep	Sep		
320	*Apluda mutica* L.	986	N	P	G	Feb	Feb		
321	*Aristida setacea* Retz. [Cheepuru gaddi]	409	N	P	G	Mar	Mar		
322	*Brachiaria distachya* (L.) Stapf [Koranna gaddi]	1781	N	P	G	Nov			
323	*B. milliformis* (J. Prest. & C. Prest.) A. Chase	603	N	P	G	Jul	Jul		
324	*B. ramosa* (L.) Stapf [Yeduru gaddi]	633	N	P	G	Aug	Aug		
325	*B. reptans* (L.) Gard. & C. E. Hubb.	424	N	P	G	Mar	Mar		
326	*Chloris barbata* Sw.	1126	E	P	G	Feb	Feb		
327	*C. gayana* Stapf	1410	E	P	G	Aug	Aug		
328	*C. montana* Roxb.	2167	N	P	G	Jul	Jul		
329	*Cynodon dactylon* (L.) Pers. [Garika gaddi]	82	N	P	G	Sep			
330	*Dactyloctenium aegyptium* (L.) P. Beauv.	22	N	P	G	Oct	Oct		
331	*Desmostachya bipinnata* (L.) Stapf [Sadanapu veduru]	1818	N	P	G	Mar			
332	*Digitaria abludens* (Roem. & Schult.) Veldk.	925	N	P	G	Aug	Aug		
333	*D. bicornis* (Lam.) Roem. & Schult.	51	N	P	G	Nov	Nov		
334	*D. ciliaris* (Retz.) Koeler	423	N	P	G	Mar	Mar		
335	*Echinochloa colona* (L.) Link	565	E	P	G	Jul			
336	*Eragrostis cilianensis* (All.) Vign.	435	N	P	G	Mar	Mar		
337	*E. ciliaris* (L.) R. Br.	420	N	P	G	Mar	Mar		
338	*E. ciliata* (Roxb.) Nees	501	N	P	G	May	May		
339	*E. coarctata* Stapf	1984	N	P	G	Feb			
340	*E. japonica* (Thunb.) Trin.	928	N	P	G	Aug	Aug		
341	*E. tenella* (L.) Beauv. ex Roem. et Schultes	331	N	P	G	Nov	Nov		
342	*E. tenuifolia* (A. Rich.) Hochst. ex Steud.	1958	N	P	G	Feb	Feb		
343	*E. tremula* (Lam.) Hochst. ex Steud. [Banka chigurinta]	1960	N	P	G	Feb	Feb		
344	*E. viscosa* (Retz.) Trin. [Banka gaddi]	412	N	P	G	Mar	Mar		
345	*Eriochloa procera* (Retz.) Hubb.	590	N	P	G	Jul	Jul		
346	*Heteropogan contortus* (L.) P. Beauv.	1145	N	P	G	Feb	Feb		
347	*Imperata cylindrica* (L.) Raeusch. [Darbha gaddi]	1430	E	P	G	Aug	Aug		
348	*Ischaemum rugosum* Salisb.	1171	N	P	G		Feb		

349	*Iseilema anthephoroides* Hack.	929	N	P	G		
350	*Myriostachya wightiana* (Nees ex Steud.) Hook. f. [Uppu gaddi]	868	N	P	G	Jul	
351	*Paspalidium geminatum* (Forssk.) Stapf	656	N	P	G	Aug	Aug
352	*Paspalum paspalodes* (Michx.) Scribner	83	N	P	G	Sep	Sep
353	*P. vaginatum* Sm.	1414	N	P	G	Aug	Aug
354	*Pennisetum pedicellatum* Trin.	1159	N	P	G	Feb	Feb
355	*Perotis indica* (L.) Kuntze [Jerri gaddi]	81	N	P	G	Mar	Mar
356	*Phragmites karka* (Retz.) Trin.	2257	N	P	G	Jul	Jul
357	*Porteresia coarctata* (Roxb.) Tateoka [Yelu gaddi]	850	N	P	G	Nov	Nov
358	*Saccharum spontaneum* L. [Rellu gaddi]	60	E	P	G	Sep	Sep
359	*Spinifex littoreus* (Burm. f.) Merr. [Ravanasuridi meesaalu]	70	N	P	G	Nov	Nov
360	*Sporobolus coromandelianus* (Retz.) Kunth	1234	N	P	G	Oct	Oct
361	*S. virginicus* (L.) Kunth. [Seema gaddi]	1429	N	P	G	Aug	Aug
362	*Trachys muricata* (L.) Pers. ex Trin.	1232	N	P	G	Jun	Jun
363	*Tragus roxburghii* Panig.	919	N	P	G	Aug	Aug
364	*Zoysia matrella* (L.) Merr.	2350	N	P	G	Jul	

N-Native; E-Exotic; P-Psammophyte; M-Mangrove; MA-Mangrove Associate; X-Xerophyte; Halo-Halophyte; Hydro-Hydrophyte; H-Herb; S-Shrub; T-Tree; L-Liana; Se-Sedge; G-Grass

Among Dicotyldone, the twelve families dominant in terms of species richness were *Fabaceae* (36), *Euphorbiaceae* (31), *Amaranthaceae* (17), *Asteraceae* (15), *Rubiaceae* (15), *Acanthaceae* (9), *Lamiaceae* (9), *Malvaceae* (9), *Asclepidaceae* (7), *Chenopodiaceae* (7), *Convolvulaceae* (7) and *Solanaeae* (7) (Fig. 3).

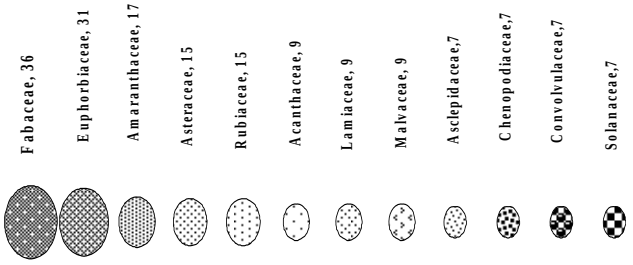

Fig. 3 Floristic dominance of Dicotyldone

Of the Monocotyldone families, *Poaceae* with 47 species was dominant followed by *Cyperaceae* with 27 species (Fig. 4**)**.

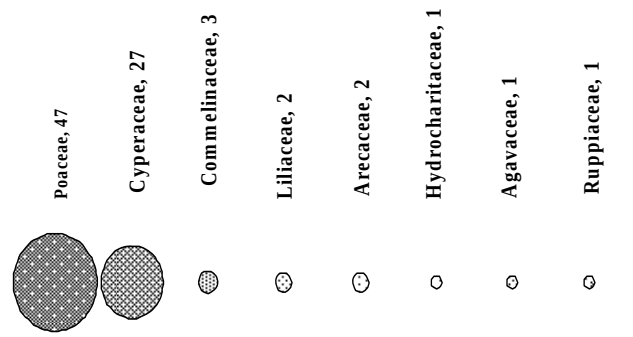

Fig. 4 Floristic dominance of Monocotyldone

In terms of nativity of plants, as many as 306 (84%) species were found to be native while the rest (58, 16%) were exotic (Fig. 5). Among the exotics, a majority (51, 88%) of species fall into the wild category whereas the rest (7, 12%) belong to cultivated group.

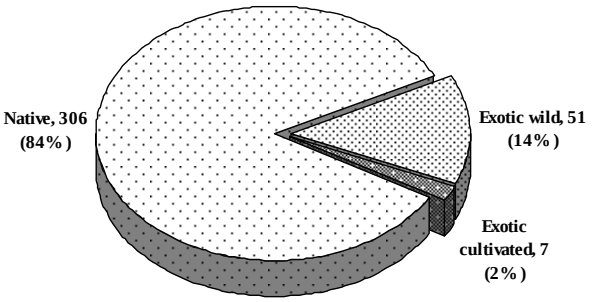

Fig. 5 Nativity of plants

According to their habitat, the flora consisted of 309 (84.89%) psammophytes, 19 (5.22%) mangroves, 16 (4.40%) mangrove associates, 11 (3.02%) halophytes, 5 (1.37%) xerophytes, 3 (0.82%) hydrophytes and a parasite (0.27%) (Fig. 6).

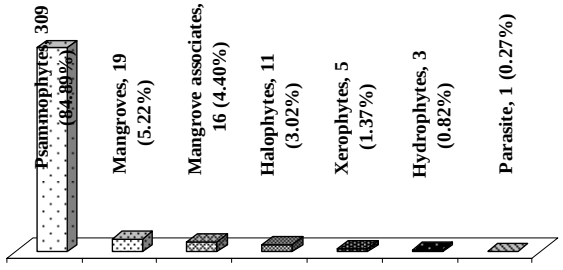

Fig. 6 Nature of habitat

As regards different growth forms, herbs represented by 189 (51.92%) species were dominant followed by shrubs 49 (13.46%), grasses 47 (12.91%), trees 30 (8.24%), sedges 27 (7.42%) and lianas 22 (6.04%) in that order (Fig. 7).

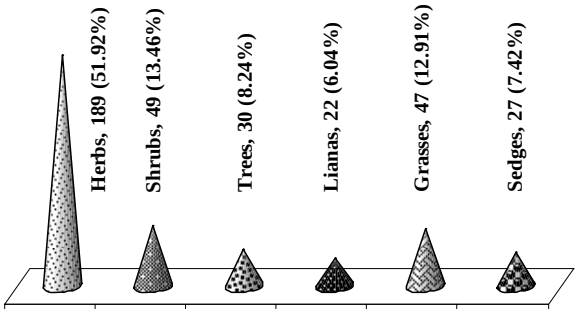

Fig. 7 Growth forms

B. Zonation

The zonation pattern of coastal strand vegetation showed that (I) "Open pioneer zone" supported 20 species from 16 genera within 8 families, (II) "Closed herbaceous zone" harboured 86 species belonging to 30 genera falling into 17 families, (III) "Middle mixed zone" nourished 70 species aggregating to 26 genera belonging to 16 families and (V) "Landward woodland zone" habitated 25 species pertaining to 22 genera in 13 families (Figs. 8, 9**)**. Thus, Closed herbaceous zone contained maximum number of plants followed by Middle mixed zone, Landward woodland zone and Open pioneer zone. The family *Cyperaceae* with 25 species followed by *Poaceae* with 12 species, *Fabaceae* with 11 species and *Rubiaceae* with 10 species dominated the Closed herbaceous zone. The family *Fabaceae* with 14 species followed by *Euphorbiaceae* with 12 species and *Cyperaceae* with 7 species dominated the Middle mixed zone. The family *Euphorbiaceae* with 6 species followed by *Mimosaceae* with 4 species and *Sapindaceae* with 3 species dominated the Landward woodland zone. The families *Cyperaceae* and *Poaceae*, each with 6 species; dominated the Open pioneer zone (Fig. 10).

The zonation pattern of mangroves and associated vegetation revealed that (i) Seaward high salinity zone supported 8 species belonging to 5 genera under 4 families, (ii) Middle moderate salinity zone nurtured 21 species pertaining to 15 genera belonging to 10 families and (iii) Landward low salinity zone sustained 19 species aggregating to 15 genera in 12 families (Figs. 11, 12).

Thus, Middle moderate salinity zone contained maximum number of species followed by Landward low salinity zone and Seaward high salinity zone. The family *Rhizophoraceae* with 4 species dominated the Seaward high salinity zone. The family *Chenopodiaceae* with 5 species followed by *Avicenniaceae* and *Poaceae* each with 3 species dominated the Middle moderate salinity zone. The family *Chenopodiaceae* with 5 species followed by *Meliaceace* with 3 species dominated the Lanward low salinity zone (Fig. 13).

OPEN PIONEER ZONE 12, 110, 129, 142, 143, 180, 239, 240, 291, 301, 312, 313, 316, 317, 352, 353, 359, 360, 361, 364
CLOSED HERBACEOUS ZONE 9, 10, 11, 12, 13, 42, 43, 46, 47, 48, 49, 50, 51, 52, 53, 59, 109, 113, 114, 115, 116, 117, 122, 123, 124, 124, 125, 126, 127, 128, 133, 134, 139, 167, 180, 181, 185, 186, 188, 189, 206, 241, 242, 243, 244, 247, 258, 272, 281, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 336, 337, 338, 339, 340, 341, 342, 344, 355, 359, 361, 362
MIDDLE MIXED ZONE 3, 46, 47, 48, 49, 50, 51, 52, 53, 68, 69, 70, 71, 74, 75, 106, 107, 108, 111, 112, 122, 123, 124, 125, 126, 127, 128, 132, 133, 134, 147, 148, 160, 161, 168, 180, 204, 205, 215, 216, 220, 225, 226, 236, 237, 256, 257, 258, 259, 265, 266, 267, 268, 269, 270, 271, 273, 290, 302, 303, 304, 305, 306, 307, 355, 359, 360, 361, 362
LANDWARD WOODLAND ZONE 16, 22, 36, 37, 38, 39, 61, 80, 81, 83, 84, 130, 155, 187, 204, 205, 260, 262, 263, 264, 270, 278, 286, 287, 288

Fig. 8 Zonation of strand flora
(Numbers correspond to 'Sl. No.' of the species in Table III)

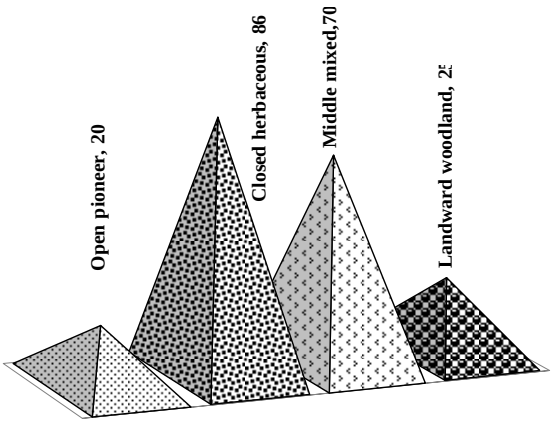

Fig. 9 Zone-wise composition of strand-flora

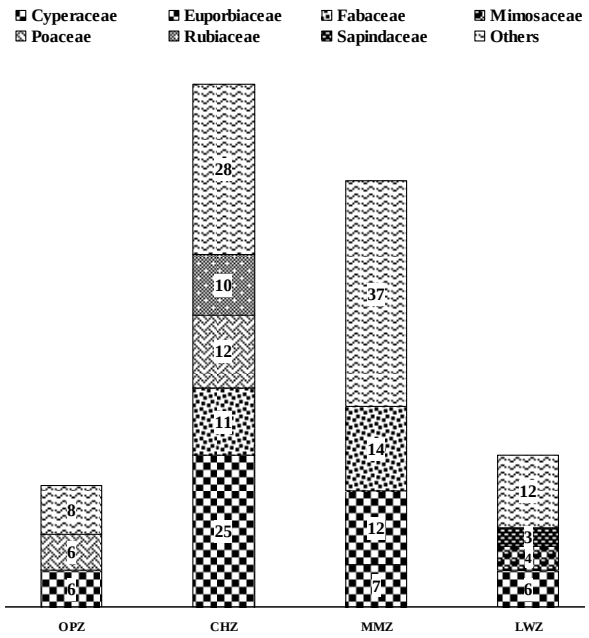

Fig. 10 Zone-wise family composition of strand-flora
(OPZ-Open pionerr zone, CHZ-Closed herbaceous zone, MMZ-Mixed middle zone, LWZ-Landward woodland zone)

SEAWARD HIGH SALINITY ZONE 87, 88, 89, 90, 96, 97, 208, 357
MIDDLE MODERATE SALINITY ZONE 54, 56, 85, 86, 91, 152, 153, 163, 204, 208, 209, 210, 240, 241, 242, 243, 244, 261, 318, 352, 357
LANDWARD LOW SALINITY ZONE 16, 32, 33, 54, 56, 163, 181, 195, 204, 210, 240, 241, 242, 243, 244, 261, 298, 304, 350

Fig. 11 Zonation of mangrove flora
(Numbers correspond to 'Sl. No.' of the species in Table III)

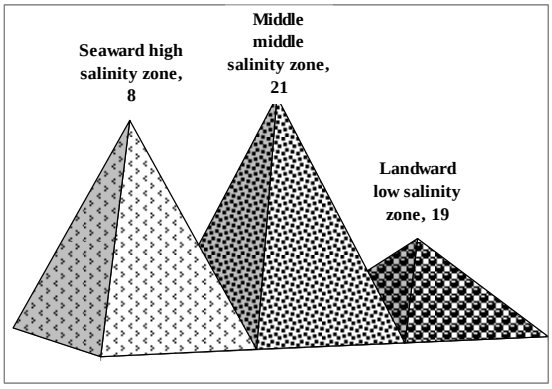

Fig. 12 Zone-wise composition of mangrove flora

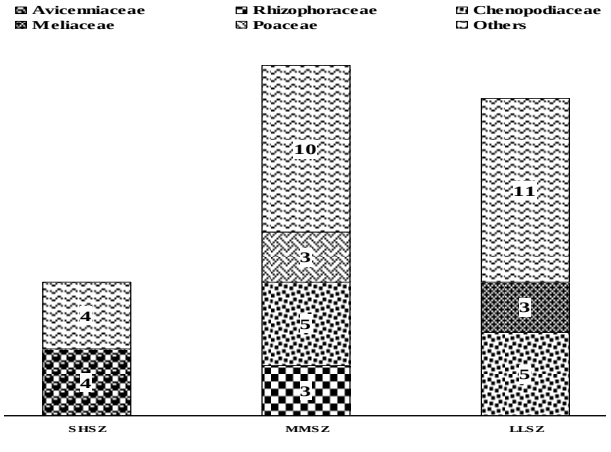

Fig. 13 Zone-wise family composition of mangrove flora
(SHSZ-Seaward high salinity zone, MMSZ-Middle moderate salinity zone, LLSZ-Landward low salinity zone)

C. Ethnobotany

The ethnobotanical information gathered on the strand flora revealed that various plant organs pertaining to a total of 100 species belonging to 84 genera under 43 families carry significant value of varied nature (Table III). Among them, the family *Euphorbiaceae* with 12 species was dominant followed by *Fabaceae* with 9 species, *Asteraceae* with 5 species, *Amaranthaceae*, *Asclepiadaceae*, *Malvaceae* and *Mimosaceae* each with 4 species and *Acanthaceae*, *Caesalpiniaceae*, *Lamiaceae*, *Rubiaceae,* and *Verbenaceae* each with 3 species while rest of the families were represented by 1 or 2 species (Fig. 14).

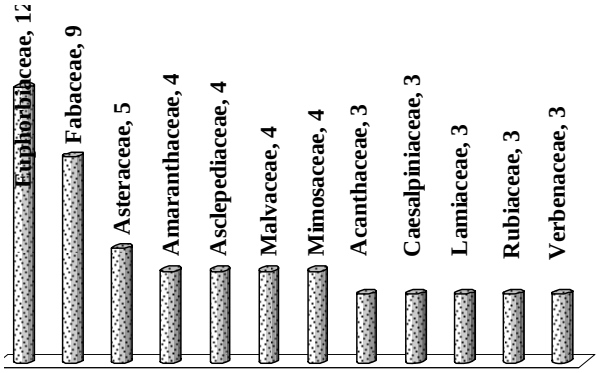

Fig. 14 Strand-flora of ethnobotanical value

Similarly, ethnobotanical information on mangroves and their associates showed that 15 species aggregating to 11 genera under 8 families possessed various plant parts useful for several end purposes (Table III). Among them, *Rhizophoraceae* and *Avicennaceae* with 3 species each dominated the assemblage while rest of the families included 1 or 2 species (Fig. 15).

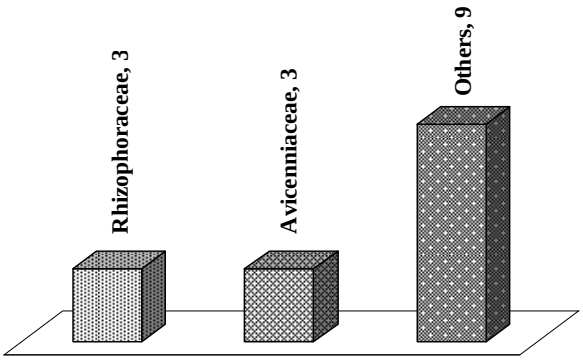

Fig. 15 Mangrove flora of ethnobotanical value

IV. Discussion

Although coastal vegetation and littoral forests fall into the category of "Forests" as per the classification of Indian vegetation [6], [24] the entire coastal stretch inclusive of mangal systems in the region surveyed is not strictly under the jurisdiction of the 'Forest Department', but certain regions thereof under the custody of 'Revenue Department' as well. Further, it is disapppointing to note that even the vast vegetated area directly under the purview of forest department is apparently given least importance in terms of its natural composition, strategic position, ecological significance and dynamic role notably due to the absence of revenue yielding vegetative cover (except for cultivated species or planted trees). Earlier observations of [2], [31] that "coastal sand dunes are neglected ecosystems" are very much coinciding with the present findings.

According to [26], the coastal dune ecosystem in Inida supported 338 species belonging to 208 genera under 69 families. But the present inventory confined to a coastal stretch of ~450km within part of a single state itself yielded a better picture of the coastal vegetation even after exclusion of mangroves and associated plants (329 species). Floristic survey in even a single district (Ganjam) of Odisha to the north of Andhra Pradesh resulted in listing of 175 species of plants belonging to 134 genera and 62 families [28]. Similarly, [26] found *Fabaceae* followed by *Poaceae*, *Cyperaceae* and *Asteraceae* to be the dominant families whereas during the present study *Poaceae* followed by *Fabaceae*, *Euphorbiaceae* and *Cyperaceae* were dominant. In Ganjam District, [28] noted *Poaceae* followed by *Euphorbiacea*, *Cyperaceae* and *Fabaceae* to be dominant. While [26] observed that the composistion of herbs, shrubs, trees and lianas was 62%, 21%, 11% and 6% , respectively in India, during the during the present work the same was noted to be 82%, 14%, 8% and 6%, respectively whereas Sahu and Misra (2010) noticed it to be 67%, 12%, 13% and 8%, respectively in Ganjam District. A total of 122 plant species were also found to be occurring in common in Ganjam District of Odisha as well as northern region of Andhra Pradesh chiefly because of geographical continuity of the coastal tracts.

The inventory combined with underlying facts indicates that the predominant sandy coastal ecosystem of the northern Andhra Pradesh was bestowed, at many places, with wide beaches coupled with well elevated dunes and several major or minor mangals. Presence of a good number (21) of fragmented mangal habitats is perhaps an indication of the prevalence of vast stretches of mangals along the coast of northern Andhra Pradesh during yore. All these ecosystems together harboured rich and varied vegetation accompanied by diverse biological associations. In fact, this coastal system is unique in several ways showering umpteen tangible/intangible benefits to mankind as well as several other life forms and unparallelled in its functions providing a wide array of (1) ecological niches, (2) habitats and (3) breeding and nursery grounds that continuously nurture several trophic chains exclusive for themselves to the CRZ I.

A few peerless features of the region surveyed are the presence of (a) *Acanthus ilicifolius*, *Avicennia marina*, *Hydrophylax maritima*, *Sesuvium portulacastrum* and *Solanum trilobatum* as new distributional records in Srikakulam district, (b) an excellent sand binder, *Pupalia lappacea* var. *orbiculata* (Fig. 16) in Bhimunipatnam, (c) a rare and endemic plant, *Dimorphocalyx glabellus* on the rocky headland at Bangarammapalem (Fig. 17), (d) a new mangrove associate, *Brownlowia tersa*, incidentally a new record to southern India; in the Coringa wildlife sanctuary (Fig. 18) and (e) rare species such as *Aegialites rotundifolia* (Fig. 19), *Ceriops tagal*, *Scyphiphora hydrophyllacea* (Fig. 20), *Xylocarpus granatum* (Fig. 21) and *X. mekongensis* either in Godavari or Krishna mangals.

Yet, a great majority of this "special forest" is unluckily considered as a 'waste land' suitable either for plantation programmes (chiefly casuarinas), pisci-/shrimp culture activities or industrial enterprise.

Most of the trees such as *Acacia auriculiformis*, *Anacardium occidentale*, *Borassus flabellifer*, *Casuarina equisetifolia*, *Cocos nucifera*, *Pandanus fascicularis*, *Sapindus emarginatus* and *Thespesia populnea* existing in the Landward woodland zone belonged either to plantations brought up in view of commerce or plants raised for shade or otherwise. It is alarming to notice that plantations were encouraged to be raised up to high tide level at many places along the coast to promote activities of Vana Samrakshana Samithis or to meet other departmental requirements and goals. The inefficiency in offering natural protection and the negative role exercised by coastal plantations, especially Casuarinas was unraveled in a number of earlier instances [7], [12], [29], [18]. So, all these conventional views and approaches should immediately be condemned and wrong practices done away with to resostre the glory and virgin nature of the vast coastal tracts of the land, that in fact are a real boon to man; in the light of the facts already mentioned.

At the time of this survey (2003-2007), the entire sea board of the northern Andhra Pradesh remained mostly pristine uninfluenced and unimpinged by modern human activites, industrial or otherwise but for budding up sea sand mining in Srikakulam District; a major port in Visakhapatnam; GAIL establishment, ONGC drilling operations and a minor port in East Godavari and beach sand poaching in West Godavari.

However, the same is now totally threatened due to allotment of large coastal stretches for coal power plants, atomic power plants, film city, tourist resorts, a major port, marin police stations, naval/ coast guard establishments, a captive port, special economic zones, pharmacity, apparel park, petro corridor, expanding oil drilling activities, oil and gas caverns, satellite launching station, etc.

With these developments, the observation of [39] that "Globally, deforestation continues to threaten topical rain forests" becomes equally applicable to the strand vegetation and mangal forests in the northern half of Andhra Pradesh. Futher, as noticed in the case of rain forests by [9], [5], the threats such as habitat degradation and loss resulting from the said land-use disrupt ecological processes by affecting native strand vegetation and mangal forests ultimately leading to fragmentation and isolation of strand vegetation and mangal forests throught the CRZ I under consideration [14], [33].

Fig. 16 *Pupalia lappacea* var. *orbiculata* - a rare palnt from Bheemunipatnam coast

Fig. 17 *Dimorphocalyx glabellus* – a rare plant from Bangarammapalem rocky coast

Fig. 18 *Brownlowia tersa* - a rare mangrove associate from Godavari mangals

Fig. 19 *Aegialites rotundifolia* - a rare mangrove from Krishna mangals

Fig. 20 *Scyphiphora hydrophyllacea* - a rare mangrove from Godavari delta

Fig. 21 *Xylocarpus meknogensis* – a rare true mangrove

In order to aid in the protection and preservation of the characteristic vegetative cover of this divergent coastal system and to incorporate the same in suitable action plans to ensure their *status quo* in the light of drastically mounting up pressure for land for various developmental activities, stabilization of the coastal areas should be achieved by implementing the principle of 'designing with nature'. Propagation of indigenous vegetation helps to control habitat losses besides bestowing numerous tangible benefits and umpteen intangible ecosystem services. In fact, all coastal vegetation including mangals and fragmented habitats should be declared as "National nature heritage" at once and accorded top priority of conservation through induction of proper training to the foresters for full appreciation of their immense value. In instances where primary coastal vegetative cover cannot be conserved directly, stringent measures to protect human modified landscapes in the form of "countryside habitats" as a last resort (because of take off of different industrial and commercial ventures) should be implemented as extremely important steps to increase the conservation potentital of native populations of plants, animals and microbes [8], [15], [9], [32].

V. Conclusion

The importance, contribution, role, benefits, economic gains and ecosystem services, etc. of the coastal forest cover should first of all be properly realized by the forest department and action courses required to ensure the due recognition it deserves need be quickly sorted out and implemented *en mass* on a war-footing as several decades have rather lapsed away since the potential of these vital green belt got undermined and rather awkwardly meddled with.

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