CHAPTER-III
FORESTS AND VEGETATION

FORESTS

Andhra Pradesh, the fifth largest state in India covering 9% of the total land area of the country (about 2,75,000 sq. km) and with about 65,000 sq. km of forests, ranks 4th in the country's state forests area and is said to constitute 23.6% of the state's total land area. Though on record, the forest area of the three regions of the state namely coastal Andhra, Telangana and Rayalaseema is indicated as 2.0, 2.9 and 1.6 million hectares respectively, most of the forests excluding those with valuable timber species along the Telangana region and the Eastern Ghats belt of coastal Andhra and Rayalaseema, are very much denuded harbouring inferior tree growth and thorny scrubs. 45% of the state forest area is located in the Telangana region, mostly northern and eastern districts, yielding 50% of states forest revenue. The distribution of forests in different districts is given in Table - 5.

Table-5
Area of forest districtwise

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>District</th>
<th>Land area</th>
<th>No. of Blocks</th>
<th>Forest Area</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
</tr>
<tr>
<td>1.</td>
<td>Srikakulam</td>
<td>5.2</td>
<td>79</td>
<td>0.69</td>
<td>11.8</td>
</tr>
<tr>
<td>2.</td>
<td>Vizianagram</td>
<td>6.5</td>
<td>103</td>
<td>1.19</td>
<td>18.3</td>
</tr>
<tr>
<td>3.</td>
<td>Vissakhapatnam</td>
<td>11.2</td>
<td>188</td>
<td>4.41</td>
<td>39.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>1. West Godavari</td>
<td>10.8</td>
<td>161</td>
<td>3.23</td>
<td>29.9</td>
<td></td>
</tr>
<tr>
<td>2. West Godavari</td>
<td>7.3</td>
<td>50</td>
<td>0.81</td>
<td>10.4</td>
<td></td>
</tr>
<tr>
<td>3. Krishna</td>
<td>3.7</td>
<td>60</td>
<td>0.66</td>
<td>7.6</td>
<td></td>
</tr>
<tr>
<td>4. Guntur</td>
<td>11.4</td>
<td>118</td>
<td>1.62</td>
<td>14.2</td>
<td></td>
</tr>
<tr>
<td>5. Prakasam</td>
<td>17.6</td>
<td>130</td>
<td>3.42</td>
<td>25.1</td>
<td></td>
</tr>
<tr>
<td>6. Nellore</td>
<td>13.1</td>
<td>268</td>
<td>2.52</td>
<td>19.2</td>
<td></td>
</tr>
<tr>
<td>Coastal Andhra</td>
<td>92.9</td>
<td>1157</td>
<td>19.56</td>
<td>21.05</td>
<td></td>
</tr>
</tbody>
</table>

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7. Kurnool</td>
<td>17.7</td>
<td>103</td>
<td>3.51</td>
<td>18.9</td>
<td></td>
</tr>
<tr>
<td>8. Anantapur</td>
<td>19.1</td>
<td>103</td>
<td>1.97</td>
<td>15.3</td>
<td></td>
</tr>
<tr>
<td>9. Cuddapah</td>
<td>15.4</td>
<td>154</td>
<td>5.02</td>
<td>32.6</td>
<td></td>
</tr>
<tr>
<td>10. Chittoor</td>
<td>15.1</td>
<td>194</td>
<td>4.51</td>
<td>29.9</td>
<td></td>
</tr>
<tr>
<td>Rayalaseema</td>
<td>67.3</td>
<td>544</td>
<td>15.01</td>
<td>22.30</td>
<td></td>
</tr>
</tbody>
</table>

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Rangareddy</td>
<td>7.5</td>
<td>127</td>
<td>0.73</td>
<td>9.7</td>
<td></td>
</tr>
<tr>
<td>12. Hyderabad</td>
<td>0.2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>13. Nizamabad</td>
<td>8.0</td>
<td>189</td>
<td>1.69</td>
<td>21.1</td>
<td></td>
</tr>
<tr>
<td>14. Medak</td>
<td>9.7</td>
<td>233</td>
<td>0.95</td>
<td>2.8</td>
<td></td>
</tr>
<tr>
<td>15. Mahabubnagar</td>
<td>18.4</td>
<td>86</td>
<td>3.11</td>
<td>16.9</td>
<td></td>
</tr>
<tr>
<td>16. Eluru</td>
<td>14.3</td>
<td>26</td>
<td>0.86</td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>17. Warangal</td>
<td>12.9</td>
<td>112</td>
<td>3.71</td>
<td>28.8</td>
<td></td>
</tr>
<tr>
<td>18. Khammam</td>
<td>16.0</td>
<td>356</td>
<td>8.34</td>
<td>32.2</td>
<td></td>
</tr>
<tr>
<td>19. Karimnagar</td>
<td>11.8</td>
<td>201</td>
<td>2.55</td>
<td>21.6</td>
<td></td>
</tr>
<tr>
<td>20. Adilabad</td>
<td>16.1</td>
<td>235</td>
<td>7.07</td>
<td>13.9</td>
<td></td>
</tr>
<tr>
<td>Telangana</td>
<td>114.9</td>
<td>1565</td>
<td>29.01</td>
<td>25.26</td>
<td></td>
</tr>
</tbody>
</table>

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>21. Andhra Pradesh</td>
<td>275.1</td>
<td>3266</td>
<td>63.58</td>
<td>23.11</td>
<td></td>
</tr>
</tbody>
</table>
Biotic interference

The incessant human assault on the verdant flora has left indelible scars on the vegetational wealth of several countries. Although records show that forests in India constitute 23% of the land area, satellite pictures have shown that actual tree cover is only about 12% of the land area.

The mounting pressure of population has forced the rural people to make incursions into the verdant forests for their habitation and to supplement their basic needs. Various aspects of this biotic interference are discussed below.

A) Industries:

Rapid industrialisation and excessive exploitation of raw materials are some of the reasons for the disappearance of many plants. Major wood-based industries are listed in Table-6.

Table-6

Major Wood-Based Industries

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the Company</th>
<th>Nature</th>
<th>Installed capacity in M.T/yr.</th>
<th>Type of Raw material used</th>
<th>Raw material assessed by the Forest Dept.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>A.P. Paper Mills, Paper</td>
<td>75,000</td>
<td>Bamboo</td>
<td>1,00,000</td>
<td>Hard wood 75,000</td>
</tr>
<tr>
<td></td>
<td>Rajahmundry, East Godavari Dist.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Sirpur Paper Mills, Paper</td>
<td>61,000</td>
<td>Bamboo</td>
<td>75,000</td>
<td>Hard wood 45,000</td>
</tr>
<tr>
<td></td>
<td>Kegazmcar, Adilabad Dist.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
</tr>
<tr>
<td>-------</td>
<td>--------------</td>
<td>----------------</td>
<td>-------</td>
<td>--------------</td>
<td>-------</td>
</tr>
<tr>
<td>3.</td>
<td>Sree Bayaaleema Paper Mills, Kurnool.</td>
<td>Paper</td>
<td>45,000</td>
<td>Bamboo</td>
<td>45,000</td>
</tr>
<tr>
<td>4.</td>
<td>Shadraclalam Paper Board Ltd., Shadraclalam, Khammam Dt.</td>
<td>Paper</td>
<td>50,000</td>
<td>Bamboo</td>
<td>60,000</td>
</tr>
<tr>
<td>5.</td>
<td>A.P. Rayons Ltd., Toyon Etturnagaram, Grade Warangal Dist. pulp</td>
<td>Hard wood</td>
<td>27,000</td>
<td>Eucalyptus</td>
<td>10,000</td>
</tr>
<tr>
<td>6.</td>
<td>Novopen India Ltd., Patancheru, Particle Pappareddy Dt. board</td>
<td>Hard wood</td>
<td>20,000</td>
<td>30,000</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Godavi Plywood Plywood Ltd., Banavodevarun, East Godaviar Dt.</td>
<td>Million (&quot;Timber&quot;) Sq.ft.</td>
<td>2,2</td>
<td>Non-Teak</td>
<td>10,000</td>
</tr>
<tr>
<td>8.</td>
<td>Hyderabad Plywood Plywood Ltd., Hyderabad</td>
<td>Teak lakh (cu.m.) Sq.ft.</td>
<td>0.018</td>
<td>Non-Teak</td>
<td>714</td>
</tr>
<tr>
<td>9.</td>
<td>A.P. Rayons Ltd., Toyon Etturnagaram, Grade Warangal Dist. pulp</td>
<td>Hard wood</td>
<td>27,000</td>
<td>Eucalyptus</td>
<td>10,000</td>
</tr>
<tr>
<td>10.</td>
<td>Novopen India Ltd., Patancheru, Particle Pappareddy Dt. board</td>
<td>Hard wood</td>
<td>20,000</td>
<td>30,000</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Godavi Plywood Plywood Ltd., Banavodevarun, East Godaviar Dt.</td>
<td>Million (&quot;Timber&quot;) Sq.ft.</td>
<td>2,2</td>
<td>Non-Teak</td>
<td>10,000</td>
</tr>
</tbody>
</table>

**B) Shifting cultivation:**

The Sirijans cultivate their food grains (millets, other dry crops and sometimes cereals) along the hill slopes, valleys and sometimes on hill tops, after clear-felling and burning the leafy vegetation (of course, after removing the logs of tall trees...
which are pushed to a side for other illegal agencies to collect and trade on them for providing ash (mineral content) to enrich the forest soil. They follow such method year after year for about 2-3 years on the same land or more if the soil is fertile. After the soil of that area becomes less fertile and proded, they select another good forest area (whose soil is naturally) and follow the same process of forest destruction. Such shifting method of cultivation is called 'podu' cultivation (Fig.7A).

Such 'podu' cultivation is of late being followed by large number of Giri families due to the increase in their population, devastating large tracts of forest slopes in the state. As such, the problem needs urgent attention by way of providing millets, cereals and pulses etc. to Giri families by improving their economic standard through project Orientation Programmes and Social Forestry, fruit bearing economic tree plantation etc., to protect and conserve whatever good forest patches now left over in the state. Such a mean away tribals from 'podu' cultivation, Forest department and integrated Tribal Development Agency has already started coffee plantations in forests in Visakhapatnam and east Godavari districts.

C. Fuel wood requirement

In the plains surrounded by low lying areas and scrub jungles, the people depend mostly on forests for their
Fig. 7: Biotic interference:

A. The degradation of forest near Borra caves - Visakhapatnam.

B. 'The desert follows the tail of a goat' - Kalasamudram RF-Anantapur district.
firewood and agricultural implements. The large scale
exploration of firewood without proper control and planning
and smuggling to nearby cities have lead to treeless belts
in some areas resulting in large-scale erosion. Energy
plantations to meet the demand of firewood by the urban and
rural population have yet to be planned and developed under
Social Forestry Programme.

D. Forest Fire:

Forest fire is an important factor which occurs
either accidentally or by negligence of men and which causes
large scale damage to young seedling, climbers, growing
trees and forest soil. Such fire damage is to be controlled
by educating forest officers and by following sincerely the fire
fighting methods.

E. Illicit Felling

Illicit cutting and smuggling of timber by private
lorries also cause considerable damage to the forest besides
heavy revenue loss to the State Government, as good number of
saplings are also destroyed during such illicit activities.
Another important factor i.e., uncontrolled grazing by
domestic cattle and goats which are brought from the plains
to the hilly forest region during monsoon and winter seasons,
damage several seedlings while the trampling of fertile forest
soil by such cattle and goats causes soil erosion during heavy
rain (Fig. 7b).
So, planned development and release by rotation of grass lands mixed with useful herbaceous species along the low open areas on the outskirts of forests and in the scattered hills surrounding the villages in plains for purposes of cattle grazing, resting and breeding, are to be urgently organised under Social Forestry and GrassLand Development Programmes of the State Forest, Agricultural and Veterinary and Animal Husbandry departments.

It is therefore evident that unless careful and serious programmes of Conservation and protection of plant wealth of each district, are implemented without any delay for the welfare of the Sirijans living in the forest and hilly areas and the rural and urban population of the State, even the few good forest patches that are now available in the State may disappear very soon even within a decade or so.

**Wild life sanctuaries**

There are 16 wild life sanctuaries spread over 9,716.71 sq. kms. Of them three are for birds and another three for Crocodiles. These are listed in Table-7.
Table-7
Wild life sancturies in Andhra Pradesh

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Area in Sq.kms</th>
<th>Location (Districts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kaval</td>
<td>803</td>
<td>Adilabad</td>
</tr>
<tr>
<td>2</td>
<td>Etungaram</td>
<td>803</td>
<td>Warangal</td>
</tr>
<tr>
<td>3</td>
<td>Pakhal</td>
<td>860</td>
<td>Warangal</td>
</tr>
<tr>
<td>4</td>
<td>Pocharam</td>
<td>135</td>
<td>Medak &amp; Nizamabad</td>
</tr>
<tr>
<td>5</td>
<td>Vinnerasani</td>
<td>635.41</td>
<td>Khammam</td>
</tr>
<tr>
<td>6</td>
<td>Popikonda</td>
<td>591</td>
<td>Khammam</td>
</tr>
<tr>
<td>7</td>
<td>Faarajunasagar-Srisailam Tiger Reserve</td>
<td>3,568</td>
<td>Guntur, Kurnool, Yadhooobarragar, Valconda &amp; Prakasam</td>
</tr>
<tr>
<td>8</td>
<td>Prashita</td>
<td>136</td>
<td>Adilabad</td>
</tr>
<tr>
<td>9</td>
<td>Volleru (Bird)</td>
<td>673</td>
<td>West Godavari</td>
</tr>
<tr>
<td>10</td>
<td>Velapattu (Bird)</td>
<td>2.83</td>
<td>Vellore</td>
</tr>
<tr>
<td>11</td>
<td>Pulicat (Bird)</td>
<td>600</td>
<td>Vellore</td>
</tr>
<tr>
<td>12</td>
<td>Lannejampedu, Trivenu (Crocodile)</td>
<td>38.66</td>
<td>Adilabad &amp; Karimnagar</td>
</tr>
<tr>
<td>13</td>
<td>Manjira (Crocodile)</td>
<td>20</td>
<td>Medak</td>
</tr>
<tr>
<td>14</td>
<td>Coringa, Vakindha</td>
<td>235.70</td>
<td>East Godavari</td>
</tr>
<tr>
<td>15</td>
<td>Sri Vankateswara</td>
<td>525.97</td>
<td>Cuddapah &amp; Chittoor</td>
</tr>
<tr>
<td>16</td>
<td>Rollapadu (Great Indian Bustard)</td>
<td>6.14</td>
<td>Kurnool</td>
</tr>
</tbody>
</table>

2,716.71
GENERAL VEGETATION TYPES

Champion and Seth (1968) while presenting 'Revised classification of forest types of India' (p3.3) indicated that their differentiation of plant communities for presenting classification of vegetation is of general nature and point out that their knowledge of the various floristic components of different types of vegetation covering limited areas of tropical forests is far too incomplete to present the distinct vegetation type based on floristic analysis of limited area. The type of forests met with in Andhra Pradesh, as per the classification of Champion and Seth. (1968) are:

1. Tropical semi-evergreen forest,
2. Tropical moist deciduous forests,
3. Southern Dry deciduous forest,
4. Northern mixed dry deciduous forest,
5. Dry Savannah forests,
6. Tropical dry evergreen forests,
7. Tropical dry evergreen scrub,
8. Coastal vegetation,
9. Aquatic vegetation.

1. Tropical semi-evergreen forests (moist deciduous forests mixed with evergreen elements):

This type occurs in a localised manner in small pockets in valleys near the banks of perennial streams.
and on hills at about 200 m. where the climate conditions are favourable with plenty of humus and moisture in the soil. In Sornkaram blocks of Modugala Range, Soden, Sileri, Sappari, Chintapalli, Dharakonda, Galivonda (Fig. 3A), Kimmuluru, Padavalasa, Thanjavaram, some areas near Anantagiri etc., in Visakhapatnam district, Borra blocks of Vijayapura district, Tekeli and Pathapatnam of Srikakulam, Pulankothi, Narasamulli areas of East Godavari district show this type of forest. Trees of heights ranging from 21-32 mts, girths of 1.2 mts and above are very common. These represent the highest floristic evolution. A number of top story species are deciduous. The second story is evergreen. Bamboos are generally absent and wherever present, they constitute the middle storey to the exclusion of the other species.

The main trees are Michelia champaca, Mandicera indica, Arctocarpus lakoocha, Dillenia pentagyna, Zimia colorata, Brinelia tomentosa, Xylocaernea etc. form the top storey.

Many small evergreen perennials such as Psychotria fulva, Lasi crispus, Boehmeria platyphylla, Ardisia solanacea, Curcuma aromatic, Zingiber cassum, Hedychium spp., form the lower storey.

The common climbers are Aneilocissus latifolia, Cissus repanda, Bauhinia vahlii, Smilax zeylanica, Entada pursaetha.
Fig. 3: A. Tropical semi-evergreen Forest
Galikonda - Visakhapatnam district.

B. Moist deciduous Forest between
Pollapenta and Bairluty
(Pallamalais)- Kurnool district.
Gnetum ula is also found in certain forests of this type.

2) Tropical moist deciduous forests:

This type occurs in region with a rainfall of 1,016 mm and above at an altitude of above 610 mts. This forests can be subdivided for convenience into (a) Northern tropical moist deciduous forests (Tropical forests) (b) South Indian tropical moist deciduous riverian forests.

(a) Northern tropical moist deciduous forests:

This type of forests is found in Crikakulan district. In the sal forests Teak robusta predominates and is associated with Syzygium cumini, Melia xylodcarpa, Taldenia Cordifolia, Terminalia tomentosa, Pterocarpus marsupium, Anogeissus latifolia, Albizia procera, Madhuca longifolia etc. forming the top storey, whereas the middle storey is formed by trees like Cleistanthus collinus, Buchanania lanzan, Dillenia pentagypra, Diospyros melanogylon, Kallotus phillipinensis, Fargya arborea, Syzygium operculatum etc. The shrubby layer comprises of Ardisia solanece, Alstonia venenata, Ixora hirsuta, Colebrookia oppositifolia, Cipadessa baccifera, Cameranum viscosum, Woodfordia Helicteras isora, Vokarrhea undysenterica, Zizyphus opoplish. Grasses like Arundinella setosa, Thysanolaena Maxima, Themeda triandra form the ground cover.
Sal is not found south of Trivandrum district.

(b) **South Indian tropical moist deciduous forests:**

These forests are found in parts of Cuddapah, Gums Agency, parts of West Godavari district, between Pollapenta and Bairutry (Fig. 73), Tadlaabrahamasuram (Tallamaleis) in Kurnool district and Tadabore in Chittoor district.

*Toona grandis* (this may be present only in some places), *Terminalia tomentosa*, *Kulic zulocarpus*, *Anaciswa latifolia*, *Malliania hutanca*, *Vallania cardifolia*, *Litracum parvifolia*, *Schleichera trijuga*, *Muculera indica*, *Dalbergia latifolia*, *Albizia adhatodae*, *Jatropha* etc. form top storey.

The lower storey is mostly formed by *Bridelia retusa*, *Carapa bicornis*, *Travita tiliasfolia*, *Polyathia caracoides*, *Hydia calvina*, *Sonneratia exarciaria* etc. with *Dendrocopulus strictus* forming bamboo brakes. *Chelanthus collinus*, *Strychnos potatorum*, *Holarrhena antidysenterica*, *Cebdias officinalis* etc. are also present in the lower storey where the soil is shallow and rocky.

*Pavetta indica*, *Valierates isora*, *Vismingia chapper*, *Indicorset cassisoides* etc. form the shrubby layer.

*Sapindus wahlii*, *Millettia curculata*, *Butea superb* are the woody climbers of these forests.

(c) **Southern tropical moist deciduous riverian forests:**

This type of forests are present along the banks
of river Codavari and other hill streams in a narrow belt.

The most common trees in these forests are

**Terminalia arjuna, Mitragyna parvifolia, Terminalia indica**, Bombax ceiba, *Derris indica*, *Periploca acuminata*, *Butea monosperma*, *Strychnos nux-vomica* etc.

Shrubs such as *Lonchocarpus riparia*, *Macaranga arborescens*, *Potula aquatica*, *Strychnos nux-vomica* are common in the rocky and sandy 'banks' of Codavari.

The common herbs are *Indigofera linncei*, *Palafoxia aurea*, *Euphorbia* etc., and some common grasses are *Digitaria ciliaris*, *Brachiaria distachya* etc.

### 3. Dry deciduous forests:

These forests are widely spread in almost all the districts of Andhra Pradesh where the soil condition is poor as well as in plains (Fig. 9 & 10 A). The main components of these forests are associated with Teak, *Anogeissus*, *Farjickia*, *Xylica*, *Terminalia*. The dominant plants are *Anogeissus latifolia*, *Albizia aderatissim*, *A. cordifolia*, *Cistanthus collinus*, *Chloroxylon swietenia*, *Terminalia tomentosa*, *Mesyros ralaeoxylon*, *Phanerocarpus kansantium*, *Cassia fistula*, *Sterculia urens*, *Strychnos nux-vomica*, *Pongia pinata*, *Cochlospernum religiosum*, *Gardenia gummifera*, *C.latifolia*, *Xylica xylcarpus* etc.
Fig. 9: A. Dry deciduous 'teak forest' in Navela TF - Adilabad district.

B. Dry deciduous mixed teak type - Katampalli TF in Miryal division - Adilabad district.
Fig. 10. A. Dry deciduous forest in Indalwai - Hizamabad district.

B. Tawaragala F.F. Hills showing transition from dry deciduous forest to scrub jungles - Amantapur district.
The main shrubs are Holarrhena antidysenterica, Grewia briosi, Helicteres isora, Triumfetta noludifolia etc.

The main climbers are Viscum spp., Dioscorea spp., Anogeissus tonentosa etc. Ixerophoren compartus, Zaragozaxn spp., Aristida setacea etc. occupy the open ground.

(b) Northern mixed dry deciduous forests:

These are confined to some hill slopes and plateau of Cuddapah district, northern portions of the hills of Chittoor district and southern portions of the Vemulapalle district adjoining the Cuddapah district, Vemulapalle of Nellore district.

The associated trees in the top storey are
Anogeissus latifolia, Hopiechia briosi, Terminalia chebula, T. tomentosa, Shorea turpensae, Syzygium alternifolium, Sterculia umara etc.

The middle storey comprises of small trees such as Chloroxylon suvetaria, Balanites naniculata, Vitex altissima, Holichandra stramiana, Feronia auriculata, F. latifolia, Syzygium nodiferum etc.

The shrubby layer comprises of Helicteres isora, Chorisia edeas, Calliandra spinosae etc.
5. Dry savanna forests:

These forests are forced, mainly due to the biotic
interference and are present as patches in some portions of
Western Ghats. The principal trees are Aristidin acetosa,
Anacardiaceae, Bombacaceae, Euphorbiaceae, Moraceae,
Mimosoideae, Bombaceae, Clusia, Guettarda, Melastomataceae,
Acacia, Parkeia sp., Erythrina sp., etc.

6. Dry evergreen forests:

This type occurs in coastal and adjacent areas with a
rainfall of 635 mm and below at an altitude of less than
200m and on impoverished soils with practically no organic
matter and where the top soil is practically non-existent.
This type of forest occurs in Pondicherry, Velagada of Vijayapura
district, Madugula range of Nizamabad, Telgu and Pathapattan of Srikakulam, in South Kundapura, Trichiriotta
island near Vallora and Nanadur Valley in Chittoor division.

The main species are Neolitarna hexandra, Albizia
amara, Acacia lancophora, Cassia angulata, Sapindus sarsasinus,
Triticum monopontium, Cryptocarya adianta, Kermes anisata,
Mitrata limonaria, Alstonia monopontium, Cordia dichotoma,
Mimusops hexandra, Manilkara indica, Oenanthus obtusata, Grewia sarroca,
Grewia sarroca etc.
7. **Tropical dry evergreen scrub forests:**

These forests are generally seen at fringes of moist and dry deciduous forests and foot of hills. They are the results of intensive biotic interference. These are mainly present in almost all the dry parts of Andhra Pradesh (Fig. 10) like the districts of Anantapur, Karimnagar, Guntur etc.

The main species are Acacia ehunde, Albizia amara, Dalbergia sepium, Anisochilus coruscus, Cathonia parviflorum, Erythroxylon monogynum, Placopterus indica, Premna tomentosa, Zizinus spp., Bolenea viscosa, Turbortia anticuorum, Dichrostachys cinerea, Cape varieginosa, Mayserus ceylanicus, Carissa spinarum, Grewia tenuiflora etc.

8. **Coastal vegetation:** (From Gastry and Rao, 1973):

The coastal vegetation of Andhra Pradesh is divisible into two sub-groups, viz. Strand and Estuarine. The strand vegetation is characteristic with open, not forming pioneer species followed by scattered herba, shrubs and trees dispersed along the ridges beyond the high tide limit on the back-shore region. This is further divisible into two substrata types namely, sand strand and rock strand (Fig. 11).

1. **Strand vegetation:**

   (a) Sand strand:

   The sand strand vegetation along the sandy beaches
Fig. 11: Coastal vegetation

A. Visakhapatnam Coast.

B. *Sporafex litoralusi* and *Inomaa
capre* in Visakhapatnam coast.
exhibits zonations distinguishable into open pioneer, closed herbaceous, middle mixed or bushy and inner woodland zones.

(i) Open pioneer zone: This zone is the first in the supra tidal region immediately preceding the drift line. In this, the vegetation is rather sparse with a few plants like Ipomoea pes-caprae, Allarica acuminata, Larrea camptotheca, Trachys rumicutes, and Zonisia carvella.

(ii) Closed herbaceous zone: Here, the vegetation attains a little more density with some subterranean herbaceous plants, of which Ipomoea pes-caprae, Conium maia, Trachys rumicutes, Tribulus terrestris, Portulaca tuberosa, P.oleracea, P. quadrifida, Botanis indica, Pluca nodiflora, Yallugo radiatus, Cicelis pharacoides, Limbristis polychinaidae, Solanum surattense and Spinifex littoralis, are some of the common plants.

(iii) Middle mixed or bushy zone: There is a mingling of herbaceous plants with some sub-shrubby/bushy plants giving rise to a mixed vegetation in this zone. The commonly noticeable herbaceous plants are Euobosis nassa, Swarremor bacciflora, Seniororpus terrillorum, Thalattthus phyllanthus, Bororica articulata, Zornia ilbesa, Caloecia procumbens, Allarica nodiflora, Neophorica diffusa, Leucanthemum coryphum, and sub-shrubby/bushy plants like Ceratoclinis limifolius, S. verrucosa, Bororica birta, Z. nassa, Goniococci dilatata, Z. auricula, Guadaca villarri, Zelkhoxia argemone, Solanum surattense, S. arilobatum, Canassa epiramus, Jatropha carenicola, Lodona viscosa and Philodendrion irame
are usually met with.

(iv) Inner woodland zone: This zone is chiefly dominated by tree species like *Cocos nucifera*, *Prosopis cineraria*, *Cocos nucifera*, *Terminalia arjuna*, *Prosopis juliflora*, *Inga spp.*, *Combretum indicum*, *Sinningia fusca*, and *Saraca indica*. Of these, *Cocos nucifera* and *Prosopis cineraria* are self-sown, forming extensive pure stands at some places. Also, some climbing species like *Gluta indica*, *Ficus benghalensis*, and *Ficus indica* are found in this zone. At places, dense stands of the screw-pine, *Tetrameris orientalis*, with branching stems bearing dense, long-leaved crowns supported by stilt roots and with extremely sweet-scented inflorescences and large sized multiple fruits form an eye-catching aspect. This zone gradually merges into the wastelands/cultivated fields in the hinterland region in the coastal belt.

(b) Rock strand: This particular type of habitat although predominant in Saurashtra, Kutch and at places along the west of the west coast, is much limited to small strips at Velvki, and Poonamalai, in the whole of Andhra coast, where the inland hills and their rocky promontories project into the sea. The vegetation and flora are mostly a mixture of coastal and inland plants, occurring in the following zones.

(i) The wave cut rocky hummocks and slopes: This zone, subjected to regular sea water inundation is seen, exposed only during low tide
and supports a rich growth of marine algae belonging to species of *Padina*, *Serranthera*, *Intertichopha*, *Caulerpa* and *Elva*.

(ii) Rocky relief sloping inland having a thin mantle of sand in crevices, not-holes and crannies: In this
Elephas cronse, *Euphorbia thymifolia*, *Portulaca tuberosa*,
*Goniopemen hirta*, *Vernonia cineras*, and *Umbanthus aneresasorum*
are commonly met with.

(iii) Irregular crevally/rocky habitat: The vegetation in
this zone resembles a scree type characteristic with spiny
thickets and shrubby herbs. *Corisca spinorum*, *Coccidiasia*,
*Ezyphus oelliia*, *Cardus ornatus*, *Dichrostachys cimaria*,
*Schizophytae actuinaflora*, *Laminia aritizia*, and *Umbobia*
tirumalli are the dominant shrubby species. The common herbaceous
plants are, *Umbanthus aneresasorum*, *Phacelia neglecta*,
*Assinthospermum hirsutum*, *Lobinca abrotanu*, *Trachelium attenuata*,
*Indesociella lomposilum*, *Acacia indica*, *Tetrapora*
*tasthetion*, and *Tulas curnonocanal" are common climbing plants
noticeable in this zone.

II Estuarine Vegetation:

The mangrove vegetation which develops along muddy tidal
banks, is primarily restricted to the Godavari and Krishna
estuarine systems in Andhra Pradesh. Unlike in the Sunderbans
and in the Mahanandi deltas where the estuarine region as well as species composition forms a bigger complex exhibiting certain plant ground into soil-vegetational units having a preference to certain habitats or niches of their own, the mangroves in Andhra region are comparatively few and consequently the vegetational units or zonations are also fewer (Fig. 12A).

In the Corinca and Caderu tidal estuaries of the Godavari estuarine system on the newly formed silt deposits in the intertidal region, the grass, Porteresia coarctata grows as a pioneer together with a few seedlings of Avicennia and Sonneratia. Further interior, Avicennia alba and Sonneratia apetala dominate forming a Avicennia/Sonneratia 'Cron'. They attain ca 6 m height with a straight, slender hole and beautiful foliage of cottony-white and green respectively. Along the sheltered banks of the side creeks near the estuarine mouth, well grown trees of Phizophora amputata, R. mucronata and Bruguiera gymnorrhiza are commonly noticeable. Further away from the estuarine mouth, the vegetation is composed of mixed mangrove species like Avicennia alba, A. marina, A. officinalis, Avicennia marina, Bruguiera gymnorrhiza and Cerco- sacina. Behind this zone, under the influence of more fresh water influx, Excoecaria acelloba, Hibiscus tiliaceus, Limnizera manuosa, Sonneratia apetala, Xylocarpus granatum and Avicennia officinalis grow well giving
Fig. 12 : A. Mangrove vegetation:

*Rhizophora* spp. and *Arthrocnemum indicum* (Willd.) Moq. in Krishnapatnam - Vellore district.

B. Aquatic vegetation:

*Nypa fruticans* var. *mauthri* in Kamaraddi road - Nizamabad district.
a mosaic appearance. These trees are overgrown by prickly climbers like *Caesalpinia erista*, *Dalbergia siniota* and *Derris iricolista* forming dense impenetrable thickets. *Ionomos macrantha* and *Zarcohous carinatus* are the two commonly noticeable climbers. *Clerodendrum thorne*, *Acanthus ilicifolius*, *Myristachyris vishiana* and *Cuscutus rotundus*, mostly grow along the water margins. The upland dry 'blank' areas that lie behind and away from tidal influx, support a sparse growth of halophytic species.

Another very interesting aspect of the existing natural vegetation along the Andhra coast is noticeable in Sriharikota Island, and in certain sandy tracts of Tirukkan Island in the Pulicat Lake. Not very far from the coast line in Sriharikota, in some undisturbed areas, the vegetation is composed of tree species of *Strychnos nux-vomica*, *Terminalia arjuna*, *Hydnocarpus beddomei*, *Tamarindus indica* and *Zamia atrata* and the shrubby zone is chiefly dominated by *Vernonia anthelmintica* and *Bodanese viscosea*. The common climbers in these areas are *Abrus precatorius*, *Hydnocarpus tristis* and *Vernonia indicus*. The margins of ponds are fringed with luxuriantly growing dense thickets of *Calamus* sp. The above floristic composition suggests the existence of a moist deciduous type of vegetation in the island in the past. Extensive plantations of *Eucalyptus*, *Casuarina* and *Cashew-nut* exist now. The *Casuarina* plantations
in this island are the best examples in quality perhaps, for the entire east coast.

The vast mudflats/saline flats that occur particularly at places in the vicinity Kakimada, Nachilipatnam and Tada (Pulicat Lake) support sparse vegetation, composed of halophytic species like Ceratophyllum demersum, E. nodiflorum, Salicornia brachiata, Sesuvium portulaccastrum, Heliotropium curassavicum, Ephedra corymphoides, Aeluropus lagopoides, and Sesuvia crocea. The occurrence of E. nodiflorum, Salicornia azoricana and lonely orchid plant of Bulbophyllum epidendron on silty-clay lore saline flats adjoining the Pulicat Lake in the vicinity of Tada is of considerable interest. Besides these, Drosera burmanni and Tricosaulon xeranthemum also occur in certain restricted wet areas bordering cultivated fields here. E. demersum is to be seen only at Nachilipatnam for the entire coast as earlier reported by Corble ( ).

The mud flats along the creeks harbour low bushes of Avicennia marina, Dalbergia spinosa, Pemphis trifoliata and Acanthus ilicifolius to give rise to a secondary type of mangrove vegetation.

9. Aquatic vegetation

The area is quite rich in streams, ponds, ditches, rivers etc. which harbour a large number of hydrophytic plants.
(including aquatic and marsh/wetland plants). These hydrophytes can be classified under the following categories on their relations with soil, water and air.

A. Floating hydrophytes:

Three types of plants are included in this category.

1) Free floating on the surface of water:

These are the plants which have no contact with soil. They float on the surface of water and are in contact with air and water only e.g. **Eichhornia crassipes**, *Lemna reynoldsii*, *Pistia stratiotes*, *Spirodea polycarpa* and *Trapa natans var. bispinosa*.

2) Attached hydrophytes with floating shoots:

These plants are attached to the muddy floor by their roots but their shoots come out and float on the surface of water. The examples of this category are: *Hydrocharis morsus-ranae*, *Lemna euratica*, *Ludwigia adscensionis* and *Nuphar graminea*.

3) Attached hydrophyte with floating leaves:

These plants are attached to the muddy floor. Their stem (mostly rhizome) remain under water in contact with soil and water while the leaves float on the surface of the water.
A. Apogroton natans, Limnophyton obtusifolium, Monochoria vaginalis, Melurbo rucefera, Nymphoides pubescens, N. nonchali, N. rubra, Nymphoides cristatus, N. indicus, Ottelia alismoides, Potamogeton nodosus and Vallisneria laterifolia (Fig. 123).

B. Submerged Hydrophytes:

These plants always remain under water surface and can be grouped into two categories.

1. Suspended submerged hydrophytes:

The plants which remain submerged in water but have not contact with soil. Their flowers may or may not come above the water level eg: Ceratophyllum demersum, Utricularia curva and U. exoeata.

2. Attached submerged hydrophytes:

These plants remain in contact with soil and water. Their vegetative portion remains completely submerged in water while the flowers may come out of water surface eg: Apogroton crispus, Cryptocoryne retrospiculata, Hydrilla verticillata, Najas granules, Leprosiphen alternifolia, Polyphoto stolosum, Potamogeton crispus, P. pectinatus and Vallisneria natans.

C. Emergent hydrophytes: Plants which are attached to soil covered with water but their root of the vegetative parts comes out of water surface eg: Asagigynum arora, A. indica,
Amaranthacea, Brassica napus, Sinapis alba, 

*C. sativum, Ziziphora coccinea, Ziziphus sp., Hyrophila auriculata, Ischnanthera pubescens, Limonium indica, Polygonum barbatum, Parthenium hysterocephalus and Tribus angustata.

D. Wetland Impollutes:

This category includes the plants rooted to the soil saturated with water, which may also survive in dried conditions too in the later part of their life cycle. A large number of species fall under this category. A few of the examples include: Eleocharis rostellata, Helianthus annuus, Polygonum plagiata and Cornus scoparius, Clirrus lotoides, Carex caespitosa, Calystegia sepium, Coprosma prostrata, Helichrysum cordatulifolia, Sphaeranthus indicus, Ipomoea carnea, Cynodon dactylon, Kurumia nodiflora, Justicia baccata etc.

Parasitic plants:

A few parasitic plants have also been recorded from Andhra Pradesh, Dendrophthoe solcata, a partial stem parasite on Albizia aurata, Acacia woodii etc., and Liscum monopora another stem parasite on Ziziphus sp. are seen in dry deciduous forests. Cacalia Californica is a partial stem parasite on a number of species like Aeonium arboresum, Ziziphus Jimbina, Hesperis pinnata, Pavetta branfieldi, Erythroxylum monachum, Euphorbia antiquorum, Acacia chundra, A. horrida, Vitex negundo, Azadirachta indica etc. This species
is recorded both in the forest and non forest areas.

*Striga angustifolia*, *S. asiatica* and *S. javanica* are frequent root parasites on crops including *Corchorus* and *Paussa*. *Striga gesnerioides* is a root parasite on *Lunaria crispa*, and

*Orobancha cernua* is a complete root parasite on tobacco and brinjal.

Plants of Economic Importance:

Plants of economic value in the family Rubiaceae occurring in Andhra Pradesh are categorised as follows:

1. Plants yielding edible fruits:
   - *Anthocecalys chirping*, *Caturra* and *Tones*

2. Plants yielding condiments:
   - *Coffee arabica*

3. Common timber yielding plants:
   - *Anthocecalys chirping*, *Karodia latifolia*, *C. sinifera*, *Karodia cordifolia*, *Indoedicta crux*, *Nitracena parvifolia*,

4. Common plants yielding gum:
   - *Karodia sinifera*

5. Plants yielding dyes:
   - *Iron Root*: *Indigofera suberula*,
   - *Korinda angustifolia*,
   - *L. citrifolia*, *L. rubescens var. rubescens*,
   - *Lobia cordifolia*.
From stem: - Morinda rubescens var. rubescens.

6. Medicinal plants:

Giricoma officinalis, Artemisia annua
fruits are used as fish poison.