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ECO NEWS

BIODIVERSITY SPECIAL

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C.P.R. ENVIRONMENTAL EDUCATION CENTRE

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A Centre of Excellence of the Ministry of Environment and Forests, Government of India

C.P.R. ENVIRONMENTAL EDUCATION CENTRE

Established in 1989

- **1980** - The C.P. Ramaswami Aiyar Foundation starts nature education for teachers and students.

- **1989** - C.P.R. Environmental Education Centre (CPREEC) established jointly by the Ministry of Environment and Forests and the C.P. Ramaswami Aiyar Foundation as a Centre of Excellence of the Ministry of Environment and Forests. Government of India.

Our Mission

- To increase knowledge, awareness and interest among the public about the environment in all its aspects
- To develop resource materials for environmental education and awareness raising
- To conduct training programmes for a wide cross-section of people
- To take up environmental projects for demonstration and research

Our Activities

- Training and awareness raising
- Awareness to and through action
- Awareness programmes in ecologically fragile areas
- Conservation of the ecological heritage
- Research and surveys
- Generation of resource materials
- Exhibitions
- Courses, seminars and symposia

Facilities

- Environmental Laboratory
- Library
- Computer Division
- Publications Division

Geographical Spread

CPREEC's activities extend to

- Andaman & Nicobar Islands
- Andhra Pradesh
- Goa
- Karnataka
- Kerala
- Maharashtra
- Orissa
- Tamilnadu
- Puducherry

NGO Network

CPREEC has an extensive network of about 600 NGOs. All educational programmes are carried out in partnership with select NGOs, Universities, Colleges and Schools.

Publications

- Activity and information books and pamphlets for children
- Environmental training guides and kits for teachers
- Researched Publications
- Colourful and informative posters
- *ECONEWS* - A quarterly magazine
- *Indian Journal of Environmental Education*, a peer-reviewed journal

Exhibitions

CPREEC designs three new exhibitions every year and has a bank of mobile exhibitions that travel all over India.

Environmental Education

- Green Schools of India (GSI)
- Training programmes for Teachers
- Training programmes for School and College Students
- Environmental Law Education

Special Projects

- National Green Corps (NGC)
- Biomedical Waste
- Biodiversity Conservation

Research and Surveys

- Sustainable Technologies
- Surveys of Natural Resources
- Socio-Economic Surveys
- Lab to Field Technology Transfer

EDITORIAL

The Conference of Parities (COP) 11 of the Conference of Biological Diversity (CBD) is an opportunity for the world to re-examine the state of the world. It is unfortunate that the rate of known global biodiversity loss according to UNDP (2012) is between 0.015% and 0.1% species per year (approximately 200 to 2000 species per year) which is still alarming and shows no signs of abating. After 10 to 11 meetings, surely countries must ACT before signing any more treaties. And of those who refuse to sign – well, we know they are the exploiters.

It is unfortunate that the term Biodiversity – or Biological Diversity – is still barely understood. The educator cannot be blamed for, as priorities change, so do terminologies. First it was Nature Education, teaching youth to appreciate habitats and wildlife. With increasing pollution, it became Environmental Education. Then, exploitation of natural resources increased exponentially and the term changed to Education for Sustainable Development. The three have totally different meanings in different contexts and the progression from Nature to Development is a clear indication that the world has decided to abandon Nature for Development.

In this context, Biological Diversity becomes extremely important. How can we preserve it? Sustainable Development is a fraudulent term – development means massive change and cannot be sustainable.

Conservation of Biological Diversity in this fast–changing era is possible only if forests and unique habitats are left untouched. This needs political will and honesty, and the world needs to rapidly change direction. Unfortunately, fast-growing populations, the greed to acquire more and the desire to conspicuous consumption make this a non-starter.

So, will the CBD remain a good resolution on paper? Only time will tell.

Nanditha Krishna
Editor

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C.P.R. Environmental Education Centre is a Centre of Excellence of the Ministry of Environment & Forests, Government of India, established jointly by the Ministry and the C.P. Ramaswami Aiyar Foundation.

The Centre has been set up to increase consciousness and knowledge about the environment and the major environmental problems facing the country today. It has been conducting a variety of programmes to spread awareness and interest among the public, including, teachers, students, voluntary workers, educators, farmers, women and youth, on all aspects of the environment and ecology, with the purpose of promoting conservation of nature and natural resources.

Convention on Biological Diversity – An Overview

Dr. T. Sundaramoorthy

The 1980s and the 1990s were characterised by growing public awareness of the consequences of the loss of biodiversity on this planet. The Convention on Biological Diversity was opened for signature at the 1992 United Nations World Conference on Environment and Development on "Earth Summit".

To conserve the biodiversity present on the planet, the United Nations Environment Program (UNEP) initiated the project titled "Convention on Biological Diversity (CBD)" during the year 1988. The CBD is the symbol of the determination of the various countries of the world to comprehensively address the issue of biological diversity. The negotiations took place under the auspices of the United Nations Environment Programme. The Convention was opened for signature on 5 June 1992 at the Rio Earth Summit and came into force on 29 December 1993. It addresses issues relating to research and training, public education and awareness and technical and scientific cooperation.

The Conference of the Parties (COP) is the governing body of the CBD. COP has established seven thematic programmes of work – agricultural biodiversity, dry and sub-humid lands biodiversity, island biodiversity, marine and coastal biodiversity, forest biodiversity, mountain biodiversity and inland water biodiversity. Each programme establishes a vision for, and basic principles to, guide future work. They also set out key issues for consideration, identify potential outputs, and suggest a time frame and means of achieving these. Implementation of the work programme depends on contributions from parties, the Secretariat, and relevant intergovernmental and other organizations. They are periodically reviewed by the COP and the open-ended intergovernmental scientific advisory body known as the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA). This body conducts assessments of states and trends of, and threats to, biodiversity and provides the COP with technological advice on the conservation of biological diversity and the sustainable use of its components.

Key provisions of the CBD

The Convention consists of 42 Articles and two Annexes. Article I sets out the objectives of the Convention as follows:

The main objectives of the Convention are:

- The conservation of biodiversity
- The sustainable use of biodiversity

- ❖ The exploitation of genetic resources and the fair and equitable sharing of benefits arising from the exploitation of these resources

Institution under the Convention

In order to ensure the development and implementation of the Convention, the Convention has established a number of institutions to participate in CBD processes. These are:

❑ **The Conference of Parties (COP)**

The Conference of Parties (COP) is the highest decision making body of the Convention and consists of governments and the European Union who form the "Parties" to the Convention. The COP now meets every two years and, if necessary, may meet in extraordinary session. The COP may be attended by governments such as the United States who are not a party to the Convention and other interested organizations including indigenous people and local community organizations in the capacity of observers.

❑ **Extraordinary Meetings of the Conference of Parties (EM)**

The COP is empowered to hold extraordinary meetings of the Parties. The first of these was staged to develop a protocol on biodiversity in Cartagena, in February of 1999. This was suspended when agreement was not reached on the text and was resumed in Montreal, Canada, in January 2000 where the text of the Protocol was agreed to.

❑ **Inter-Societal Meetings on the Operations of the Convention (ISOC)**

During COP 4 it did not prove possible to take decisions on all issues relating to the organization of the work, or "operations" of, the Convention. On this basis, the COP decided to convene an inter-session meeting on the operations of the Convention to consider outstanding issues and recommended the development of a strategic plan for the Convention to COP 5. Such meetings may, from time to time, be held in the future when the COP is unable to reach decisions.

❑ **The Subsidiary body on Scientific, Technical and Technological Advice (SBSTTA)**

The role of the SBSTTA is to provide the COP with "……. advice and recommendations on scientific, technical and technological aspects of the implementation of the Convention. Specific functions of the SBSTTA include providing scientific and technical assessments of the measures taken to implement the Convention; identifying innovative, efficient and state of the art technologies and know how, and advising on how to promote their development; providing advice on scientific programmes and international cooperation in research and development; and generally responding to scientific, technical and technological and methodological questions asked by the COP".

❑ **The Secretariat**

The Secretariat of the CBD presently consists of about 50 staff members under the leadership of the Executive Secretary and is based in Montreal, Canada. The Secretariat is primarily responsible for preparing and servicing the meetings of the CBD and coordination with other

international bodies. The Secretariat is the main contact group for indigenous peoples and local communities seeking to participate within the CBD processes.

National reporting

Under the terms of the Convention each Party is required to submit regular national reports. During COP5, under decision V/19, it was decided that these reports would be submitted every two years. The parties prepare their national reports through a consultative process involving all stakeholders.

All Parties to the CBD have an obligation to develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity. Particular emphasis was, therefore, placed on the implementation of NBSAPs, with Parties adopting voluntary guidelines to be used for the review and updating of such strategies and action plans.

National Biodiversity Strategies and Action Plans

National Biodiversity Strategies and Action Plan (NBSAPs) help to identify biodiversity at risk and provide conservation measures. The development and adoption of a national biodiversity strategy serves as a cornerstone for the implementation of the Convention by the Parties and reflects how the country intended to fulfil the objectives of the Convention in the light of specific national circumstances and the sequence of steps to be taken to meet these goals.

By the end of 2006, 134 Parties had finalized their NBSAPs, 11 Parties had completed revisions and another three Parties had informed the CBD that a revision was being carried out. Another 36 parties are presently preparing their first NBSAPs. These figures indicate that in all some 90% of the Parties are currently involved in implementing conservation measures for biodiversity conservation.

Sixteen Parties submitted their first NBSAP during 2006: Angola, Belgium, Brazil, the Czech Republic, Guinea-Bissau, Laos, Malawi, Mali, Nigeria, Saint Vincent & the Grenadines, Sierra Leone, Suriname, Trinidad & Tobago, Turkey, Uganda and Zambia.

Brazil became the first Party to adopt a set of measurable biodiversity targets within the 2010 framework. Belgium, the Czech Republic and Sweden have also linked their NBSAPs to this framework and Ghana convened a national meeting to develop its action plan and agreed to prioritize actions which would support the implementation of the 2010 Target.

NBSAP is India's biggest ever development and planning exercise in scale and participation. The NBSAP project entered its final stage in December 2002. Under the NBSAP project, 74 action plans are being prepared.

The CBD goes a long way in ensuring that compliance mechanisms are in place and if countries can set achievable targets and devote sufficient manpower to the task, the various forms of biodiversity can be preserved for posterity.

Strategies to improve the Teaching-Learning Process of Biodiversity

U. Thirunavukkarasu

Nature education and its practice

The concerns of environmental education are being addressed in different ways around the world. The approach towards imparting education about natural resources have changed over the period of time in all countries, based on the need and prevailing circumstances.

In India, for ages, environmental education has been taught by an informal way by the communities as 'life skills'. Unfortunately, the culture, which cohabited with other living beings in perfect harmony over many centuries, has to be re-educated about the necessity of protecting the natural resources.
If we dwell deep to find out the cause for this state of reminding ourselves about the need and importance of nature education to our children, we could find that the role community in educating the children was gradually ignored. This could be attributed to westernisation of education starting from colonial rule to the present day globalisation.

In the midst of altered context and changed system of preparing the future citizens, young children gradually lost touch with nature. A 'modern day city child' does not know where his cereals are coming from; he/she has problem in comprehending the necessity of wildlife to human survival.

The present day efforts of making environmental education as compulsory part of curriculum and its subsequent efforts on teacher preparation have further stressed the need for concentrated effort to educate the children on environment. In recent days our policy makers, government machineries and scores of other agencies are clamouring for 'novel methods of environmental education'. The intensity of present environmental challenges requires new initiatives in teaching - learning processes of environmental education.

Models of nature education

There are various approaches by many governmental and non-governmental agencies in creating awareness and cultivating values in the minds of young children. Different models are available and practiced in education system. Environmental awareness activities, greening programmes, curriculum based supportive programmes, technology up-scaling, community based activities and sustainability initiatives are some of the broad bases for environmental models.

Benchmarking environmental education

The modern environmental education models started its focus 1970s, it is on

awareness and revolved around ensuring human survival, protection of natural resources and hastening the destructive forces of human community. The process got shaped through many international events and policy directions. Amongst it, The UN Conference on Human Environment at Stockholm (1972), UNESCO/UNEP International workshop on environmental education at Belgrade (1975),UNESCO Inter-governmental Conference on Environmental Education at Tbilisi (1977) are important mile stones.

The pro-environmental movements in India, in the 1970s and 1980s were swept away by the globalization and resource intensive consumption patterns in the decades of 1990s and 2000s. The intensity of environmental degradation and resource depletion we face today compel us to have concrete action oriented environmental education efforts.

It is the necessary to bench mark or ascertain the environmental status before and after every environmental education initiative. The initiative that guide the learners in groups to glide through environmental milestones in stages. The models practiced should bring about a perceivable environmental standard improvement- to justify and to measure the learning outcomes.

Concerns to be addressed while enriching the environmental teaching learning

- Improving basic education and providing health care will greatly contribute in improving classroom practices and enrich curriculum
- The concept of environmental sustainability has to be introduced in a proper light and in a positive way. While trying to save ecology, the economic aspirations of society should also be given its due place. A caring and prosperous society with concern for the environment will pave the way for a sustainable society in the future.
- Promoting community cohesion and re-linking the school and community will encourage sustainability principles taking root in childhood education.
- The centrality of nature education should bring in local relevance with peaceful co-existence with others.
- If the principles of sustainability are integrated in early education, it promotes children to internalize values, attitudes, skills and behaviors at a very early age to lead a sustainable way of life in later years.

There are many ways by which, the teaching learning process of biodiversity education might be enhanced. Some of them are discussed here.

Creative biodiversity education to strengthen the teaching-learning process

Comprehending creativity by a single technical definition is difficult. But in a larger sense “creativity involves the ability to produce original ideas and to perceive new relationships among unrelated things”. Time and again it has been proved that creative mind and processes solved many of our societal

problems at the time of crisis. The concept of creativity could be used effectively in biodiversity education.

Multiple areas for learning and responding

In learning situations, like in class rooms or in natural areas, it is always advisable to have multiple opportunities for learning and responding. Learning corners, activity centers, evaluation booth, marked trails, bird observation towers, labeling of plants, suggestion console and reference guides are some of the tools, the learner may get involved.

School gardens

School gardens are a place for the children to interact with nature. We may not know what will transpire between a child and the nature exactly. Theorizing it will be a futile attempt. Leave it to nature. Children, not only get a dose of fresh oxygen, but also learn many things on every encounter. Garden provides space for school-community interactions. Community elders and parents can interact with the children and share knowledge about the environmental resources. The garden can be also thematic, stressing on, medicinal plants, local species, fruit bearing plants, ornamental plants, vegetables, etc.,

School Resource Center on biodiversity

The concept of resource centre for biodiversity education can be an effective focal point where, the sharing of knowledge and experience can happen. The concept of resource centre may vary according to the basic objectives and intended learning outcome. The School Resource Centre may concentrate on any one particular aspect of ecology like biodiversity or it can broaden its focus to suit changing environmental education needs.

Flexible learning on biodiversity

Appropriate teaching-learning materials to promote conservation education are essential. It can be in the form of self-learning materials, interactive models, questionnaires, working models, posters, paintings, illustrations, scientific diagrams and play materials The aim is to create 'positive attitudes towards natural resources and promote conservation initiatives'. Even a series of pictures, paintings, illustrations may also serve as learning motivators to the young learners.

Teaching and learning on bio-resources

The bio resources of the earth are enormous and only because of the sheer variety in living organisms, the human kind could sustain its life on this biosphere. There are various approaches in 'teaching' biodiversity to young children. But, strangely most of the methods fail to create the necessary values and attitudes in understanding biodiversity. Highlighting the perceivable benefits of biodiversity conservation to the young learners instead of stressing on complex benefits is appropriate. The benefit of tasty new fruit variety is preferable than the ecosystem maintenance because of biodiversity conservation.

Reverence for life – the key for conservation

The whole focus of biodiversity education issues can be addressed by stressing

respect for all life forms. The lives of great saints and sages were replete with examples of reverence for life. The biodiversity conservation concerns could be promoted by advocating the traditional wisdom of having respect for life.

Involving the learner in the process of conservation

Use the instances of aspects of environmental resources in individuals' life and highlight it. The act of highlighting the involvement, would promote positive thinking among the learners in crystallizing the positive attitude towards conservation

Learning and unlearning

The learner in the past and in the present would have been exposed to many kinds of wrong/raw information through other channels of communication and that might intervene in the present learning process. For that, it is essential to unlearn whatever we have learnt in a wrongful manner in the past. The electronic and print media carries many shades of facts and figures with concocted opinions. It is natural that a learner is sometime found in confused state with his earlier inputs. Hence, it is essential to orient the learners about learning and unlearning and its importance in conservation.

Experiencing nature in its own lap with its beautiful rhythms is the best way of learning and teaching about nature. Biodiversity education carried out with proper light and orientation will benefit the learner and make them feel worthy of learning.

School – Community initiative for environment biodiversity

A school community interactive forum in every school can be established to activate the community participation in biodiversity education. All the stakeholders of local environment like the children, parents, community leaders, traditional health practitioners, panchyat members, village administrators and voluntary workers can be included in the forum. The city schools may also try to collect the relevant people in to it. Mothers' Committees, School Development Management Councils, School Parliaments, Eco Clubs, Nature Clubs, Adventure Sports, Village Education Committees are some of the efforts made by different agencies to address the issues of education.

Based on the agreed point of action plan, the parents, teachers and school children should act and try to address the biodiversity issues. Collection of local data, survey of resource usage, points of environmental problem, resource collection, design and development of local technologies, garbage clearing, tree planting, rain water harvesting, construction of community smokeless-chulas, soak pits, erection of community message boards, construction of low cost sanitary facilities, de-silting of ponds, protection of sacred groves, collection of seeds maintenance of gardens, and promotion organic farming are some of the activities which the forum can concentrate. Through that, many local environmental problems can be addressed. In the process, the stakeholders get educated about the environment and managing it for optimal use.

An active community will bring social cohesion and responsibility on the part of every stakeholder and instill right values among children.

Conclusion

The resource that feed and sustain us should be revered and worshiped. Ancient societies worshiped nature in its various forms. The sacred rivers, temple tanks, snow clad Himalayas and innumerable streams and water bodies of our land remind us of the reverence our forefathers had for the natural resources. Contradictorily, the present society neither has concern nor reverence for nature. We have arrived at a stage of environmental crisis where a mere awareness about environmental matters is not sufficient. The situation demands - immediate perceivable action-oriented results in the protection of environment.

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Wildlife Census

M. Kumaravelu

Wildlife census always evokes interest not only because it affords an enjoyable time for the volunteers on duty trailing inside the woods, but also helps wildlife managers to arrive at certain conclusions regarding the population of different animals, their density, distribution and the presence of different types of flora across the jungles.

It is an accepted fact that the exact numbers of animal populations and that of the flora cannot be arrived at because of the animal count. The census helps to bring to light the approximate population of the flora and fauna in the given area. The wildlife census, although it looks easy on paper, is indeed a tough job as it involves highly complicated mathematical and statistical techniques.

A numbers of factors are considered important for wildlife census. The period, species, landscape, status of forests, floral distribution are important components of the jungle census be it in the national parks or wild life sanctuaries or tiger reserves. Some key species like the tiger and other endangered species are always kept in high focus during the census.

To collect the actual number of animals in a given area, wildlife managers generally employ many indices and calculations. This has the following objectives – the study of the status wild population, secondly, monitoring the changes in animal numbers and thirdly to study the population dynamics and management. Generally, the census of wild animals is used to determine the change in population size at periodical intervals. In India, wildlife census methods broadly can be dived into two categories - direct and indirect methods.

Direct methods of wildlife census

In this category, six major methods are involved. These six methods are direct count, drive count, road-side count, waterhole count; pellet group count and camera trap method. However, the bird census operation is conducted separately.

Direct count involves counting of every animal. This could be possible for larger mammals including deer, wild dogs, jackals, hyenas etc,. This direct count method should be carried out at least on two or three successive days during the early morning hours. Direct count helps in finding the approximate age, sex, exact number in the herd / pack / group which can thus be arrived at. While doing this, it is necessary to avoid double counting. Thus, the errors in arriving at data can be eliminated.

The drive count is nothing but a direct count; it can be possible only in the open forests and the terrain should be plain. Experienced enumerators can easily surround the area and drive the animals

in one direction. Normally the enumerators use sides and relevant points as a stop to count the animals. Since the drive count method results in many hindrances to the animals and enumerators, it is not popularly in practice during the animal counts.

Road-side count is a common method used for animal counting all along the road-side. However, this cannot be used for overall data for a stipulated zone or protected area.

Water-hole techniques are being widely used in dry deciduous forests and scrub jungles. Mostly, large animals are counted from a hide when they visit water-hole. While employing this method some important criteria should be followed. For example, there should be availability of sufficient water in the tanks and ponds which would draw a sufficient number of animals. Open water-holes are to be selected where a *machan*/ hideout can be constructed. This method should be followed for about three to four days continually. Using of binoculars will help in determining the sex and approximate age classes. In this method, generally expert enumerators are deployed.

Pellet group count is a method by which the density of deposited defecades of a single species is used to determine the population density. The small pellets deposited during a single defecation at place are called 'pellet group'.

Indirect methods

During the absence of the possibilities of direct sightings indirect methods like King strip census, Pugmark census, sampling for tigers and other carnivores signs are being applied effectively.

The King strip census applies a simple formula to estimate the population. This is done by the observer by walking along a transect line which is a permanent tract in the habitat. Similarly, the sight method is also a scientific method with a simple formula to arrive at the number of animals. This method is mainly in the case of mammals.

Pugmark census is a common and popular method of counting large cats, including tigers. Only trained enumerators can employ this method effectively. Only a clear impress with plaster of paris and well defined pugmarks are being taken into account. In addition, information about the area, surface i.e. hard ground or soft ground, scratch marks, droppings, roars and nearby kills can be noted in this method. This would help in identifying the uniqueness of each animal, especially for tiger pug marks. While making data uses of GPS, the forest types are to be noted without fail.

Equally important is the bird census. Generally, birds are not considered as vital as other wild animals. However, birds are the one species which are found practically in every place and the presence of species in different areas indicate the status of the habitat. The decline of vultures and the black eagle in the eastern slopes of the Nilgiris has been indicated by the disappearance of tall trees. The bird census is being carried out in three major ways viz: a) Wetland bird count b) Non-wetland bird count and c) Call count. All these methods are being done only in the early

morning hours by experts and local bird watchers. Wetland bird count is being carried out generally during mid-winter. To avoid overlaps in huge wetlands, the enumerators can select important points for observation. Using detailed maps with GPS data and the selection of points for observation are to be done prior to the census days. Residential and migratory birds are to be observed separately. Call counts can be involved only in the hilly tracts, wherein the vegetative cover is highly dense. The enumerators are to be well versed and trained to carry out avian count by using this method.

The result of a census of wild animal species in an area is that we can understand the status which would further help in the planning for the management of a particular species and its habitat conservation. It is important to train the enumerators, especially those who are new to animal and bird count. This would help them to have an acquaintance with the jungle cover and landscape and the strategies to be adopted and applied during the count along the jungle trails.

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Biodiversity of Andhra Pradesh

K. Venkataratnam

The state of Andhra Pradesh has rich biodiversity, and geographically stands as the fifth largest state in the country with an area of 2,75,068 sq km with the longest coastline stretching nearly 1000 KMs. Strategically located in the central region of the Indian sub-continent, Andhra Pradesh has representatives of the magnificent Indian plant and animal life. It also has wide and varied vegetation types enriched by a variety of flora and fauna, varied topography ranging from the hills of the Eastern Ghats and the Nallamallas to the shores of the Bay of Bengal which support varied ecotypes. The forest in the state can broadly be divided into four major biotic provinces i.e. Deccan Plateau (53 %), Central Plateau (35%), Eastern Highland (11%), East Coastal Plains (1 %) and has a network of 21 sanctuaries and 6 National Parks covering an area of 12,579 Sq. Kms. or 4.57 % of the geographical area of the state. The state bird is the Blue Jay (*Cyanocitta cristata*). The state animal is Black buck (*Antelope cervicarpra*). The state tree is the Neem (*Azadirachta indica*) and the state flower is the white lotus (*Nelumbo nucifera*).

Andhra Pradesh can be broadly divided into three regions, namely, Telengana

(Northern Region), Coastal Andhra (Eastern Region) and Rayalseema (Southern Region). The most forested districts of the state are Khammam, Adilabad and East Godavari, while the least forested are Nalgonda and Anantapur. Mangrove swamps and palm trees margin the coastal plain of Andhra Pradesh, while thorny vegetation covers the scattered hills of the plateau. Of the state's total area, about one-fourth is forest-covered, with dense woodlands occurring primarily in the north along the river Godavari and in the south in the Eastern Ghats. The forests consist of both moist deciduous and dry savanna vegetation; teak, rosewood, wild fruit trees, and bamboo are plentiful. Elsewhere in the state, neem (which produces aromatic oil), banyan, mango, and the pipal are among the common trees. Flowering vegetation, including jasmine, rose, and a number of endemic species abound in the hilly region of the Eastern Ghats. A few more endemic species are (local names) Gum Arabic, Prickly Chaff flower, Baobab, Bengal quince, White Dammar, *Indian* frankincense, Indian bdellium tree.

The varied habitats harbour a diversity of fauna which includes the tiger, panther, wolf, wild dog, hyena, sloth bear, gaur, black buck, chinkara, chowsingha, nilgai, cheetal, sambar and a number of birds and reptiles. The long sea coast provides the nesting ground for sea turtles, the back water of Pulicat lake is the feeding ground for the flamingo and grey pelican. The estuaries of the rivers Godavari and Krishna support rich mangrove forests with the fishing cat and otters as key stone species. The state has a rich range of 1424 species of native medicinal plants which are present in three agro-climatic regions. 176 non-native medicinal plants occur in the region in cultivated, planted or naturalized state. Plants like the tulsi, neem, King of bitters are commonly used in treating and preventing specific ailments and diseases.

Flora

Andhra Pradesh harbours a total of 2800 taxa belonging to 1051 genera under 185 families i.e., 16% of the angiosperms known from India. Of these 2071 species belonging to 150 families and 796 genera are Dicotyledon and 729 species belong to 255 genera and 35 families are monocotyledons. The most diverse families are Leguminoceae (340 species), Poaceae (294 species), Cyperaceae (157 species), Euphorbiaceae (136 species), Asteraceae (123 species), Acathaceae (117 species), Rubiaceae (93 species), Orchidaceae (79 species), Lamiaceae (75 species), Convolvulaceae (63 species). The wild Gymnosperm species include *Cycas circinalis*, *Cycas beddomei*, *Cycas sphaerica*, *Gnetum montanum* and *Gnetum ula*.

Mammalian diversity

The mammalian diversity of Andhra Pradesh is represented by 108 species belonging to 33 families in 12 orders that include 7 species of marine mammals belonging to 2 families. More than 50% of the known mammalian diversity of Andhra Pradesh is constituted by small mammals that belong to the orders chiroptera (bats), scandentia (tree shrews), rodentia (rodents and squirrels), pholidota (pangolins) and lagomorpha (hares and pikas). The Indian cheetah that once existed in India was also found in Andhra Pradesh.

Fungi

Fungi belong to the kingdom Eukaryota that can be divided into four phyla, 103 orders, and 484 families' and4979 genera. More than 27,000 species of fungi have been recorded from India making it one third of the global fungal diversity. As many as 5000 species of fungi are believed to be present in Andhra Pradesh.

Herbs, medicinal plants

Andhra Pradesh has a rich range of 1424 species of native medicinal plants which are present in three agro-climatic regions (Andhra region, Telangana region and Rayalseema region). 176 non-native medicinal plants occur in the region in cultivated, planted or naturalized state. Seven important medicinal plants of Tirumala are endemic plants. Konda samrani (*Boswellia Ovalifoliolata*), Rana guvva (*Cycas beddomei*), Konda kottimeera (*Pimpinella tirupatiensis*), Raktachandanam (*Pterocarpus santalinus*), Guggilamu (*Shorea thumbuggaia*), Tamaralli (*Syzygium alternifolium*) and Tella karaka (*Terminalia pallid*).

Exotic plants

Some exotic plants have entered into Andhra Pradesh causing severe damage to our native species and some plants have turned into weeds, multiplying fast and causing harm to the ecosystem, e.g. water hyacinth, Agave and Parthenium.

Miracle grains - Millets

Millets have been core to India's food and farming cultures. As against other food grains, millets provide multiple securities of food, fodder, health, nutrition, livelihood and ecology.

Protected areas and National parks

Protected areas of the state of Andhra Pradesh include: Nehru Zoological Park, Hyderabad, Sri Venkateswara Zoological Park, Tirupathi, Indira Gandhi Zoological Park, Visakhapatnam.

National parks like Sri Kasu Brahmananda Reddy National Park, Hyderabad Sri Venkateswara Mrugavani National Park, Tirupathi, Mahavir Harini Vanasthali National Park, Hyderabad, Papikond National Park and Rajiv Gandhi National Park.

Wildlife / Sanctuaries: Nagarjuna Sagar-Nalgonda Dist, Kawal- Adilabad, Pranahita-,Rangareddy, Eturunagaram, Pakhal-warangal, Kinnerasani-khammam, Coringa-EastGodavari, Kolleru-West Godavari and Krishna districts, Krishna Pocharam, Manjira, Rollapadu Gundla Brahmeswaram, Sri lankamalleswaram Nelapattu, Pulicat, Kaundinya Sri Penisul narasimhaswamy, Kambalakonda, Sivaram and Kambalakonda.

Avian diversity

The avian diversity of Andhra Pradesh is represented by 486 species which belong to 71 families in17 orders. Some of the rare and endangered avian species occurring in Andhra Pradesh include the Great Crested Grebe, the spotted-billed pelican, the painted stork, the darter and vultures (all species). Other species include the red jungle fowl, the Malabar pied hornbill, the great Indian bustard, the lesser Florida, the Indian courser, the

yellow-throated bulbul, the hill myna and the tree sparrow.

Rare and endemic species

As many as 70 species and subspecies are endemic to Andhra Pradesh. The hill area snakes such as the Indian Python and the Indian Sawbuck Turtle are some of endangered species in Andhra Pradesh. Seven important medicinal plants are endemic to Tirumala and they are *Boswellia Ovalifoliolata, Cycas beddomei, Pimpinella tirupatiensis, Pterocarpus santalinus, Shorea thumbuggaia, Syzygium alternifolium* and *Terminalia pallida.*

Endangered animals

The gaur (*Bos gauru*) is restricted to south India and south east Asia. Eturunagaram and Papikonda sanctuaries.

Reptilian diversity

The reptilian diversity of Andhra Pradesh is represented by 103 species belonging to 20 families and 3 orders. Two species of crocodiles and less than 15 species of tortoises and turtles are found in Andhra Pradesh. The rest of the reptilian diversity is represented by lizards and snakes. Among the lizards, two species, namely Nagarjuna's Skink (*Eutropis nagarjuni*) and Ashwamedh's Supple Skink (*Lygosoma ashwamedhi*) and among the snakes, one species, namely, Bholanath's Racer (*Coluber bholanathi*) are endemic to Andhra Pradesh.

Amphibian diversity

The amphibian diversity of Andhra Pradesh is represented by 22 species belonging to 14 genera and four families. Some of the interesting amphibians include the grey balloon frog, the marbled balloon frog, the painted frog, Leith's frog and a yet to be described species of Hylorana genus.

Fishes diversity

The fish diversity of Andhra Pradesh includes 180 plus species of freshwater fish in 98 genera and more than 50 families and 600 plus species of marine and estuarine fish in 300 genera, 121 families and 28 orders.

Odonate & butterflies diversity

The Odonate diversity of Andhra Pradesh is represented by more than 75 species of dragon flies and damselflies in 43 genera and 10 families. The spider diversity consists of over 110 species belonging to approximately 38 genera and 27 families. The butterfly species diversity is represented by over 250 species. So far as many as 125 plus species belonging to as many as 65 genera and 7 families of beetles have been documented in the state.

Invertebrate diversity

Among the other invertebrate diversity, as many as 40 plus species of plant mites in 21 genera belonging to 12 families; 15 plus species of ixodid ticks in five genera belonging to one family; 52 plus species of orabatid mites in 37 genera belonging to 23 families; 23 plus species of collembolan in 13 genera belonging to four families; more than seven species of aptery gots I five genera under three families and 60 plus species of short-horned grasshoppers in 25 genera

belonging to two families have been documented from Andhra Pradesh.

Wetlands

Apart from the world famous fresh water Kolleru Lake, Pulicat lake, Coringa-Nelapattu and Uppalapadu bird sanctuaries, Pakhalwater tank, coastal mangroves are the important wetlands in Andhra Pradesh. Mangrove forests are located in the estuaries of the Godavari and the Krishna rivers. The Godavari mangroves are located in Godavari estuary of East Godavari district and the Krishna mangroves in Krishna estuary of Krishna and Guntur districts.

The total area under Godavari and Krishna mangrove wetlands are 58,263 ha of which 33,263.32 ha are under Godavari and 24,999.47 ha are in Krishna. However, the dense mangroves in Godavari and Krishna are only 17,000 ha and 7,347 ha respectively. The rest are distributed between mudflats, water bodies, sand bodies and casuarinas plantations. The Coringa Wildlife Sanctuary has three Reserve Forests, namely Corangi reserve forest, Corangi Extn reserve forest and Bhairavapalem reserve forest. The mangroves of Coringa Wildlife sanctuary receive tidal flushing through the Matlapalem canal, Corangi River and the Gaderu River. The Gaderu and Corangi rivers are the distributaries of the River Godavari. The Coringa mangrove forest is the second largest coastal ecosystem in the east coast of India.

Even from prior to the identification of the taxa, these mangroves have been used by the fisherman for the timber, fuel, fodder and medicine. The mangrove community consists of more than 13 species of mangrove and other plants. The following three dominant mangrove plants, *Avicenna marina, Excoecaria agallocha* and *Sonneratia apetala* are found to be present on the banks of a major channel of the Godavari River running through the forest. 27 groups of zooplankton are there in these mangroves. The macrobenthic animal of the Godavari mangrove ecosystems are represented by 15 groups. The group polychaetes are represented by 18 species.

Threats

The wetlands and mangrove ecosystems have, like other biotopes, been experiencing the human-impact in the form of resource utilization and resource alteration and/or modification.

Biological heritage sites proposed

The Andhra Pradesh State Biodiversity Board, which was established in the year 2006, has taken up a variety of initiatives to improve the biodiversity in the state. Formation of Biodiversity Management Committees (BMC) in the local bodies throughout the State is essential to implement the Biodiversity Act, 2002. As on 10th September 2012, only five (5) peoples' bio-diversity registers are completed.

The state bio diversity board has identified & proposed the following 9 places to be declared as Biological Heritage Sites considering their importance in the respective Districts. Migratory birds - Kondakarla- Ava (Vishakhapamum), Telukunchi

(Srikakulam), Katakshapur (Warangal), Chintapalli (Khammam) Choudavaram (West Godavari) and Tatipudi Reservoir (Vijayanagaram) for fiss foot birds. Apart from above six, the Biodiversity Board has also proposed the following three areas to be declared as Biological Heritage Sites. These are 1) Marshy area in Sompet Bela (Srikakulam), 2) a huge banyan tree (500 years old) the Timmamma Mari Manu (Anantapur), 3) Agricultural Biodiversity (Zahirabad Agri biodiversity) heritage site (Medak).

Establishing biodiversity museum

The Andhra Pradesh State government has decided to establish a world class Biodiversity museum in the state capital Hyderabad and has allocated 13 acres of prime land in Gatchibowli, Hyderabad.

Conservation of biodiversity through traditional knowledge

Natural preparations are used to combat pests and to preserve foods and seeds. In some parts of the state, farmers follow their own /traditional storage methods in keeping the seeds. During the regular sowing in the fields, the seed is regenerated and conserved. This is a living seed bank method without refrigerated chambers. These treasures are sealed with a mixture of clay and cow dung. Ashes and neem leaves protect them against pests. In this way, the seeds can be preserved for at least a year.

Status and conclusion

The current status of knowledge, research on biodiversity and conservation measures taken by the Andhra Pradesh government are far from complete and it is assumed that the known diversity, especially among the lower groups of animals and plants, is less than 40-45% of the diversity that could be present in the State. Experts in biodiversity have appealed to the Andhra Pradesh State Forest department and the State Biodiversity Board to initiate projects for the purpose of documenting the biodiversity.

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Traditions that help Preserved Plant Biodiversity in Ancient Tamil Nadu

M. Amirthalingam

Introduction

Traditional knowledge plays a very important role in the conservation and management of nature, natural resources and biodiversity. Every village temple had a sacred tree. The king, in times of war, appealed to this tree to bloom in emerald verdure to presage victory (*purapporul vennpamalai*, 243). This tree was also revered by devotees for its divine foreknowledge and unfailing prophecies. The king worshipped the tree and a healthy and sturdy tree reflected the prosperity of his rule. In Tamil Nadu, local practices of vegetation management were perhaps derived from the basic ecological concepts of local communities reflected in "bio-geographical zones like concepts in Tamil tradition" (Raman, 1998). Local knowledge systems have been found to contribute to sustainability in diverse fields such as conservation of sacred elements; some places are named after plants and animals such as sacred groves, sacred trees, remnant tree worship, sacred gardens and sacred animals. Local knowledge has also been found useful for the revival of folk traditions in Tamil Nadu and these traditions are useful for the conservation of biodiversity.

Ecological traditions and name of places

Places named after animals, birds and plants are numerous. Puliyur, Pulipakkam (Chengalpattu District), Karadipatti (Madurai District), Aanaiyur, Aanaika, and Maanturai (Tiruchi District) have been named after animals. Onankudi, Konnaiyur, Viralimalai, Kaaraiyur, Usilampatti, Sooraikadu, Murungaikollai, Kurundhampatti, Iluppur, Kadukkaai Kaadu, Panaiyapatti and so on (Pudukottai district); Thamaraipoondi, Kumizhiyam, Palakuruchi, Mullaiyur, Ichangkaadu (Ariyalur district) have been named after plants. The culture and lifestyle of the ancient Tamils were deeply intertwined with trees, foliage and flowers. Seasonal behaviour like flowering, producing new leaves, or shedding of flowers and leaves was taken as an indication of future happenings. The tree was revered by devotees for its unfailing prophetic attributes. The king worshipped the tree and a healthy and strong tree represented the king and his rule. Such trees were known as *kaaval marangal*.

Sacred plants

Trees worshipped in the temple and associated either with the temple or the deities came to be known as *sthalavrikshas* or sacred plants. Further, trees like *vembu*, *vilvam* and *kontrai* were sacred to a particular deity whose idol was installed beneath the tree (*purananuru*, 199-1; *agananuru*, 287-7; *paripadal*, 4-67). Later, when temples were erected for the deities who had originally occupied places under the

trees, devotees took special care not to remove or disturb those trees. In Tamilnadu, there are a number of tree shrines and the prominent ones include the mango (*ekamra*) tree at Kanchi, a black plum (*jambu*) at Jumbukeswaram near Tiruchirappalli, the Indian palm (*panai*) at Tirupanaiyur and the "blinding' tree (*tillai*) at Chidambaram.

The sacred trees are symbolic of a single genetic resource and play a pivotal role in the conservation of local floral wealth and biodiversity. Every tree has a legend of its own. For example, Thillai (Chidambaram) is derived from the *tillai (excoecaria agallocha*), the mangrove tree. The Tamils considered the tree sacred and worthy of worship. Even if the sacred tree happened to fade away or perish, it did not cease to be sacred and worship was still continued. A *kadamba* tree (*Anthocephalus cadamba*) once flourished in the Meenakshi Sundareswarear Temple at Madurai. There are several examples of trees found in sculptures: in Kutralam, people worship the *lingam* under the *kurumpala;*, in Kurukkai, the tree is worshipped by the goddess and *rishis;* in Tirukuvalai, the *lingam* under a tree is worshipped by the king and others; in Anbilalandhurai, the *lingam* under the tree is worshipped by a king; in Tirukottai, a *rishi* sits under the *kottai chedi* (*Ricinus communis*) and in the five metal sculptures of the Tirumangalam temple, one of the *nayanars* is seen under the *kontrai* tree. The social, economical, medicinal and environmental importance of these trees was recognised and the sacred tree concept evolved as a means of conserving the land's rich plant diversity. The sacred trees represent various geo-climatic habitats. For instance, the banyan (*Ficus benghalensis*), pipal (*Ficus religiosa*) and Indian fig (*Ficus glomerata*) are afforded total protection in India. Trees came to be regarded as abodes of certain deities: the *arasu* or pipal tree and the *thulasi* (basil) symbolized Vishnu; the *vilva* tree symbolized Shiva and the *kadambu* tree symbolized Amman and Muruga. Some temples were erected in places where such trees were worshipped and, in course of time, they came to be associated with the temples as *sthala vrikshas:* the *jambu* tree with Jambukesvaram, the mango tree with Ekambareswarar Temple and the fig (*athi*) tree with Attiyur (Varadaraja Perumal Temple, Kanchipuram). It has the *punnai* (Alexandrian Laurel) tree as the *sthala vriksha*. *Alwar* Tirunagari in Tirunelveli district has the tamarind tree as its *sthala vriksha*, because the saint *Nammalvar* did penance under it and the sacred tree itself is worshipped as Thiru-pali-Alwar. The sacred trees are thus symbolic of a single genetic resource and play an important role in the conservation of biodiversity. The social, economical, medicinal and environmental importance of these trees was recognised and the sacred tree concept evolved as a means of conserving the land's rich plant genetic diversity. The sacred trees represent various geo-climatic habitats. Sacred plants play a very important role in ecology. The red flowers of the Indian coral tree are used in the worship of Lord Vishnu and Lord Siva; of *Alari* (*Nerium indicum*) in the worship of Lord Siva and the Sun-god; ketaki (*Yucca gloriosa*) in the worship of Lakshmi, and *pala* or breadfruit (*Artocarpus integrifolia*) in the worship of Lord Vishnu. The use of some flowers is prohibited in worship rites like

vaagai (sirisa /*Albizzia lebbeck*) in the worship of Lord Ganesha and *vengai* (*Pterocarpus marsupium*) in the worship of Lord Siva. Most of the roadside shrines in Tamil Nadu are associated with reservoirs, ponds, rivers, springs or streams.

Sacred plants and biodiversity

Tamil tradition and culture have successfully preserved biodiversity through the ages. The sacred trees are symbolic of a single genetic resource and play an important role in the conservation of biodiversity. The social, economic, medicinal and environmental importance of these trees was recognised and the sacred tree evolved as a means of conserving the land's rich genetic plant diversity. The sacred trees thus represent various geo-climatic habitats.

Rare plant species are also preserved and worshipped as sacred plants. The process of conserving economically, ecologically and medicinally important plants by declaring them as sacred also protected the genetic value of several plant species. Thus, the preservation of sacred trees may also help in the conservation of local floral wealth. As a result, the sanctity attached to several contemporary sacred trees remains unexplained or untraced.

This religious practice plays a vital role in the conservation of certain native plant species. The *sthalavrikshas* of Tamilnadu constitute a part of the genetic resources for the conservation of species diversity. Many living organisms depend on the plants for their resources like food, medicine and shelter and also they conserve our floral diversity. Some of the *sthalavrikshas* are very important for their economic value like for the shipping and timber industry. Almost all the *sthalavrikshas* are one way or another are used for medicinal purposes

Sacred plants and their role in ecology

Sacred plants play a very important role in ecology. Sacred plants provide food, shelter and nesting substratum for several species of birds and squirrels. For instance, the banyan (*Ficus benghalensis*), the pipal (*Ficus religiosa*) and the Indian Fig (*Ficus glomerata*)) are afforded total protection in India. The five most sacred leaves of pipal, cluster fig (*Ficus lacor*), banyan and mango are ubiquitously employed in making prayers and offerings. The red flowers of the Indian coral tree are used in the worship of Lord Vishnu and Lord Siva; of *Alari* (*Nerium indicum*) in the worship of Lord Siva and the Sun-god; of ketaki (*Yucca gloriosa*) in the worship of Lakshmi, and of *pala* or breadfruit (*Artocarpus integrifolia*) in the worship of Lord Vishnu. The use of some flowers is prohibited in worship rites like *vaagai* (sirisa or parrot tree /*Albizzia lebbeck*) in the worship of Lord Ganesha and *vengai* (*Pterocarpus marsupium*) in the worship of Lord Siva. During the sacred thread ceremony, the brahmacarin has to perform the sacrifice using pipal twigs called *samit*.

Keystone species, biodiversity and ecosystem function

Keystone species play a crucial role in biodiversity conservation, through key functions that they perform in an ecosystem (Ramakrishnan, 1992a). Sacred groves, sacred trees and sacred

animals teach us the rudiments to be learnt in the evolution of the conservation system in the wider fabric of the cultural pattern of India (Amirthalingam, 2006).

Sthalavrikshas support several species of primates, birds, reptiles and insects. Animals and birds could live undisturbed in these trees since *sthalavirkshas* are considered sacred. Several insects and butterflies play a vital role in pollination. The *sthalavrikshas* act as a safe guard and important feeding ground for insects and butterflies.

However, socially and culturally, religiously important species are worshipped in temples. These plant species play a vital role in the conservation of soil nutrients and ground water level.

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Mangroves of Andaman and Nicobar Islands

A. Gopal

Introduction

The word mangrove is derived from the Portuguese word '*Mangue*' and the English word 'grove'. Mangroves are salt-tolerant forest found mainly in tropical and sub-tropical inter-tidal regions of the world. It is in the mangroves that the fresh water from the Everglades meets the salt water from the tidal flats, thus creating a brackish water estuary. Mangrove swamps are a very important habitat in the Andaman and Nicobar islands. These mangroves are highly

productive but very brittle. Moreover, mangroves act as an ecosystem and are also a haven for plants and animal species.

Salient features of mangroves

Mangroves are basically evergreen with bulky tough leaves designed to minimize transpiration. The root system is adapted to the peculiar conditions found in the mangrove forests such as still root in *Rhizophora* and knee roots in *Bruguiera*. Pneumatophores (breathing roots) are sent in profusion in *Sonneratia* and *Avicennia*. Viviparous germination, a process by which the seed germinates while still on the tree and falls down thus giving rise to further growth is an essential characteristic of the species of the family Rhizophoraceae.

Significance of mangroves

Mangroves consist of tropical tidal forests and swamps. The buffer zone is between the land and the sea and thus protects the land from sea erosion. They also act as a cost-free, self-repairing and static border security force for protecting the coast from erosion by storms, cyclones and floods. They also support a vast range of biodiversity. They act as a natural sewage treatment plant, absorbing pollution, including heavy metals. Mangroves provide land protection, sediment trapping, high primary productivity and fishery yield. The mud deposits at the mouths of streams slow down the current and help the silt to settle. The forest accumulation consisting mainly of fallen leaves and branches from the mangrove provide nutrient to the marine environment. The Mangroves form a nursery for the breeding of fish, crabs, shrimps and mollusks, and the habitat of some species of fish. They constitute a unique habitat for wild animals and birds and provide a nesting

ground for various species of birds. It is also a potential recreation site for fishing, boating, bird watching, sightseeing & photography. Mangroves thus provide a vast field for scientific and socio-economic studies.

The situation of mangroves in the Islands

The Andaman and Nicobar islands consist of 572 islands, rocks and islets, extending over a land area of 8,249 Sq.kms and coastline of 1962 kms. Andaman and Nicobar consist of a very fragile islands ecosystem. The total area under vegetation in the islands is 7171 sq.km. as per the Forest Statistics-Department of Environment and Forest, Andaman and Nicobar. Out of these, 966 sq.kms. consist of mangrove vegetation. In Andaman district, the area under mangroves is 929 sq.kms, while in Nicobar district mangroves occupy 37 sq.kms. The mangrove cover of these islands comprises 9.4% of the land area or 10.85% of the total forest area. Luxuriant mangroves can be seen in Shoal Bay (South Andaman), Carbyan Cove (S. Andaman), Chidyatapu (S. Andaman), Wandoor (S. Andaman), Yerrata Jetty in Rangat (Middle Andamans) & in Austrin Creek (Mayabunder).

Important mangrove species of Andaman and Nicobar Islands

The Andaman and Nicobar islands are one of the richest mangrove regions of our country. As per the available information from various sources, 27 tree species, 5 shrubs, 1 climber and 2 species of palms and ferns, each belonging to 17 genera, are reported to occur in the mangrove ecosystem of these islands. Important mangrove species found in these islands include *Rhizophora mucronata, R. apiculata, Bruguiera gymnorrhiza, B. parviflora, Avicennia officinalis, A. marina, Ceriops tagal, Heritiera littoralis, Sonneratia caseolaris, S. alba, Exoecaria agallocha, Xylocarpus granatum, Aegiceras corniculatum, Scyphiphora hydrophyllacea, Nypa fruticans* etc. (source: DOEF, ANI)

What will be the reduction of mangroves in Andaman and Nicobar Islands?

The value of the mangroves has gone unrecognized for many years after the tsunami hit the islands in December 2004. Mangrove systems require intensive care to save threatened areas. So far, conservation and management efforts lag behind the destruction; there is still much to learn about proper management and sustainable harvesting of mangrove forests. Degradation of mangroves is caused by natureinduced changes. The tsunami affected 21 sq.km (Forest statistics, DoEF, ANI) of mangrove cover in these islands. The damaged forests take a very long time to recover. This type of damage of the mangrove will lead to reduction of wild life. The animals likely to get affected are the water monitor lizard, the saltwater crocodile, the Andaman teal, the sand piper, the Kingfisher, the stork etc. In addition to this, the nursery area of important fin and shell fishes will be reduced.

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