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Editor's Column

Indira Gandhi on Environment

Our late Prime Minister Smt. Indira Gandhi's concern for a cleaner environment is very well known. She had dwelt on this subject at many National and International Conferences both at home and abroad. The awareness she has created about the conservation of environment and the guidance given on these lines are not to be ignored. As a fitting tribute to her memory we present below some of Smt. Indira Gandhi's views on environment *vis a vis* people and forests.

Environment is the concern of all and its effective management is possible on a holistic basis only through partnership with all sections of people. There is a link between conservation, peace and elimination of poverty. An environment in which animals and plants have become extinct is not safe for human beings either. Our emphasis should, therefore, be on the qualitative improvement of life as a whole rather than on the quantitative growth of various sectors of economy. Attention cannot be diverted from the main question before us, which is to bring basic amenities within the reach of our people and give them better living conditions, without alienating them from the nature and their environment.

Concern with economic and social development need not be a choice between poverty and pollution. People can be taught to live in peace with nature and among themselves only if they are assured of food and water. Let not the burden and cost of conservation fall on the poorest. There is need to achieve growth in the economic and social well-being of people within the confines of a sustainable environmental resource base. The rich out of greed and the poor out of need have been reckless in plundering the earth's assets. What one has to take across to the people and teach is that true development is not incompatible with conservation. When a forest is saved not only a few trees but people's future is also saved.

Today the forests are no longer a matter of personal taste. It is of relevance to the country's economy and the well-being of our people. Forestry is no longer a simple science requiring only some botanical skills. It is increasingly becoming a complex science involving disciplines like biology, soil science, genetics, ecology and not the least economics. Forest personnel should consider themselves as custodians of future and only dedicated people who think forestry not merely as a career are required. Social forestry should not replace valuable forests.

Viable humid tropical forests now remain only in Western Ghats, Northeastern India and Andaman and Nicobar islands as small scattered pockets. Therefore, increasing of plantations or putting up of industries and so on and cutting down these valuable forests should be stopped and these forests which represent the richest source of genetic diversity must be fully protected and scientifically maintained as Biosphere Reserves. Any continuation of forest felling in these areas without consideration of a large number of other plant and animal species of great genetic value will destroy irretrievably a vast unknown reservoir of biological wealth. There should be a collective anxiety on the rapid depletion of our forests and the ill effects that would have on our climate - it is already having, our economic development and our future itself.

There is tremendous pressure on our forest resources for timber, fuel, fodder, forest products etc. While one cannot minimise the importance of these needs they should not result in indiscriminate felling of forests. In this connection the function of the Forest Department cannot simply continue as it is going on now. Vegetation forms a green "security blanket" protecting the fertile yet fragile soil, maintaining balance in atmospheric conditions and moderating their flow to prevent flood and drought. Half the land in our country suffers from soil degradation and this severely reduces our capacity to increase our production. Massive afforestation of degraded and barren lands should be taken up on a priority basis by the Forest Development Corporations instead of clearing natural forests. The Forest Development Corporation should not earn the bad name of being called Forest Destruction Corporation. Through foresight and imaginative physical planning many potential dangers can be avoided or at least minimised. It is not enough for official agencies to become environment conscious since by its very definition environment is pervasive. There cannot be an environment planning without the involvement of the entire population at all levels.

Pollution, for example, is not a technical problem. The fault lies not in Science and Technology as such but in the sense of values of the contemporary world which ignores the rights of others and is oblivious of the longer perspective. Rapid economic development without ecological damage can be reached only if conservation becomes a way of life, with every man, woman and child.

There is the least doubt that more comprehensive forest legislation is needed to curb the rapacity of our poachers, smugglers, those who break the rules with regard to shooting of the fauna and most important of all, contractors. Planners must call for ecological impact statements to indicate the probable long-term effects of any technological innovation.

The system of leasing forest lands on contract basis should also be reexamined in the present situation. It is no longer possible to assign forest areas even for industrial uses without a clear commitment towards replantation or new plantation. When degraded areas, deforested areas and other vacant lands are available for plantation they should be taken up on a priority basis rather than starting plantations after clearfelling natural forests. One should also pay special attention to indigenous plant species many of which have diverse uses either because they are fruit bearing, or fodder giving or of medicinal value.

As far as wildlife is concerned it has been decided to entrust the subject to the Department of Environment with the objective to ensure that the scientific management of wildlife which is an integral part of the environment gets more specialised attention.

Uptill now the approach has been to maximise the forest revenue and release driblets for plantation programmes. This should also change although it may cause difficulties in States where forest revenue is significant. But if such States want a stable income over a number of years they would do well not to kill the golden goose They should ensure that the forests are not cleared at an alarming fashion as now occurs and that replantations on a massive scale takes place simultaneously.

The ultimate awareness of "one earth" and "one environment" should guide us to the concept of "one humanity".

ENTOMOLOGY

"In all countries research in forest entomology manages to convey the impression that it produces little that is of direct use to the executive forest officer. The average entomological bulletin with its detailed life-cycle studies, its technical descriptions, its records of discarded theories and incidental experiments does not appeal to his taste. It is either rejected or digested hastily, and the core of practical results remains undetected in the voluminous fruit of the investigation. What the forest officer requires, it has been said, are not life histories, but death histories; not suggested remedies but tested remedies". These are the words of Beeson, one of the leading forest entomologists. The Division of Entomology, now about eight years old, has been trying to face up to this challenge. The Division, with a present strength of five scientific staff; four at Peechi and one at Nilambur, has addressed itself mainly to the following functions:

1 Evaluation of the present and potential insect pest problems relevant to forestry in Kerala, 2 Development of suitable methods or procedures to reduce the economic loss caused by the pests, 3 Dissemination of this information to the Forest Department and other user agencies. In addition to this problem-solving research, some fundamental studies on the taxonomy, biology and ecology of insects are undertaken to increase our understanding of the interaction between insects and trees and the role of insects in the forest.

The caterpillar, *Eligma narcissus* feeding on *Ailanthus triphysa* leaves in a one year plantation at Kothamangalam.

Such understanding, apart from advancing the knowledge in Entomology, is often necessary for developing better and environmentally safe pest management strategies.

Teak plantation at Palippilly showing mortality of trees due to the trunk borer, *Cossus cadambae* Moore. Inset shows trunk of a dead tree with borer holes.

A dozen research projects have been taken up so far by the Division of Entomology, of which six have been completed and the others are in various stages of completion. The first project, completed in 1982, was concerned with standardisation of methods for control of termites in eucalypt plantations. Earlier, different insecticides were used in many different ways with varying results. Losses continued to occur as there was neither adequate research data base nor an agency to suggest appropriate methods. In a comprehensive study carried out under field conditions over a four year period, we tested combinations of various dosages, formulations and methods of application of selected insecticides, and standardised simple and effective methods. It was possible to cut down the cost of treatment and to increase the effectiveness. Selected treatments were tested in large-scale field trials in Trichur and Nilambur Forest Divisions and the effectiveness confirmed. In collaboration with the Forest Department, a demonstration plot of 10 ha of *Eucalyptus grandis* treated as per standardised method was laid out at Mavinhalla in 1981-82. The practical procedure for control has been described in KFRI Information Bulletin - 3, published both in English and Malayalam. Forest Departments outside the State have also shown interest in adopting the method standardised by the Division and the Gujarat Forest

Department has distributed a Gujarathi translation of the KFRI Information Bulletin to their field staff

In another completed project, a comprehensive study of the identity of insect borers of stored commercial wood has been carried out. This serves as a basic aid for studies on control of timber borers. In projects undertaken in collaboration with the Wood Science Division, methods were standardised for management of insect borers in stored reed and cashew. The Entomology Division demonstrated that the sapling borer, *Sahyadrassus malabaricus* is not a serious pest of forest plantations of most species contrary to popular belief. Methods involving cultural practices and spot application of an insecticide were worked out for protection of high value plantations from this insect.

In another study just completed, the loss of wood increment in teak due to insect defoliation has been quantified. It has been shown that while *Hyblaea puera* causes significant loss of volume increment, loss due to *Eutectona (Pyrausta) machaeralis* is insignificant. In a two-pronged approach to management of *Hyblaea puera* in teak, the potential of natural enemies is being studied and attempts are being made to select teak trees that show resistance (comparative) to *Hyblaea*, for possible mass propagation. Also in progress are investigations on the seasonal incidence and control of pests of *Ailanthus*, *Albizia* and *Gmelina*; and studies on the distribution, spread and control of the teak trunk borer, *Cossus cadambae*. Another study in progress examines the incidence of pests in natural forests, to test the general assumption that pest outbreaks do not occur in tropical forests because of natural biological equilibrium. Fundamental studies have also been made on fungal and bacterial parasites of insects, dispersal and migration of *Hyblaea*, artificial rearing of insects, etc.

In view of the environmental hazards and other problems that may result from widespread use of insecticides in the forests, the thrust in our research is to develop methods to manage insect pest populations in such a way as to limit the economic loss to tolerable levels rather than attempt to control the pest completely.

The Division maintains a representative collection of identified insects and is equipped to provide identification service to other research organisations on the Lepidopteran fauna.

When you have any insect problem in your forest nurseries or plantations

Please contact

The Entomologist,

KERALA FOREST RESEARCH INSTITUTE

Peechi-680653, Kerala

Management of environment

Prof. Madhav Gadgil is a leading environmental scientist in India. Presently he is the Director, Centre for Ecological Sciences; Bangalore.

Evergreen : What are your views on the National Forest Policy of 1952 and what should be the one for the coming years?

M. G. : The Forest Policy of 1952 was a mere continuation of the British Policy on forest management. The British forest administration primarily emphasised the alienation of forest resources from the traditional community sector for industrial exploitation like ship building, railways etc. This has given rise to many problems like encroachment of forest lands by local and migrant population. So now, we have to have a new forest policy which can change the orientation of the forestry sector very dramatically. By changing the orientation I do not mean paying mere lip service to a number of objectives which we always do but actually setting down clear-cut priorities and changing the pattern of forest resources utilisation.

Evergreen : Has anything been done in this direction to the revision of Forest Policy of 1952?

M. G. : Of course, for the last three years there has been considerable debate on this issue and various drafts of a revised forest policy have been floated. The Ministry of Agriculture has produced a draft but along the lines of the old Forest Policy of 1952. While paying lip service to certain social objectives this policy aims at increasing the regulatory powers of the forest bureaucracy for channelising the forest resources towards the needs of the industrial sector.

The Department of Environment at the Centre too has produced a draft and considerable changes have been brought about on the recommendations of a number of groups. A lot of debate is also going on which I consider as a healthy sign.

Evergreen : What is your role in the formulation of the draft of the revised forest policy?

M. G. : The National Council for Environmental Planning and Coordination (NCEPC) requested me to review the current forest policy and to suggest some modifications to meet the environmental priorities and social objectives. So I did produce a report which was almost entirely accepted by the NCEPC and the same has formed the basis for the recommendations of the Department of Environment towards a new forest policy.

The forest policy of 1952 was a mere continuation of the British policy on forest management.

Evergreen : Can you highlight some of the major objectives of the proposed New Forest Policy?

M. G. : Well, this policy is based on the following major objectives :

A rapid increase in the forest cover through the protection of all existing forest ecosystems and the esta-

blishment of man-made forests and grasslands on denuded and degraded areas; Generation of employment for the unemployed and underemployed and the derivation of other long-term economic benefits that may flow from environmentally well managed resources

Evergreen : How would you define ecodevelopment?

M. G. : The notion of ecodevelopment was introduced to Indian Planning by Dr M. S. Swaminathan and I think it is an important concept which is beginning to have some impact on our developmental planning. With respect to the development of Western Ghats the last three Five Year Plans laid special emphasis. Earlier plans followed the traditional lines of developmental planning which were characterised as exploitative development and such a developmental path brought little benefit to the actual local population in the hill ranges. The resource utilisation should be on a sustainable long-term basis and while developing the benefits should not flow out of the region. These two are the major criteria on which plans are formulated.

The concept of ecodevelopment has begun to have certain effect. Already at the Planning Commission level and at the State Planning level changes in priorities are beginning to appear slowly.

The concept of ecodevelopment has begun to have certain effect. Already at the Planning Commission level and at the State Planning level changes in priorities are beginning to appear slowly.

Evergreen : In view of the general feeling that larger developmental projects (hydroelectric, thermal, nuclear, mining etc.) cause serious environmental problems what alternatives would you suggest?

M. G. : Large scale developmental programmes are followed by large scale disruption of the environment. It is not that small scale programmes will not give rise to environmental problems unless proper attention is paid to the alleviation of these problems from the beginning. Nevertheless, because the scale is small, small scale programmes will naturally lead to smaller disruption and smaller scale of environmental problems.

Large scale developmental programmes are followed by large scale disruption of the environment.

In the field of irrigation there is tremendous potential for conservation of water and better and careful usage is called for. Similarly, in the energy sector too there is much scope for conservation. Power and irrigation projects on a smaller scale and alternate sources of energy like biomass based energy can help us to develop with minimum environmental disruptions.

Evergreen : What is your opinion about clearance of natural forests to give way for plantation crops like rubber, cocoa, eucalypts, oil palm etc?

M. G. : I think it is an undesirable policy for many reasons. Firstly, the natural forests are vanishing and it is really necessary from a long-term point of view to preserve the genetic diversity. Sometime ago we tried to find out how much of good moist deciduous natural forests are left in Kerala. It would appear very little and whatever left is being cleared too. So from the point of view of genetic diversity, hydrology and so on it is quite necessary not to clearfell natural forests.

Power and irrigation projects on a smaller scale and alternate sources of energy can help us to develop with minimum environmental disruptions.

Evergreen : Will you kindly throw some light on the concept of Biosphere Reserves?

M. G. : The Biosphere Reserve is a notion which was introduced through the Man and Biosphere Programme of the UNESCO, some ten to twelve years ago. The idea was to have representatives of all (various) biological communities of the world in a global net work. In India also, this idea has considerable relevance because while we have set up a number of Nature Reserves they have not been planned to ensure a proper representation of all biological community types of the country. Secondly, the Biosphere Reserve differs from an earlier concept of Nature Reserve and is meant to serve as location for bench mark studies for long-term understanding of natural communities. As the Biosphere Reserve will also encompass certain modified communities within itself comparative monitoring too is possible. In addition, the Biosphere Reserve Programme envisages restoration zones in the periphery where ecorestoration activities can be taken up and techniques of restoration can be tried upon.

The Department of Environment at the Centre has prepared some project documents for establishing Bios-

phere Reserves in certain places. The first one was prepared for Nilgiris, followed by Namdapha, Nandadevi, Valley of Flowers, Andaman and Nicobar islands etc. No Biosphere Reserve has been actually established in the country. Discussions regarding establishment of the Nilgiri Biosphere Reserve are at a relatively advanced stage.

Evergreen : Being the author of the document can you say something on the proposed Nilgiri Biosphere Reserve?

M. G. : The area of the proposed Nilgiri Biosphere Reserve falls within the three states of Kerala, Tamil Nadu and Karnataka. The reserve will have a representation

So, from the point of view of genetic diversity, hydrology and so on it is quite necessary not to clearfell natural forests.

of each biological community typical to this tract, ranging from communities in very low rainfall areas to humid evergreens. For example, from the Moyar gorge and the Thalamalai plateau in Tamil Nadu to the very high rainfall areas of Korakundahs in the Nilgiris. On the Western face, from the base in New Amarambalam to the evergreen sholas and grassy downs of the Kundahs of the Nilgiris. The reserve will cover large deciduous tracts of Bandipur and Nagerhole also. So you will have a whole variety of biological community types. The idea is to form a ring around the Nilgiris, adding to the same some areas of Mysore plateau so that the reserve will be represented by a variety of vegetation types of the peninsular India. The three states will have considerable say in administering their part of the Biosphere Reserve through a Monitoring Authority located perhaps at Coonoor.

Evergreen : Do you foresee some administrative constraints in the management of Biosphere Reserves?

M. G. : There has been, in any case, certain amount of problems between the Centre and the States. Although the Centre insists on a different type of management to be adopted in National Parks, Tiger Reserves etc., the States are not ready to accept *in toto*. With three States

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involved in the Nilgiri Biosphere Reserve we may have certain amount of disagreement, but I think more and more States are becoming conservation conscious and in future problems may be minimised.

Evergreen : Last and about your own Institute, The Centre for Ecological Sciences, what is its status and the major activities?

M. G. : The Centre for Ecological Sciences is one of the centres of the Indian Institute of Science and it was established two years ago with the help from the Department of Environment. The Department has specified that we should focus on the ecology and environmental problems of the Western Ghats. So we have chosen an area in the Uttar Kannada district of Karnataka and a variety of schemes, both research and action oriented, have been launched.

We are trying to understand how different activities have modified vegetation and animal life and how they have affected the productivity as well as diversity of the biological communities.

We are trying to understand how different activities have modified vegetation and animal life and how they have affected the productivity as well as diversity of the biological communities. At the same time, we are taking up some action oriented ecodevelopment programmes. For instance, we have involved a number of Farmers' Cooperative Societies, local schools and colleges in afforestation of barren lands and development of fodder resources. Uttar Kannada has a very large livestock population and we are experimenting on shifting the feeding pattern from grazing to stall feeding. Our engineers have also developed a good model of fuel efficient chulas which can be fabricated easily. So in some villages the entire population have these chulas and we are trying to assess how the same will affect the fuelwood consumption and the vegetation nearby. It is only two years since the Centre is established and our immediate task is to consolidate programmes along these lines.

Forest herbarium

Taxonomy is the essential basis of all biological sciences as it enables the enormous diversity of organisms, both living and fossil, to be recognised and described, named according to an internationally accepted code and systematically classified. The most important tool as far as angiosperm taxonomy is concerned is the herbarium, also sometimes called as the 'dry garden', composed of collections of preserved plant material usually organised in one of the several acceptable systems of classification. Thus, in essential, taxonomic research and development of herbarium are complimentary to each other.

Among different types of specialised herbaria, forest herbarium is one that preserves mainly specimens of forest plants. It will also contain representative samples of exotics that are introduced in the forest for various purposes. Within the scope of a forest herbarium, representations will be maximum for important timber species, species of other economic and forestry importance, characteristic elements of different forest types, endemics etc. A forest herbarium will also serve as a depositary of the voucher specimens based on which research conclusions are arrived at in different disciplines of forestry. To supplement this wealth of data, wood samples (or a separate Xylarium by itself), carpological specimens, authentically identified samples of medicinal plants or specimens of other ethnobotanical interest and their useful part or parts, and representations of plants that yield other forest products of both major and minor importance are also added. For certain groups of plants like bamboos, canes, palms, etc. herbarium specimens will often be supplemented by stem samples, culm bases, bracts, leaf-sheaths, culm-nodes, internodal parts, fruits and seed samples, complete leaves etc.; some of which a standard herbarium sheet cannot accommodate but at the same time are of diagnostic or informative value.

As already stated, research activities of any sort centered on forest plants will naturally contribute to the development of the forest herbarium. Forestry research being multi-disciplinary in nature, not only taxonomists but also researchers from allied disciplines of forestry science will also be able to make substantial contributions to its development by depositing plant collections of their interest (fig). However, it is for the taxonomist to ascertain that such materials are collected in accordance with the accepted standards of herbarium methodology and they are suitably processed to be incorporated into a herbarium which has to last for centuries.

Plant collection work solely to increase the bulk of the herbarium is a tiresome task as it will not give sufficient taxonomic returns immediately. Further, such general collections will be left with their provisional identification as there is no scope in such situations for more detailed and critical studies. Instead, if it is planned to explore exhaustively the forest flora of a region or to identify all plant taxa of forestry importance therein, taxonomic achievements will always be encouraging During such detailed field surveys a lot of data on the distribution pattern, identity, new uses or other useful information on forest plants will be available in addition to the data generated on the general aspects and constituents of the flora. Even a preliminary checklist prepared during such explorations will be of immense practical value to practising foresters and also to those engaged in the revision or preparation of Forest Working Plans.

From the earlier concept of herbarium as an organised collection of dried specimens useful mainly in identification work or as depositaries that maintain types and vouchers which help in correcting and fixing names, it is now accepted as a laboratory to study population structure, distribution pattern and range of variation of different taxa. Further, specimens of cultivated plants and plantation species in a herbarium will document and provide comparative material for the silviculturist and geneticist for forest management and tree improvement programmes. Herbarium will also provide basic information pertaining to research activities of experimental taxonomists, phylogeneticists, physiologists and also ethnobotanists by way of field data and preserved materials. Similarly specimens of forestry importance whose chromosome numbers have been ascertained or those which are subjected to important morphological and physiological investigations will give clues and guidelines to plant breeders and physiologists in their work.

To the conservationist, herbarium is much useful as a source of valuable data for locating endemic, rare and threatened plants and to identify those taxa that are extinct from a region. Such details on the population status of different species will be helpful to identify taxa that deserve protection, and thereby to initiate conservation programmes on them. Further, in developing countries, especially those in the tropics where ecosystems are fast changing, herbarium collections will serve as a record of the original nature, characteristic constituents and also

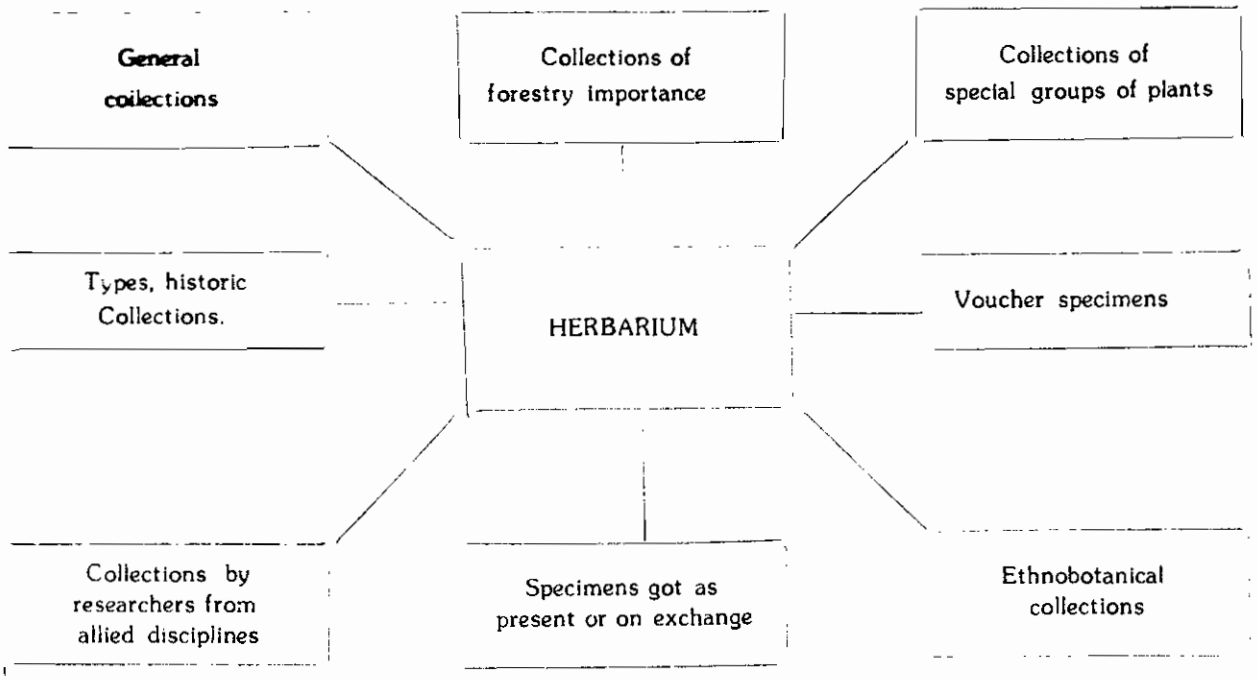


Fig. Development of herbarium

the pattern of change in the vegetation types. Information available from such herbarium records will be very useful in implementing conservation programmes, and in this respect herbaria are now accepted as institutions of national importance, helping to preserve our valuable heritage.

Thus, a dynamic herbarium with deposits of types, historic collections, collections of economically important forest plants, plantation species, representations of endemic, rare, endangered and extinct taxa, voucher specimens from various disciplines of forestry research and also general collections of forest plants will no doubt be the most valuable source of stored information to which additions are made systematically and continuously. Hence herbarium should be accepted as an information storage and retrieval system of a permanent nature and its value as a data bank will be increased as we proceed further in forestry research.

K. K. N. NAIR
Division of Botany (Taxonomy)

Avail KFRI herbarium facility

— Identification of medicinal plants.

Computers in forestry research

A computer is an electronic machine which can do addition, subtraction, multiplication and division of numbers, make comparisons and store, search and retrieve information. All the information inside the computer is stored as strings of zeroes and ones. The first generation computers of the forties were made of vacuum tubes. Eventhough such computers were voluminous the total amount of information they could process was very small. The invention of tiny transistors and their assemblage in tens of thousands per cm^2 as integrated circuits reduced the bulk and cost of subsequent computers and increased their speed and accuracy. As the price of smaller computers came down to as low as that of an electric typewriter computers which were earlier limited to major laboratories and defence establishments began to be widely employed in all fields of activity.

The computer performs various tasks according to the step by step instructions given to it (computer program). The present day computers still cannot make any logical or intelligent decisions by themselves The step by step instructions have to be very detailed and complete. The machine's ability to perform the tasks given to it arises from its unimaginable speed and accuracy. A medium sized computer executes over a million instructions per second. This is roughly equivalent to all the arithmetic operations a human being can perform in the course of an year, given he works day and night and does not do anything else!

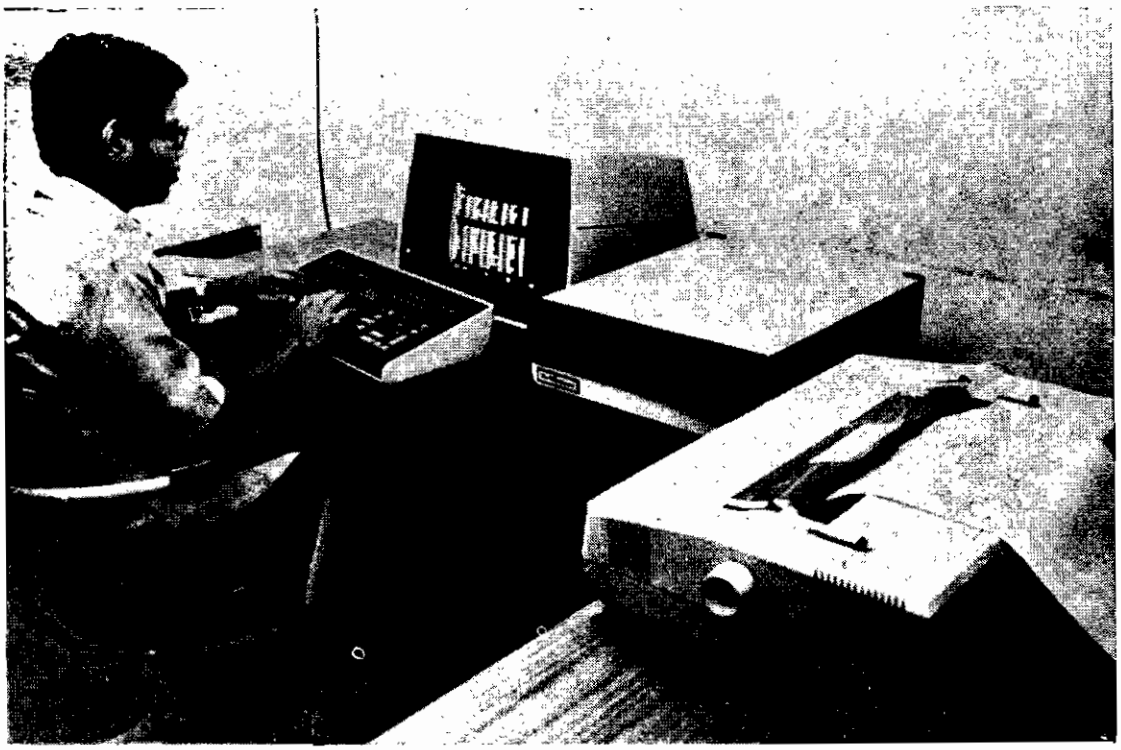
Before going into the details of what computers can do for forestry research let us examine how computers are used in general. The digital computers are used for numerical analysis, simulation, preparation of documents and bibliographic search. Even complex trigonometric, iterative calculations can be done in a few seconds depending upon the number crunching abilities of the computer. Fitting a curvilinear regression beyond the 2nd degree was seldom attempted during the precomputer era. Now this operation is carried out even by school children who have access to the machine. The computer in a way has made it unnecessary to know the exact details of complex mathematical operations like integration, differentiation, solving equations etc. By mere knowledge of the context of using these techniques and with ability to interpret the results, powerful tools of analysis can be employed almost by anybody. The computer serves as a black box between the raw data and the result and one need not worry about the nature of it.

Preparation of documents is another field the computers have revolutionised. In the place of half a dozen drafts prepared earlier, corrections are made now a days on the first draft, keyed into a word processor and stored into a disc inside the computer. The draft can be recalled, corrected any number of times and as many copies as required can be printed with perfect alignment, justification and spacing.

With the help of the computers we have been able to some extent curb the information boom that is taking place in every field of Science and Technology. Almost all the articles published in journals and books are entered into the computer by the abstracting and cataloguing agencies. In developed countries advances in one's field of interest can be searched conveniently through personal computers connected to the information source through a telephone line. Queries can be made based on author, subject, year, journal or key word. Some agencies keep us ever informed about the latest developments in science only with the help of computers

In the field of forestry research and related subjects, in addition to the general type of uses mentioned above, the computers can be put to several tasks that would greatly reduce time consuming manual work. Some of these areas are computations of yield, volume, biomass., identification of plants; stock taking and inventory applications; surveying and mapping and forest management.

As such, in applications like calculating volume of timber from girth and length, tables are used These can be generated by computers. Many other parameters like price can also be simultaneously generated. Each and every data necessary for the forest manager can be kept track of, if fed into the computer as and when they are acquired. With a computer at hand inventoring and stock taking procedures greatly become simple. Another area which holds lot of promise is the employment of computers in plantation management. Computers can be programmed to remind the manager of weeding, thin-



HCL Work Horse installed at KFRI

ning, control burning, felling etc. Many programmes are available for wildlife managers too. These take into consideration food availability, animal numbers etc., and suggest actions to be taken. The computer data bank on forestry, if prepared properly, can be of great help to the forest planner, manager and scientist.

Thus the computer can play a key role in shaping the future of forestry.

A. R. RAJAN
Division of Statistics

Contact Statistician KFRI — any computation problem in forestry.

Induction of phase change in Trees

All plants have two definite phases in their life cycle viz., vegetative or juvenile, and reproductive or mature. During the first phase the zygote undergoes development involving division and differentiation to form a specialised adult plant. On attainment of this stage, plants change to reproductive phase which, in the case of angiosperms, can be morphologically visualised in the form of flowering. The transition of a plant from juvenile to mature stage is known as phase change and it involves several physiological processes. The juvenile period may vary within species and from species to species. Various external and internal factors are known to influence the process of phase change leading to flowering. External factors are temperature, light, water and nutrient status, while, internal factors include level of growth regulating substances, carbohydrates, etc However, no structural difference has been noticed between the meristem producing leaves and that producing flowers.

Reluctance to flower during the juvenile phase and irregular cycles of flowering later are some of the major problems faced by the tree breeders. Trees attain large size and their height poses serious problems for harvesting pollen, fruits or seeds. For a successful tree breeding programme what is required is early flowering at workable and convenient heights. Knowledge of the various factors responsible for phase change has directed the research workers to evolve artificial methods to induce the same. Treatments which induce flowering in mature plants are generally not very effective in juvenile ones. However, certain treatments can stimulate precocious flowering even in juvenile plants. Reliable flower induction at a convenient height is possible in a number of genera by using mature grafts, rooted cuttings and also seedlings. Various methods used for induction of early flowering include physical and chemical treatments. Most of the physical treatments are based on subjecting the plants to different forms of shock like, drought, freezing the root, shoot pruning and bark ringing. Of these, bark ringing is found to be promising for a number of unreiated genera covering both conifers and broad leaved trees such as *Thuja plicata, Pinus sylvestris, Pseudotsuga menziesii, Betula pubescens* and *Betula pendula*. The cut surface is protected with a suitable wound paint and ringed branches are given extra support for better results.

Chemical treatments involve application of various growth regulating substances. These chemicals are applied to the plants by different methods such as foliar sprays, soil drench and injection. The mode, time and duration of application as well as the quantity of chemicals have been found to be critical in inducing flowering and vary with species. Different growth regulating substances are known to influence flower formation in various species of plants or in other words no single chemical may generally be effective over a large variety of plants. The major groups of chemicals which have been employed so far in flowering experiments are gibberellins, growth retardants, ethylene releasing compounds, auxins and auxin antagonists The application of gibberellins for induction and enhancement of flowering in conifers, especially in plants belonging to the families Cupressaceae and Taxodiaceae, is well established. Profuse flowering is reliably and repeatedly stimulated in seed orchards by gibberellic acid (GA_3), alone or in combination with other gibberellins. A mixture of $GA_4 + _7$ has also been found effective in pines. Growth retardants include various antigibberellins, AMO 1618 (2'-isopropyl-4' (trimethyl ammonium chloride) - 5' methyl phenylpiperidine - 1 - carboxylate), CCC (2-chloroethyl trimethyl ammonium chloride), Phosphon D, Daminozide (B-9, B 995, SADH or Alar) and Ancimidol. Treatment with growth retardants enchances flowering in many fruit trees like apple, pear and lemon wherein gibberellins are not effective. Role of ethylene in induction of early flowering was earlier known but the use of this gas was restricted due to the difficulty in handling gas tight chambers. But this problem was solved with the introduction of ethylene releasing compound viz., 2 - Chloroethyl phosphonic acid (CEPA, ethrel, ethephon) which hydrolises at pH above 4.0 to form ethylene, following contact with plant tissue. An auxin antagonist 2, 3, 5 tri-iodobenzoic acid (TIBA) has been used to induce flowering in apple. This compound inhibits the polar transport of auxins in several tissues. Apart from these, various other chemicals belonging to phenolics, nucleic acid components, amino acids, foliar fertilizers and carbohydrates have been tested and found effective in few plants.

In forest trees standardised methods for induction of early flowering are mostly confined to members of conifers and temperate trees. However, obeche (*Tri-*

plochiton screoxylon K. Scheem) which takes about 15 years to flower under natural conditions has been induced to flower within 26 to 82 months in tropicalised glass houses. The selection of effective treatment, suitable growth regulating substance to be used, appropriate concentration, mode, time and duration of application have to be developed for many other species to control the flowering process.

Induction of early flowering and stimulation of profuse flowering in selected trees can help in tree improvement programmes. In many countries seed orchards are established with vegetatively propagated ramets of selected trees and are grown at a wide spacing. For bulk seed production and for controlled pollination to test parental genotypes, reliable methods for induction of flowering are required for each species.

K. K. SEETHALAKSHMI
Division of Botany (Physiology)

*There are advantages in being a Botanist. Mr. X should note this. He is singularly unfamiliar with Botanical nomenclature.**

* From field inspection notes drawn up by a Conservator of Madras Presidency in 1932.

Wood - Some common queries - II

1. What is the difference between sapwood and heartwood?

Sapwood is the portion of wood in the living tree that contains living cells and reserve food. After an indefinite length of time, which varies greatly with different species and with the condition of their growth, the living cells gradually die and heartwood forms.

The transition of sapwood into heartwood is accompanied by the formation of various organic substances known as extractives, extraneous materials or infiltrations. Usually heartwood formation is marked by appreciable darkening of the tissue. The darker colour is not, however, always a necessary condition for the existence of heartwood. For example, in mango or rubber wood, the inner core is not marked with colour change; nevertheless, since it consists of dead cells it is technically heartwood.

Differences in durability also exist between heartwood and sapwood. Sapwood of even highly durable timbers is perishable. The chemical composition of heartwood and sapwood differs principally in the proportion of extractives present.

2. What are the general defects of products made from young trees? Can this wood be made equivalent to wood from full grown or mature trees?

Strength of wood from young trees will generally be lower than that of mature trees. Young trees will have more sapwood compared to mature trees. Short rotation trees from intensively grown plantations will have distinct features - generally low specific gravity, high shrinkage, more juvenile wood, growth stresses, etc.

Though the wood from young trees cannot be made equivalent to the wood from mature trees, wood can be processed carefully and used effectively.

3. Can we use sapwood?

Sapwood of even highly durable species, like teak, rosewood, is non-durable. The general tendency is to remove the sapwood. However, the sapwood portion, if treated with preservative chemicals, can be used like heartwood. Sapwood is in no way inferior to heartwood in strength, though in some species it may be less strong compared to heartwood.

4. Is there any method to prevent decay in wood?

All wood-rotting fungi, to grow well, need a source of food (wood), a suitable temperature, and a supply of moisture and oxygen. If any of these is lacking, the fungus will either die or remain dormant until better conditions prevail. Moisture content is an important factor, and generally, wetter the wood is, the more likely it is to decay. Below a moisture content of about 20 percent, wood is too dry for fungi to become established. So, to prevent decay in wood, wood should be dried to below 20 percent moisture content. Also, preservative treatment will prevent decay in wood.

5. What are the advantages of drying wood?

When a tree is felled, fresh green wood will have high moisture content. Drying of wood is the first step in the efficient utilisation of wood. Drying the wood has a number of distinct and important advantages:

a) Drying reduces weight and thereby transportation and handling costs.

b) As wood dries, strength properties increase.

c) Strength of joints made with nails and screws is greater in dry wood than in green.

d) Wood must be relatively dry before it can be glued or treated with preservatives

e) Drying reduces the likelihood of mould, stain and decay.

f) Drying also increases electrical resistance and thermal insulating properties and improves finishing characteristics.

6. What is the reason for shrinking and warping of wood? Is there any remedy?

Water in wood is present in two forms - free water in the lumens of the wood cells and bound water in the cell walls. When all the free water is removed and the cell walls are still saturated with water, this point is referred as fibre saturation point (FSP). There will be little shrinkage in wood when drying from green condition to FSP and nearly all the shrinkage will take place below the FSP. This is because, when the bound water is removed from cell walls, cell walls will shrink. The tangential shrinkage is about twice as much as the radial shrinkage and this results in warping of wood. If wood is painted, water movement in the wood will be less and will control the shrinkage. Twisting and cupping can be minimised by weighting the stacks while kiln drying.

7. Is drying to be carried out before or after the preservative treatment?

Seasoned wood usually takes preservatives easily because the cell lumens will be empty. Attempts to force preservative chemicals are resisted by the water already present in the cell lumens and by the back-pressure of trapped air, so wood should be dried prior to treatment. Wood treated with a water-borne chemical will be saturated with water and it has to be re-dried. However, in diffusion treatment, a non-pressure process, green wood can be treated and the wood needs to be dried only after the treatment.

8. Why are some timbers difficult to treat?

In most species, sapwood can be easily impregnated. On conversion from sapwood, the cells generally become blocked, restricting the penetration of preservatives. In some species of hardwoods, the vessels get blocked as a result of the growth of adjacent parenchyma through the pits in the vessel wall. These growths, which have balloon like structures, are known as tyloses In some species, tannin or gum-like substances block the vessels. These materials often harden when the wood is dried.

9. Is there any way to increase the strength of wood? Will treatment with preservative chemicals make the wood stronger?

Treatment with preservative chemicals will improve the durability, and thereby the service life of wood; it will not, however, make the wood stronger. One way of increasing the strength of wood is to modify the wood chemically. In this method, after the wood is impregnated with a liquid monomer using vacuum-pressure impregnation techniques, the monomer is polymerised either by gamma irradiation or by the use of free-radical catalysts and heat. However, this is a very expensive process and used only for specialty products.

10. How safe is it to handle preservative-treated wood?

Wood treated with copper-chrome-arsenic (CCA) preservatives has to be re-dried after treatment. After surface drying, which usually takes about 7 days at 25°C, the treated wood is clean, non-oily, non-poisonous to mammals and safe to handle. During this initial drying period, wood should be protected from rain. Otherwise, small amounts of the preservative may be leached from the wood. When the fixation process is completed in 7 days, treated wood can be handled safely without gloves even when wetted by condensation or rain water.

A question generally asked is whether the arsenic in sawdust from CCA-treated wood is a health hazard? All evidences suggest that there is no greater danger to health than from cutting untreated wood.

The amount of arsenic which escapes into the atmosphere when CCA-treated wood is burned, is relatively small compared to that produced by coal-burning.

Wood, treated with pentachlorophenol in liquefied petroleum gas, emerges from the treatment vessel dry to touch and is safe to handle.

R. GNANAHARAN
Division of Wood Science

For more information —

Contact Division of Wood Science, KFRI

Endemic Trees of Western Ghats

Parinarium travancoricum Bedd.

Rosaceae

An endemic tree of interest, *Parinarium travancoricum* with cylindrical bole and drooping branchlets, grows to a height of 20-30 m. The bluntly acuminate, submembraneous, linear-lanceolate leaves measuring 8-12 cm/ 2-3 cm bear a distant resemblance to *Hopea parviflora* and this perhaps may be the reason which made a forest guard to call it '*Thambagam*'(Vern. Mal. for *H. parviflora*) upon sighting the tree. But the known vernacular name for this species is 'Kallankaimaram'.

The flowers, white petalled with exerted purple stamens, occur in less branched pubescent racemes, towards the tip of the drooping branchlets. The fruits are brown, hard and dry, subobovoid and are about 3 cm across. They are usually single seeded.

The earliest collection of this species dates back to R. H. Beddome in 1873 from the mountains of Travancore near Shendhurni (near Courtallum). Further collections are mainly of M. A. Lawson (Colatoopolay 1893), T. F. Bourdillon (Merchiston Estate 1893, Ponmudi 1895), N. G. Nair (Poringal 1981) and C. N. Mohanan, (Idukki, 1982).

The Poringal collection represents the known northern limit of distribution. Right in the much disturbed catchment of Poringal reservoir this species survives in a small population of three profusely fruit bearing adults with plenty of young seedlings around. The noticed absence of sub-adult trees may be assigned to the human interference especially due to fellings and large scale clearing of evergreen forests for raising teak and eucalypt plantations.

Most of the seeds collected from this area germinated within a period of 1-2 months while, a few took more than 3 months. The initial rate of growth appears to be poor but may speed up after 5 or 6 years.

The wood is hard and smooth, close and even grained, and heavy with a density of 718 kg/m^3.

The seed contains an oil, worth attention for exploitation, A few species of *Parinarium* in Burma and Africa are reported being exploited for their timber and seeds.

I. Distribution II. A flowering twig III. Flower IV. Fruit V. Seedling - 3 days old VI. Fruit with 2 - seedlings - 15 days old.

A few seedlings of this endemic tree were supplied to the garden at Trivandrum Zoo. The 'latest' botanical name of the species is *Atuna travancorica* (Bedd.) Kosterm. but for any conservation programme,the name *Parinarium travancoricum* would suffice.

N. G. NAIR
Division of Botany (Taxonomy)

P. S. In the last Evergreen, Vol. 13 P. 23 the species *Humboldtia laurifolia* Vahl. somehow got in with the endemics. The error is regretted - NGN.

Seminar

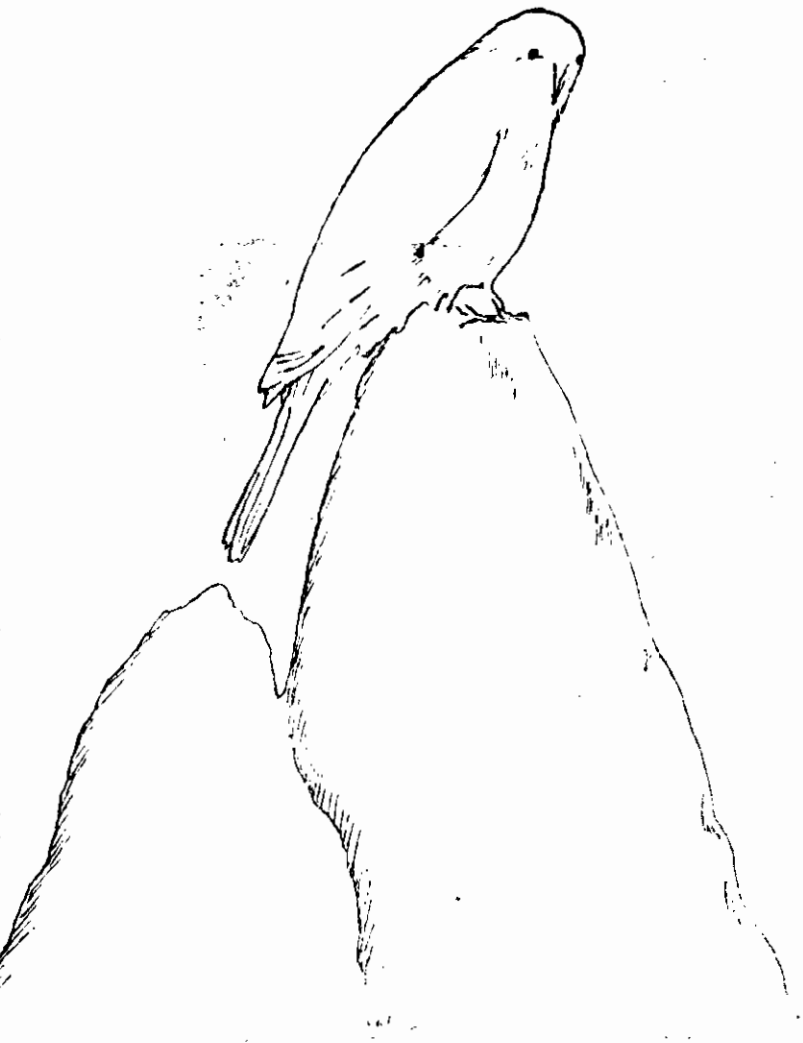
on

Ecodevelopment of Western Ghats

The Seminar on Ecodevelopment of Western Ghats was held on 17-18th October, 1984 at Kerala Forest Research Institute, Peechi. The seminar was organised to examine the various issues involved in adopting the concept of ecodevelopment in the Western Ghat region. The specific objectives were (1) to study the environmental problems arising in this region and to identify methods for ecological restoration in degraded areas, (2) to assess the data requirements, to identify areas for research and studies, so as to devise suitable approaches for managing life support systems in a sustainable manner.

a feature

Inaugural



Ecodevelopment - an urgent need

With the growing awareness of the environmental problems arising from human activities, both planned and unplanned - we have become conscious of the urgent need to adopt appropriate measures for resource management.

K. P. Nooruddin

Path to follow

Therefore, it is necessary for us to adopt a development path which is acceptable socially or economically and viable ecologically.

K Karunakaran

To admit

As a result of some unwise policies and management practices in the past, the Western Ghats in general, have suffered severe losses in forest wealth.

P. N. Nair

Basic changes imperative

The preparation and implementation of such a programmme would call for a basic change in the attitude of development departments and may call for new institutional structures.

V. Ramachandran

Overview

[illegible] approach

Any strategy dealing with the development of **Western Ghats** shall have to take into consideration the **protection,** preservation and conservation of the **ecosystem of the** region.

C. S. Chandrasekara

Micro level planning

Development plans for a region should be built up **as the** sum of a series of projects devised for the smallest **economically** significant unit of land or population.

T. Madhava Menon

Improvement of resource base

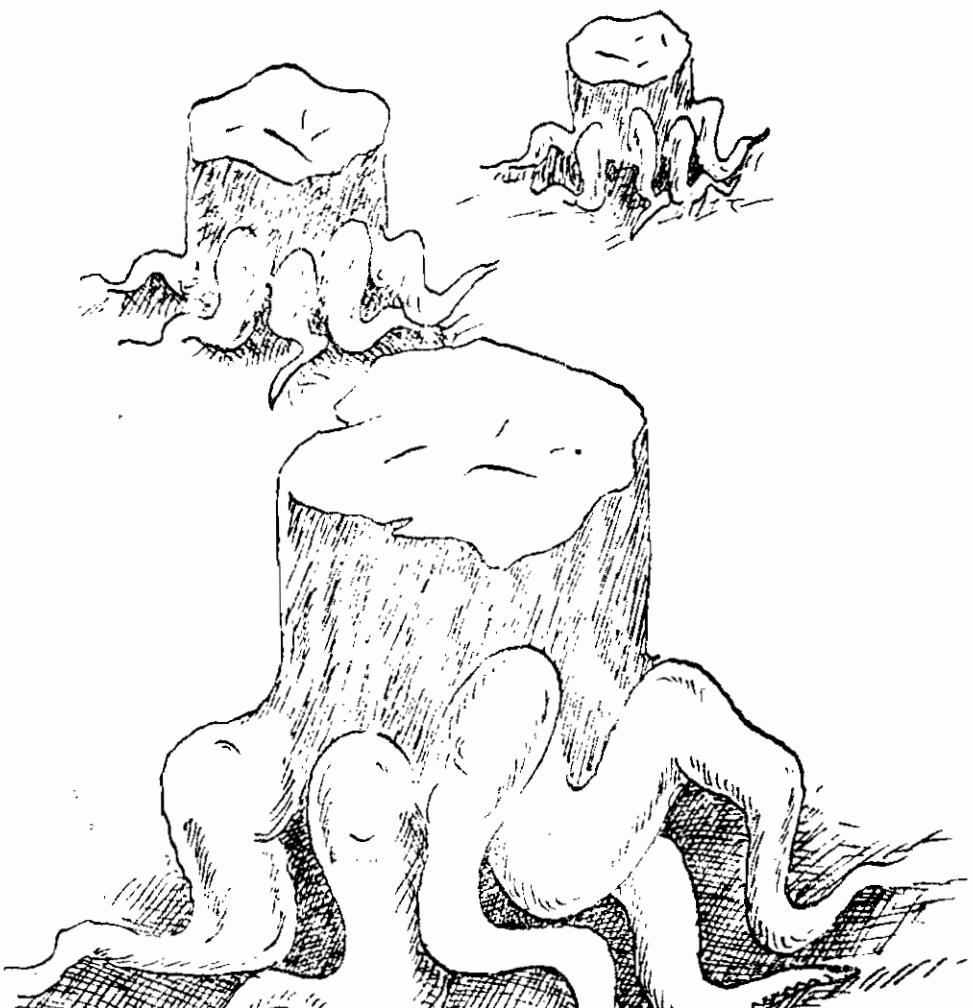
The most acute problem, at present, is the depletion of resources and clearly, therefore, the highest priority has to be given to the protection and regeneration of the resource base.

R. N. Loganey

Ecological audit

Any new project taken up in the Western Ghats shall be weighed, in terms of its effect on ecology and environment.

S. Shyam Sunder

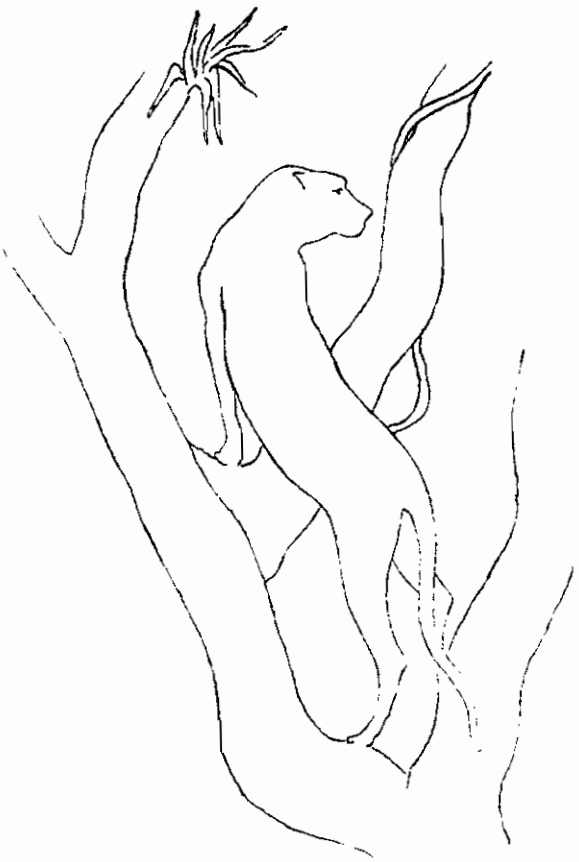


Flora and Fauna

Main threats

Encroachment, forest plantations, hydro-electric projects, poaching, fishing, cattle grazing....

M. Balakrishnan



Attention - endemics

The only plausible solution to save our endemic trees is to make an evaluation of them and to link conservation strategies with domestication trials.

N. G. Nair

Based on ecological criteria

Wherever the rainfall is above 3000mm, the natural vegetation should not be disturbed.

K. G. Prasad

Germplasm banks - the right approach

To protect the natural genetic diversity for future improvement programmes.

K K. N. Nair

Through.....

Sacred groves containing unique plant entities should be protected by declaring them as National Monuments.

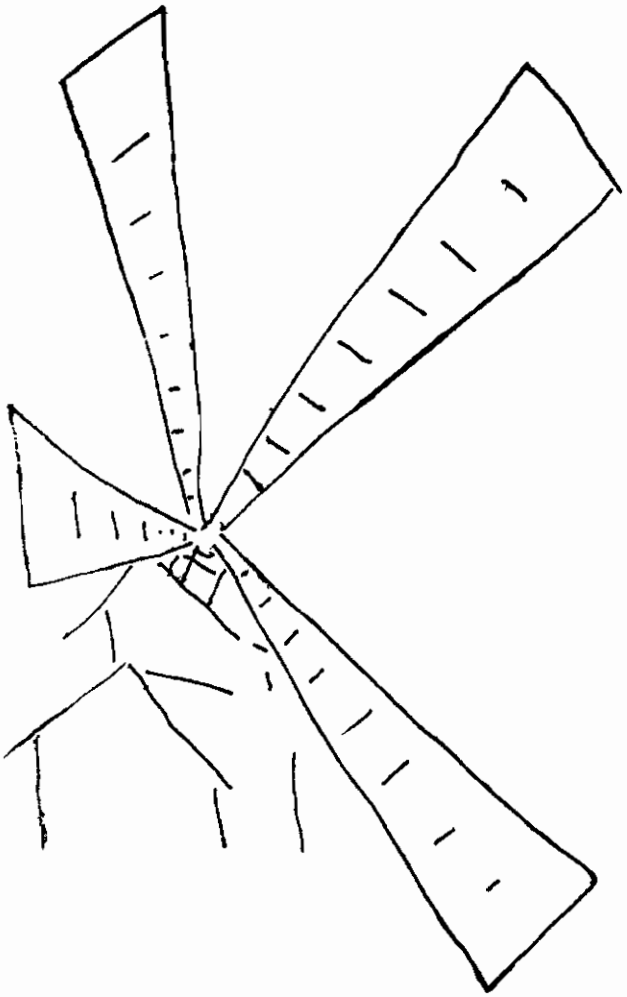
U. D. Vartak

and Biosphere reserves

The best way to conserve plant and the varied germplasm of different species is to establish Biosphere Reserves.

A. Abraham

Water and Energy



Alternate sources of energy

Wind Energy needs attention since conventional non-renewable energy resources are getting depleted fast.

G. Mohankumar

Water.....Water

Substantial amount of fresh water is available in the form of springs.

P. Basak

To tap.....

An entirely fresh outlook on land use and water management is necessary in the Western Ghats.

V. K. Vamadevan

Small is beautiful

Mini and micro-hydel projects will help in conserving and effectively utilizing the resources of Western Ghats... with least environmental damage.

V. K. Damodaran

Forest and Agriculture

At the 11th hour

Intensive research on tropical wet evergreen forests cannot be postponed any further.

K. K. Nair

What is happening?

The natural forests were uncared for and left to the ravages of fire, grazing, illicit fellings etc.

C. K. Karunakaran

The Result

Thus the forest reserve in Trichur Division in effect is about 130 sq km as against the forest area of 329.2 sq km.

A. R. R. Menon

New agricultural practices

Whatever be the system adopted, a no till, maximum canopy cover and maximum biomass production approach is essential.

K. V. A. Bavappa

One such approach

Integration of trees or shrubs in agroforestry system.

K. R. Vijayakumar

Sound agriculture

Substainability of agriculture is essential to preserve the ecosystem of the hills.

M. Mahalingam

No data base.....

An integrated picture for framing management **alternatives** for wildlife sanctuaries is not available.

E. A. Jayson

Look for new species

Since tropical pines are economically valuable, they can be raised on a plantation scale in the Western Ghats.

P. A. Abdul Bari

A must

The control and regulation of forest grazing is essential.

T. N. Gholap

Alternatively

Selection, improvement and propogation of suitable fodder species can prevent ecological degradation of grasslands and support cattle.

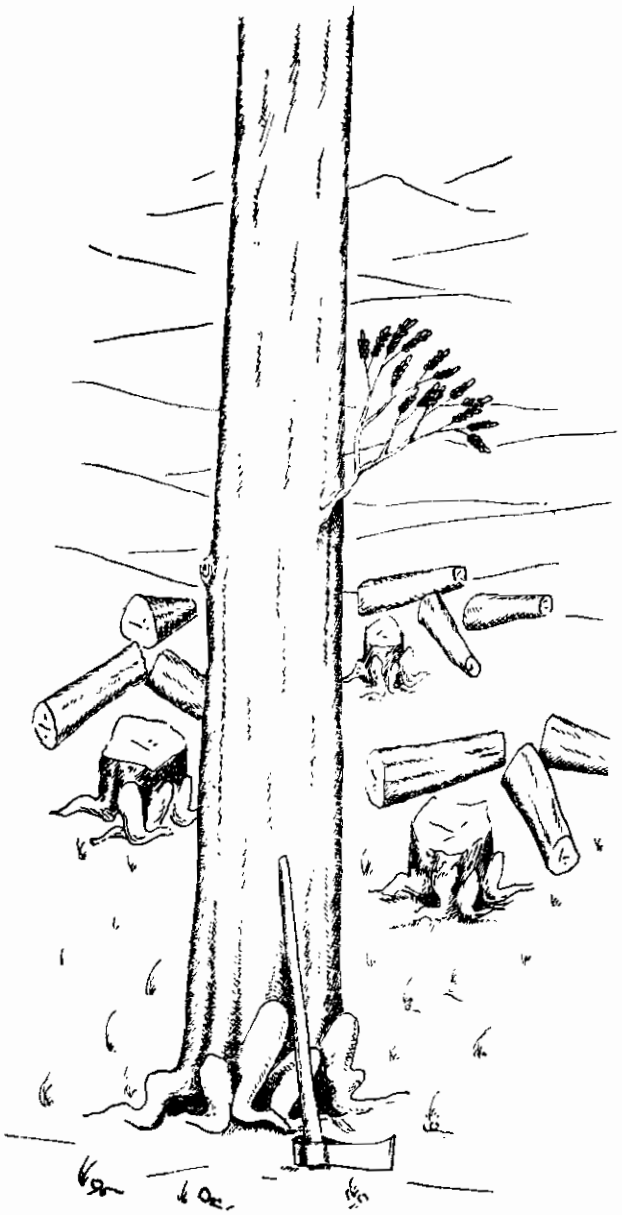
G. Raghavan Pillai

A forgotten truth.

Evergreen forests are important as regards to the critical benefits such as climate amelioration, water retentivity... intrinsic genetic diversity etc.

Chand Basha

Impact of Development



Defective planning

Unplanned and unscientific trends of development without environmental considerations.

M. K. Prasad

Over exploited

Indiscriminate sinking of irrigation wells.

K. M. Gurappa

Man only

Biotic factors.....felling, grazing, fire..... cause a great threat to the ecological balance.

J. Singh

and Man alone

Anthropic disturbances enhance changes in soil properties.

T. G. Alexander

and none but man

Landslides in Western Ghats are mainly due to deforestation.

Roy Chacko

Social injustice

Increased inequality and environmental degradation are closely linked.....

Kailash Paliwal

Future Options

Ecorestoration

Afforestation of degraded areas is to be taken up on a sound footing.

S. Shyam Sundar

Better planning

Ecodevelopment zones having regional perspectives have to be identified.

Sreekumar Chattopadhyay

Better land use

Reorientation of land use planning necessary.

S. D. Shinde

Not without fear

Ecodevelopment in the true sense will be adopted not by a consumer society but by a conserver society.

C. T. S. Nair

Not without people

The success depends upon the extent of public cooperation and involvement.

Planning Commission

and effective laws

The absence of an environmental policy legislation is a major lacuna.

Leela Krishnan

Recommendations

1. The Western Ghats is a very rich resource area with large areas of forests, plantations, minerals and potential for hydro-electricity. It has also a large population and because of the inroads made into the exploitation of the resources so far, and the attempts to meet the needs of the population living in the Western Ghats, the environment in the Western Ghats has undergone degradation in many ways and in a substantial measure. The major concern today is, knowing that further developments will take place in the Western Ghats to exploit its resources and to bring betterment in the socio-economic conditions of the people - to ensure that such developments do not cause further degradation and that appropriate safeguards, measures, and other steps are taken to arrest not only such degradation, but also to lead towards the gradual restoration of the degraded areas to their natural state.

To this end the Seminar recommends that Scientists, Planners and Administrators should jointly evolve a composite sensitivity index for each area in the Western Ghats region based upon physical, ecological and biological factors, which will give clear indication as to how a proposed development or extension of an existing development would affect the environmental quality of the area. All new developments should be checked against the sensitivity index of each area and allowed to proceed only if further degradation is not likely to take place.

2. Each State and the Union Territory of Goa in the Western Ghats region should set up a high level expert committee to which all developments proposed to be undertaken by the Centre or State Government should be referred to. The committee should study the impact of the proposed developments in that area against the sensitivity criteria evolved for the purpose, and advise the State and Central Governments appropriately in regard to proceed or not with the developments and also on making such modifications as might be found necessary in the proposed development so as to conform to the environmental balance in that area.

3. Since the development of Western Ghats must involve the people of that region, some of whom are tribal people, it is important that the interests of the tribal people are taken fully into consideration by the programmes.

4. Restoration of degraded environment should have high priority. Tribal skills and their knowledge of the forest should be used to the maximum extent in such restoration, so that they realise that further degradation, either by themselves or by others, is against their own interests.

5. Feasible models to suit such conditions can be worked out for each specific situation. These models will have to include : (a) survival activities for food production. (b) enrichment of sources of Minor Forest Produce, management of the same to increase availability of productivity value addition by local primary processing, employing tribal labour in marketing in order to eliminate exploitation by middle men; (c) involvement of tribal people in reforesting the area for which Forest Departments and Governments will have to work out formulae for sharing of the ultimate benefits and (d) integration of various elements of routine tribal welfare programmes to subserve the above.

6. If at all forest tracts are to be developed into plantation of industrial species, eg. *Eucalyptus*, either by Government or selected industrial companies, then, an initial survey of the tribal families inhabiting the area should be done and programmes for ensuring their survival and betterment built in as integral and necessary components of the development. Strict enforcement of these conditions should be ensured.

7. Development planning of the Western Ghats region should be specific for given stretches, population groups and objectives. While preparing such plans, care should be taken to study the ecological aspects and ensure that the impact will not be harmful. The interests of the local population, especially the members of the Scheduled Tribes should be fully safeguarded.

8. Micro-level for Ecodevelopment planning should be flexibly defined to include a physical feature like a watershed, or a socio-ethnic group like a tribal hamlet, or a vegetational entity like a defined stretch of forest or grassland or population centre.

9. Linkages between micro-plans should subserve the ecological integrity of the region.

10. For a fuller understanding of the value-systems and social dynamics of ethnic groups, more anthropological studies should be sponsored.

11. So far as agriculture activities in the Western Ghats are concerned there should be no further extension of agriculture but only intensification and improvement of agricultural practices in the presently cultivated areas

12. Where land has become degraded, it should be brought under tree cropping as a first step towards restoration and this should be taken up by the Forest Department of the States as a major afforestation programme.

13 Collection of endemic flora of Western Ghats and their systematic preservation should be organised at appropriate centres (*ex situ* conservation in arboreta and Botanical Gardens).

14. There should be better management and use of springs as a substantial source of water in the Western Ghats. As a protection measure, conservation of springs and improvement in storage and distribution should be undertaken.

15. The Western Ghats have large potential for mini and micro hydel projects. It is essential to exploit this energy potential as a supplementary source.

16 With a view to lower the pressure of population on the Western Ghats progressively, the following steps be adopted :

a) Discouragement of activities within the region which would attract population from adjacent and other regions.

b) Introducing training programmes and learning of skills to build up capabilities of the region's population to manage their ecosystem better with conservation as the goal.

c) Creating activities in adjacent regions so as to attract population presently residing in the Western Ghats so that population pressure in the Western Ghats region is substantially lowered as we go towards the end of the century.

d) Developing secondary and tertiary sectors in the region so as to reduce the burden on the resources of the region to support the population; this may mean establishment of national level activities such as production of scientific equipment, electronics, and similar high value goods which do not use extensive raw material but use specialised skills and support a large working force.

e) Development of non-destructive tourism which will bring income to the region without exploiting or degrading its basic resources and values.

f) Playing down demand for raw material requirements from national angle such as pulp wood, timbers, rayon pulp, cashew, bamboos, etc., so that supply against such demands will be well within the annual incremental production limits of the region

17 The Seminar took note of the various research projects sponsored under the Western Ghats Region Programme and the findings emerging from these studies. The Coordinated Action Research Programme should be continued in the Seventh Five Year Plan and enlarged in its scope. The studies should be practical oriented, interrelated and also in regard to the results that will emerge and should bring out some indicatons in regard to policy and programme formulation for the development of Western Ghats.

18. In order that the reserved forest areas which have already been depleted and have been endangered are not further attacked and are at least conserved and preserved in their present state, steps should be taken to ensure that no encroachment be permitted into reserved forest under any circumstances; nor should the present encroachments be compounded or regularised in any manner.

19. As a further measure of protection from exploiting the forests for firewood, it is essential that firewood depots be established by the Forest Department at convenient places and allowed to sell firewood, if necessary at a subsidised rate to the people. Where big projects are undertaken, the supply of firewood to such projects which attract a large temporary population during the construction stage, be organised in advance and arrangements should be made with the Forest Department to supply firewood to the project population at a subsidised rate, the subsidy being made a charge on the project.

20. In the case of towns, villages and other settlements in the Western Ghats, where arrangements for alternate fuel such as kerosene or LPG cannot be made, the Forest Department be requested to establish firewood depots in those towns and settlements and sell firewood at a subsidised rate.

21 With a view of reducing the hazards of the cattle grazing to forest development, the production and supply of fodder be undertaken by the Forest Departments and made available to the rural population at subsidised rates. This step would greatly help in stopping the grazing of the cattle in the forest, otherwise leading to its degradation and also encourage the cattle to be stall-fed.

22. The present privileges that are given in some states to the rural population in terms of extensive grazing land, grazing rights, lopping rights etc., be abolished as soon as possible, as the action on the recommendations made above will provide for supply of both firewood and fodder to the population, at subsidised rates.

23. The rehabilitation locations of displaced population from a project area should not be within the reserved forest areas and preferably located in the area that will benefit from the project by acquiring some beneficial land for the purpose

24. The Seminar took a serious note of the poor fire prevention, fire safety and fire fighting arrangements that are available with the Forest Departments and which appear to be ineffective and lead to a great danger of loss of substantial forests annually due to forest fires. High priority should be given to ensure effective fire protection of both natural forests and plantations. For this purpose sufficient budgetary provisions should be made available to the Forest Departments. Effective fire prevention and fire protection would considerably enhance the environmental wealth and value of the Western Ghats.

25. Adequate compensation be paid to the people for any damage they suffer due to cattle lifting or elephant damage or other wildlife action and believes that such a compensation will reduce the tendencies of people in harming the wildlife and wildlife protection will be enhanced.

26. The Kerala Forest Research Institute is the only autonomous research institute in forestry and allied sciences, well-equipped and well-staffed other than the FRI at Dehra Dun. The KFRI be recognised as an institution of national importance for carrying out special studies and research on tropical evergreen forests and that the services of KFRI could be advantageously developed and utilised by the other States.

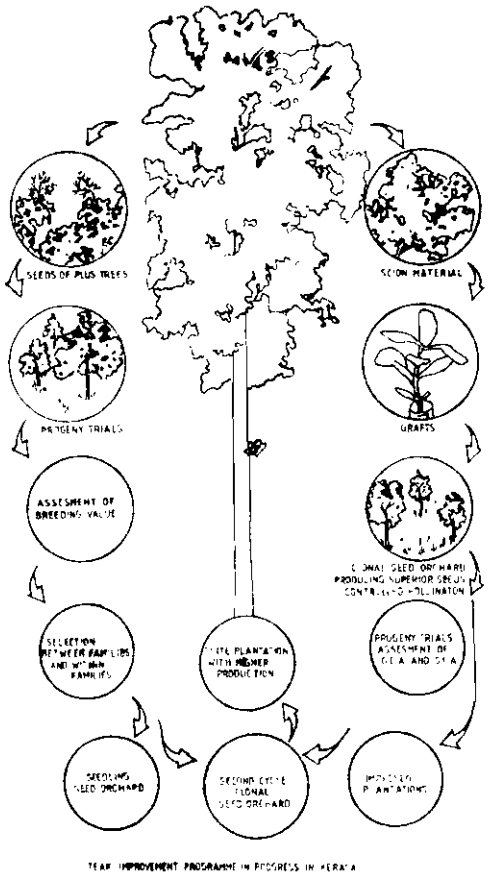
27. Watershed planning in the Western Ghats region should be conceived in a multi-level planning framework. The various planning functions, which would be undertaken at the watershed level, should be identified and linked to the higher levels of planning and decision making.

28. For watershed planning, there should be an adequate organisation. It should be a local organisation with people's representatives and having the authority to carry out, maintain and operate works of development. The nature of this organisation, its composition and powers should be specified by each State Government. It is also necessary to have an enabling Legislation for watershed planning.

29. Since watershed planning would need information on various aspects-both physical and economic - attempts should be made to build up an information system for the purpose. It is also necessary to standardise the engineering and other developmental standards for watershed planning.

30 The potential benefits from watershed projects can be realised only through the full participation by local watershed communities. Therefore, every effort should be made to mobilise the watershed community by creating full awareness among them of the various benefits that would accrue from watershed planning.

Towards better teak



TEAK IMPROVEMENT PROGRAMME IN PROGRESS IN KERALA

Teak, the prime timber of Kerala will surely be the mainstay of plantation forestry or rather forestry in Kerala in near future. According to 1979-80 data, about 500 ha of teak plantations have been felled and planted up again with teak. Additionally about 2500 ha have been newly planted up The reported final yield in 1979-80 was about 40,000 m^3 of timber. If the annual conversion rate reaches upto 2000 ha which is possible in future, a minimum improvement of 10% timber production will increase income by 1.5 crore per year at the present market rate.

Taking into consideration the great scope and need, Kerala has already started a genetic improvement programme in teak The scheme of work in progress is summarised in the figure.

MATHEW P. KOSHY
Division of Genetics

A close up of a budded plant of teak which has sprouted.

Bench grafting of teak plus trees for use in clonal seed orchards

Book of interest

Birds of Andaman & Nicobar Islands :

B. K. Tikader, Zoological Survey of India, Calcutta. 1984

The importance of Andaman and Nicobar Islands in the biogeography of South East Asia is admittedly beyond doubt and a book on these Bay Islands attracts special attention when it claims that "the author has dealt with various aspects of these islands as well as avifaunal information" (inside cover). This chain of islands in the Bay of Bengal leading South to Sumatra from the Arakan Yoma ranges of Burma is blessed with an unique biota, principally Indo-Malayan, a good percentage of which being endemic. The survival chances of this fragile ecosystem are dwindling day by day due to excessive human actions in the larger islands, caused by the unimaginative settlement system including the rehabilitation programmes in vogue.

The book, Birds of Andaman and Nicobar Islands by Dr. B. K. Tikader is an eye opener, for it points out our meagre knowledge on island biology and the lack of appreciation of the extensive stretch of scientific informations, stored in about three hundred and odd islands of different masses and configurations. In the strict sense of island biogeography, the Andaman and Nicobars are continental islands (the term 'oceanic islands' is used at a few places) showing in general resemblance to Burma in the North (the Andaman group) and Malesia towards the South (the Nicobar group). This aspect is being considered truer to the flora than the fauna.

Dr. B. K. Tikader "being himself a distinguished Zoologist and Head of the Zoological Survey of India, with the advantage of the relevant bibliography and expert advices at his elbow"* tries to consolidate material on the avifauna of these islands, "from the published literature available in the well-stocked library of the Zoological Survey of India and others"*, and the book, the net result is a hurriedly made popular picture book.

The physiography chapter clearly indicates the hurry in bringing out the book, at a few occasions contradicting the statements made in the preface, especially regarding the number of islands and the number of endemic birds. The word 'exotic' seems to be erroneously used, perhaps designating the non-endemics (wides). The purpose served by the floristic part is dubious for it is vague and least understood including the should have been avoided off-clour photographs. Some important literature cited in the text do not appear in the Bibliography or elsewhere. For example, Blasco 1975 (p.6), Chaturvedi 1980 (p. 9), Karunakaran 1967 (p.7), Smith 1931 (p.8) and Stoliczka 1870 (p.8). The absence of pertinent references in the geology part itself makes the physiography chapter confusing.

Out of the 242 birds enumerated, 52 are illustrated in colour, dealt more or less in natural settings ('ecological habitats' of the author!). Though it is attractive to see beautiful birds in pairs, it is only but superfluous to illustrate them so, when sexes are alike and to designate them as males and females. For example : *Phaethon lepturus* Daudin, *Rallina canningi* Blyth, *Charadrius dubius curonicus* Gmelin, *Lonchura striata fumigata* Walden etc. The indexing of scientific names (adapted from Salim Ali, Birds of India and Pakistan) could have been done in the traditional method with generic names alphabetically arranged preceding the specific and subspecific epithets. The plates should have been numbered separately and also the numbers given in the main text along with the names of the birds. The names of the islands at which the birds were observed by the author and the time of observance etc. if given, would have enriched this beautifully printed picture book by the Zoological Survey of India.

N. G. NAIR
Division of Botany(Taxonomy)
&
K. K. RAMACHANDRAN
Division of Wildlife Biology

* Salim Ali in preface.

Recent publications

Published in Journals

Bhat, K. M., Bhat, K. V., Dhamodaran, T. K. and Rugmini, P. 1984. *Some wood and bark properties of Hevea brasiliensis. J. Tree Sci. 3 (1 & 2):40-46.*

Selected properties such as wood basic density, bark basic density, thickness and percentage of bark, fibre length and cellular proportion of 28-30 year old *Hevea brasiliensis* (HBK.) Muell. Arg. (rubber wood) have been studied. The wood is light to moderately heavy and lighter than bark. The fibrelength is higher than average for fast-growing hardwood species. Except in the thickness and percentage of bark, no statistically significant differences exist between the three height levels (0.5m above the ground, 50% and 75% of tree heights) in basic density, fibre length and cell type percentages. The basic density and fibre length show an increasing trend from the pith outwards (with an increase in age), although they remain constant or decrease near the bark region. The radial patterns of variation in basic density and fibre length (in parabolic curves) suggest the occurrence of juvenile core of about 9 cm radius, which is important in determining the quality of sawn-wood.

Dhamodaran, T. K. and Gnanaharan, R. 1984. *Effect of immersion time on loading and distribution of boric acid in rubber wood by diffusion process. J. Ind. Acad. Wood Sci. 15 (1) : 19-23.*

Rubber wood squares of 2, 3 and 5cm cross-sections were treated with boron compounds (boric acid and borax) by diffusion process. The effect of immersion time on the dry salt retention was studied. The dry salt retention increased with the increase in immersion time although rate of increase was low. For higher thicknesses, prolonged immersion time reduced the dry salt retention. From the relationship of concentration of solution, loading of chemicals, thickness of wood and immersion time, a constant of proportionality was arrived at for rubber wood.

Gnanaharan, R., Ghosh, S. K., Balasundaran, M. and Dhamodaran, T. K. 1984. *Predictors of ultimate strength of mistletoe-infested teak (Tectona grandis Linn. f.). Holzforschung 38 (5): 293-295.*

Wood from teak (*Tectona grandis* Linn. f.) trees attacked by the mistletoe, *Dendrophthoe falcata* var. *pubescens* Hook. f.. was tested in static bending. Highly significant correlations have been obtained between modulus of rupture (MOR) and modulus of elasticity (MOE), MOR and fibre stress at proportional limit (FSPL), and, MOR and specific gravity relationships. The ultimate strength of mistletoe-infested teak can be predicted in machine stress grading either by MOE or by FSPL.

Ghosh, S. K , Mohamed Ali, M. I. Balasundaran M. and George Mathew. 1984. *Redarator bimaculatus, a possible vector for sandal spike in Kerala. Int. J. Trop Plant Dis. 1 : 197-198.*

Redarator bimaculatus Dist (Fulgoroidea : Issidae) was found to feed and thrive well on healthy and spiked sandal trees. After an aquisition feeding of *R. bimaculatus* on healthy 2-year - old sandal seedlings for 8-10 days typical spike symptoms developed. Bright fluorescent spots were seen in transmitted spiked tissue. The study indicates that *R. bimaculatus* is a probable vector for sandal spike in Kerala.

Ghosh, S.K., Mohamed Ali, M.I & Balasundaran, M. 1985. *Studies on spike disease of sandal in Kerala. Paper presented at the National Seminor on Mycoplasma Infections in Animals, Plants and Men; Mathura, February 27-29, 1984-Proceedings pp. 111-116.*

Marayur range in Kerala has isolated patches of sandal wood trees with very high density. Occurrence of spike disease was recorded in 1980 and based on the external symptom manifestation, trees could be grouped under various classes Diseased tissues could be differentiated and detected under fluorescence microscope using the fluorochrome aniline blue. Marked differences could be observed between the electrical resistance of healthy and diseased trees using Shigometer. A tree injection method has been devised and standardlsed. Tetracyclines gave complete but temporary remission of the disease symptoms. Attempts are being made to prolong the remission period.

Mohandas, K. and Varma, R. V. 1984. *A new host record for Atteva fabriciella (Lepidoptera : Yponomeutidae) a pest of Ailanthus. J. Tree Sci., 3 (1 & 2) : 128.*

Quassia indica is newly recorded as an alternative host of *Atteva fabriciella*, a pest of *Ailanthus* spp.

Mohanan, C., and Sharma, J. K. 1984. *A serious disease of Anacardium occidentale caused by Cylindrocladium camelliae and its possible control. PLACROSYM - V (1982) : 527-535.*

A seedling disease of *Anacardium occidentale* caused by *Cylindrocladium camelliae* and its teleomorph *Calonectria camelliae* is reported for the first time in India.

The disease is characterized by leaf blight, stem and root-rot in young seedlings in nursery as well as in plantation. High mortality (c. 70%) of 4-month-old seedlings due to multiple infection of leaf, stem and root was recorded in a nursery at Kunnathur, Thaliparamba Forest Range. Widespread infection of leaf and shoots resulting in severe die-back was also observed in a nearby 6-month-old cashew plantation. In severe cases, the pathogen caused root-rot thus killing the seedlings outright. During monsoon, masses of conidia and ascocarps of the fungus were produced on rotten parts of stem and petioles. Bavistin was the only effective fungicide in laboratory screening done against *C. camelliae.*

Nair, K. S. S., and Mathew, G. 1984 *Dried tapioca tuber for laboratory rearing of the bamboo borer. Dinoderus minutus Fabr. (Coleoptera : Bostrychidae) Material und Organismen 19(1): 49-54.*

Dried tapioca tuber *(Manihot esculenta)* was found suitable for the laboratory rearing of the bamboo borer *Dinoderus minutus.* Up to a 10-fold increase in the beetle population was obtained on the diet within 60 days. Tapioca tuber is more suitable than reed or bamboo in which survival of the insect is known to be dependent on the starch content, and therefore unpredictable. In addition, it is easy to retrieve the insects from the comparatively soft tapioca medium for experimental studies.

Mathew, G. 1984. *Occurrence of an unusual type of frenulum in Pycrarmon caberalis Gneu (Lepidoptera : Pyraustidae) Entomon 9(3) : 223.*

In the male *Pycnarmon caberalis* (Lepidoptera : Pyraustidae), a long frenulum bearing a distal knob is reported.

Varma, R. V. and Mohanan, C. 1984. *Paecilomyces farinosus, a potential biological control agent for major pests of Ailanthus in Kerala, India. Proc. 1984 Br. Crop Prot. Cong. pp. 277-282.*

Ailanthus triphysa is a fast growing tree species of considerable economic importance. *Eligma narcissus* (Lepidoptera : Noctuidae) and *Atteva fabriciella* (Lepidoptera : Yponomeutidae) are the two major pests of *Ailanthus* in India. in a natural situation a number of pupae of *E. narcissus* were found parasitized by the fungus, *Paecilomyces farinosus.* Preliminary laboratory studies employing spore suspension of *P. farinosus* confirmed the effectiveness of the fungus in causing mortality of *E. narcissus. A. fabriciella* was also found susceptible to the fungus in a similar infection experiment.

Sankaran, K. V., Maria Florence, E J. and Sharma, J. K. 1984. *Two new diseases of forest tree seedlings caused by Sclerotium rolfsii in India. Eur. J. For. Path. 14 : 318 - 320.*

Collar rot of *Swietenia macrophylla* and leaf blight of *Pterocarpus santalinus* caused by *Sclerotium rolfsii* are reported for the first time from India.

Sharma, J. K., Maria Florence, E. J. and Mohanan, C. 1984. *A shot hole disease of Ailanthus triphysa caused by Colletotrichum state of Glomerella eingulata. Trans. Brit. Mycol. Soc. 83 (2): 344-346.*

A new leaf disease of *Ailanthus triphysa* caused by *Colletotrichum* state of *Glomerella cingulata* is reported from India. The disease characterized by shot holes formed at the site of infection, was prevalent during periods of high humidity.

Sharma, J. K., Mohanan, C and Maria Florence, E. J. 1984. *A new stem canker disease of Eucalyptus caused by Botryodinlodia theobromae in India. Trans. Brit. Mycol. Soc, 83 (1) : 162-163.*

A new stem canker disease of *Eucalyptus* caused by *Botryodiplodia theobromae* is reported from India. The disease caused upto 20% mortality. Survey and pathogenicity trials suggest that *E. tereticornis* is more susceptible than *E. grandis* to stem canker.

Sharma, J. K., Mohanan, C. and Maria Florence, E. J. 1984. *Outbreak of pink disease caused by Corticium salmonicolor in Eucalyptus grandis in Wynad, Kerala, India. Trop. Pest Manage. 30(3) : 253-255.*

An outbreak of pink disease caused by *Corticium salmonicolor* Berk. & Br. in *Eucalyptus grandis* plantations in Kerala State is reported. The sporadic infection recorded during 1979 spread to an epidemic proportion within four years, affecting more than 50% of trees in two plantations surveyed. Probable factors responsible for this outbreak of pink disease are discussed.

Sharma, J. K., Mohanan, C., and Maria Florence, E J. 1984. *Two mycelia sterilia parasitic on the foliage of hardwood seedings in Kerala State, India. Trans. Brit. Mycol. Soc. 83(2): 342-344.*

Rhizoctonia solani and *Sclerotium rolfsii* are reported causing a seedling web blight of *Eucalyptus* and a leaf spot of teak respectively in Kerala, India, Both are new disease records.

Sharma, J. K., and Sankaran, K. V., 1984. *Web blight of Albizia falcataria in India. Eur. J. For. Path. 14(4&5) : 261-264.*

Web blight of *Albizia falcataria* seedlings caused by *Rhizoctonia solani* state of *Thanatephorus cucumeris* is reported for the first time from Kerala, India. The disease observed during the monsoon (June - August), causes high mortality of seedlings in nurseries.

KFRI Research Reports

Vijayakumaran Nair, P., Ramachandran, K.K., Vijayan, V. S., Easa, P. S., and Balakrishnan, P. V. *An ecological study in Periyar Tiger Reserve with special reference to wildlife. KFRI Research Report No. 24. Final report of the project Wild 02/1977, January 1985, 158 pp.*

Studies on the distribution, ecological requirements and resource availability to selected mammals of Periyar Tiger Reserve was carried out for a period of about five years from 1977 to 1982. This sanctuary is located on the crestline of Western Ghats in Kerala State. The forest types in this high rainfall and undulating terrain consist of grasslands, deciduous and evergreen forests. The study methods included recording population parameters and activities of animals sighted and collection of evidences of animals from systematically laid out sample plots. The grass production from different parts of the habitat was estimated by the harvest method. The reserve had a rich avifauna of 181 species. Almost all the families of birds reported from Kerala are present in the study area. A total number of about 800 elephants were estimated to be present in the study area based on the quantity of dung heaps counted from the sample plots. The overall density was about one elephant per sq. km., with an ecological density as high as two or three times this in some seasons in certain parts of the reserve. The proportion of various classes of individuals in the population and their sex ratio were comparable to that of healthy elephant populations elsewhere except in the proportion of adult male elephants. Density of animals like sambar, gaur and wild boar showed extreme variation. Frequency distributions of the number of animals in groups of sambar deer and wild boar were constructed and comparisons made with the same in other populations. Fodder and water did not appear to be a limiting factor to the animals Based on the habits and habitat use, the herbivores could be classified into two groups, the first one consisting of animals like barking deer, sambar, gaur, cattle and elephants and the second group consisting of mouse deer and hare. The wild boar was not part of either of these groups. The distribution of arboreal animals like the Nilgiri langur, Liontailed macaque, Bonnet macaque, and Giant squirrel were examined. The availability of prey to carnivores and the competition among them were also studied. Two important suggestion towards scientific management have been put forward, the first concerning the inadequacy of the present demarcation of the reserve into the tourism, buffer and core areas, and the second concerning the need for adopting different management strategies in the eight divisions proposed for the reserve

Ghosh, S.K , Balasundaran, M , and Mohamed Ali, M.I. *Studies on the little leaf disease of eucalypts. KFRI Research Report No. 25. Final Report of the project Pathol (NF) 02/1979, March 1985, 15pp.*

A little leaf disease was recorded in plantations of *Eucalyptus tereticornis* and *E. grandis* at many localities in Kerala. The possibility of the association of the mycoplasma like organisms (MLOs) with this disease was investigated in detail. General anatomical studies indicated necrosis and excessive formation of phloem in diseased plants. Diseased phloem tissues showed positive reaction to Dienes' stain in the form of dark blue spots while fluorochrome aniline blue gave bright fluorescent spots. However, Hoechst 33258, a DNA binding fluorochrome gave negative reaction. Disease could not be transmitted either through grafting or dodder. Tetracyline infusion in affected trees gave temporary remission of the disease symptoms. In transmission electron microscopy MLOs were found in the phloem of the diseased tissue. The present study has confirmed the association of MLOs with the little leaf disease of eucalypts.

Vijayakumaran Nair, P. and Balasubramanyan, K. *Long-term environmental and ecological impacts of Multipurpose River Valley Projects. Wildlife studies in Idukki, Periyar and Silent Valley. KFRI Research Report No. 26. Final Report of the Project Wild 03/1980. April 1985. 75 p.p.*

Studies on the impact of the Idukki hydro-electric project on the larger mammals were carried out for a period of about four years from 1981 to 1984. The study area is located in the Idukki district of Kerala. Forest types consist of grasslands, deciduous and evergreen forests. Study methods included collection of details of animals from systematically laid out sample plots, examination of population parameters from sighting data and recording of habitat quality on a gridded map. About 75 elephants are estimated to be present in the area. The herds were of a smaller size indicating disturbance. The proportion of various classes of individuals and their sex ratio was not similar to that in other populations. There were only very few young ones. Number of male elephants in the population was also very low. Animals like sambar, barking deer, jackal and wild dog were present in the study area. But their number was very low. The study area contained wild boar and hare in moderately good numbers. Gaur, bear, tiger and leopard are no more found in the area. The bonnet macaques in the periphery of the reserve indulged in a great deal of crop raiding. Wild dogs attacked domestic cattle in a few cases. The study shows that construction of the Idukki hydro-electric project had an adverse effect on many animals. In addition to the construction of dams, large scale encroachment and forest colonisation also played an important role in the destruction of animals. As far as animals are considered there were both negative and positive impacts. The study recommends habitat improvement measures for the Idukki Wildlife Sanctuary, the need for keeping the forest continuity of crucial Meenmutty region and a few other measures to prevent further deterioration of the habitat.

Seminar, Congress, Lectures

Dr. K M Bhat, Division of Wood Science, participated in IUFRO P5.01 Project Group Workshop, held at Manaus, Brazil from 19 to 24 November, 1984 and presented a paper entitled 'Properties of selected less-known tropical hardwoods' by K. M. Bhat and a paper entitled 'Utilization of rubber wood (*Hevea brasiliensis*) in India' by R. Gnanaharan.

Dr. R. V. Varma attended the British Crop Protection Conference held at Brighton, U. K. from 19 to 22 November 1984 and presented a paper entitled '*Paecilomyces farinosus*, a potential biological control agent for major pests of *Ailanthus* in Kerala, India' by R. V. Varma and C. Mohanan.

Shri. M. Balagopalan attended the International Seminar on Geobotany and Biochemistry in Exploration for Groundwater and Mineral Resources, held at Sri Venkateswara University, Tirupathi from 27 to 30 November 1984 and presented a paper 'Soil organic carbon distribution along a transect through teak, eucalypt and Albizia plantations' by M. Balagopalan and T. G. Alexander.

Dr. C. T. S. Nair attended the seminar on Ecological Crises in India and Legislative Safeguards, held at the India International Centre, New Delhi from 30 November to 2 December 1984. He presented a paper 'Crisis in Forest Resource Management'.

Dr. T. G. Alexander participated in the 49th Annual Convention and Golden Jubilee Celebrations of Indian Society of Soil Science, conducted at IARI, New Delhi from 7 to 10 December, 1984 and presented a paper 'Cultural practices for managing soil erosion in forest plantations of Kerala' by T. G. Alexander and Thomas P. Thomas, and also another paper on 'Effect of Mussoorie rock phosphate on the growth of *Eucalyptus tereticornis* seedlings' by T. G. Alexander and M. V. Mary.

Dr. K. S. S. Nair attended the National Workshop on Advances in Insect Behaviour, held at Entomology Research Institute, Loyola College, Madras from 14 to 16 December, 1984 and presented a paper on 'Role of behavioural studies in the development of management strategies for forest insect pests'.

Sri C. Mohanan, Dr. K. V. Sankaran and Sri. M. Balasundaran participated in the Symposium organised by Indian Phytopathological Society at Lucknow from 8 to 10 January 1985 and presented papers entitled 'Twig,branch and trunk cankers of *Eucalyptus* caused by *Cryphonectria gyrosa* in Kerala' (C. Mohanan), 'Epidemiology and chemical control of web blight of *Albizia falcataria* caused by *Rhizoctonia solani*, (K.V. Sankaran) and 'Spread of spike disease in the Sandal Reserve Forests of Marayoor, Kerala' (M. Balasundaran).

K F R I Seminars

Dr. F. T. Last, Institute of Terrestrial Ecology, Edinburgh	:	Atmospheric pollution, Afforestation in West Africa, Mycorrhiza (25 October,1984)
Dr. K. V. Sankaran	:	The role of mycorrhiza in forestry (29 October, 1984)
Dr. C. Renuka	:	Tree architecture (05 November, 1984)
Dr. A. R. R. Menon	:	Planning and conservation (19 November, 1984)
Dr. K. Jayaraman	:	Numerical taxonomy (26 November, 1984)
Kum. M. V. Mary	:	Some concepts in forest fertilization (03 December, 1984)
Dr. George Mathew	:	Genetalial morphology as a tool in insect identification (10 December, 1984)
Prof. S. Balasubramaniam, Dept. of Botany University of Peradeniya Sri Lanka	:	Botany and chemistry of Dipterocarps (10 January 1985)
Dr. Andrew Greller, Queen's College, City University of New York	:	Bioclimatology of eight forest zones of Sri Lanka - (Introduction to newly recognised types) (10 January, 1985)
Dr. R. C. Pandalai	:	The influence of silvicultural practices on wood properties (04 February, 1985)
Sri N. Gopalakrishnan Nair	:	Species Extinction (25 February, 1985)
Sri. T. K. Dhamodaran	:	Chemical and biological utilisation of wood and bark (04 March, 1985)
Dr. S. Kedharnath	:	Strategies for breeding forest trees resistant to insect pests and diseases (25 March, 1985)

Forthcoming Events of 1985-86

5-10 AUGUST, 1985. International Workshop on Resistance of Trees to Harmful Agents. Curitiba, Brazil.
Contact : K. von Weissenberg, Finnish Forest Research Institute, SF-77600 Suonenjoki, Finland.

2-8 SEPTEMBER. 1985. Flowering and Seed Bearing in Forest Seed Orchards, Kornik, Poland.
Contact : W. Chalupka, Institute for Dendrology, PL-62035 Kornik, Poland.

23-27 SEPTEMBER, 1985. Meeting on Environmental Influences on Measuring Tree and Stand Increment. Durham, NH, USA.
Contact : Dr. Dale S. Soloman, Northeastern Forest Experiment Station, USDA Building, Orono ME 04401, USA.

24-25 SEPTEMBER or 1-2 OCTOBER, 1985 Forest Site Classification Methods. Frederiction, New Brunswick, Canada.
Contact : H. van Groenewoud, Maritimes Forest Research Centre, PO Box 4000, Frederiction New Brunswick E3B 5P7 Canada.

29 SEPTEMBER - 3 OCTOBER, 1985. Meeting on Current Problems in Water and Nutrient Management in Forest Soils. New Hampshire, USA.
Contact : Robert C. Pierce, USDA Forest Service, Northeastern Forest Experiment Station, Forestry Sciences Laboratory, Concord-Mast Road, PO Box 640, Durham, New Hampshire 03824, USA.

14-20 OCTOBER, 1985. Meeting on Crown and Canopy Structure in Relation to Productivity. Tsukuba, Japan.
Contact : T. Fujimori, Forestry and Forest Products Research Institute, P. O. Box 16, Tsukuba Norin Kenkyo, Danchi-Nai Ibaraki 305, Japan.

21-25 OCTOBER 1985 International Symposium on Ecology of the Development of Trophical and Subtrophical Mountain Areas. Chengdu, China.
Contact : Jiang Youxu, C/o Zhu Jing, Ecological Society of China, 7 Zhonguancum Road, Beijing 100080, China.

24-30 NOVEMBER, 1985. Noxious Insects to Pine and Eucalypt Plantations in the Tropics. Curitiba Brazil.
Contact : J. H. Pedrosa Macedo, Universidade Federal do Parana, P. O. Box 2959, 80000 Curitiba PR, Brazil

16-21 JUNE, 1986. World Conference of the International Council for Bird Preservation. Queen's University Kingston, Ontario.
Contact : ICBP, 219 C Huntingdon Road, Cambridge CB3 ODL, UK.

22-29 JUNE, 1986. 19th International Ornithological Congress, Ottawa, Canada
Contact : Dr. Henri Ouellet, Secretary General, XIX Congressus Internationalis ornithologicus, National Museum of Natural Sciences, Ottawa, Ontario, Canada KIA OM 8.

10-17 AUGUST, 1986. 6th International Congress on Pesticides. Ottawa, Canada.
Contact : H. V. Morley, Station de Recherche Agricole de I'U'niversit'e, Sous-bureau Postale Universitaire, London, Ontario, Canada.

10-16 AUGUST, 1986. Fourth Congress of the International Association for Ecologists. Syracuse, NY, USA.
Contact : F. B. Golley, Institute of Ecology, University of Georgia. Athens, GA 30602, USA.

13-20 AUGUST, 1986. International Congress of Soil Science, Hambourg, FRG.
Contact : ISSS Secretariat, International Museum, 9 Duivendaal, PO Box 353, 6700 AJ Wageningen, The Netherlands.

19-22 AUGUST, 1986. 10th International Congress of the International Union for the Study of Social Insects. Hambourg, FRG.
Contact : C. Czoppett, Max-Planck-Institute for Biochemistry, D-8033 Martiensried, FRG.

24-29 AUGUST, 1986. 4th International Symposium on Microbial Ecology: Ljubljana, Yugoslavia.
Contact : France Megusar, Biotechnical Faculty, E. Kardelj University of Ljubljana, Jamnikarjeve 101. 61600 Ljubljana, Yugoslavia.

26-28 AUGUST, 1986. Symposium on Mineral Nutrients in Savanna and Tropical Forest Ecosystems. Stirling, Scotland, UK.
Contact : J. Proctor, Deptt. of Biological Science; University of Stirling, Stirling FK9 4LA, UK.

7-13 SEPTEMBER, 1986. 14th International Congress of Microbiology. Manchester, UK.
Contact : J. A. Cole, Department of Biochemistry; University of Birmingham, PO Box 363, Birmingham B152TT, UK.

7-25 SEPTEMBER, 1986. 18th IUFRO World Congress-Forestry Research Serving Society Ljubljana, Yugoslavia.
Contact : IUFRO Secretariat, Schonbrunn, A-1131 Vienna, Austria.

Joined KFRI recently

Sri. C. D. Johney	...	Deputy Registrar (Administration)
Sri. K. Shanmuganathan	..	Silviculturist

Left KFRI recently

Sri. C. V. Jose	...	Stenographer
Sri. M. K Krishnankutty	...	Watcher

Sri. K. C. Chacko (Junior Silviculturist) joined Diploma Course in Forestry at State Forest College, Coimbatore in January, 1985 (on deputation) He handed over the charge of Nilambur sub-centre of KFRI to Sri. V. V. Sudheendrakumar.

Dr. K. S. S Nair and Sri George Mathew rendered assistance, on invitation, to the National Museum of Natural History, Department of Environment, New Delhi to plan an exhibit depicting insect diversity and the role of insects in nature.

Sri. George Mathew gave an invited lecture on the taxonomy and ecology of Indian timber boring beetles, on 28-11-1984 in the International Training Workshop on 'Ecotaxonomy and Diagnostics of Agricultural Insect and Mite Pests in the Oriental Region' held at the School of Entomology, St. John's College, Agra. The Workshop was organised in collaboration with the Commonwealth Institute of Entomology, London.

Sri C. Mohanan and Dr. K. V Sankaran visited FRI, Dehra Dun and identified various fructifications of Basidiomycetous fungi.

Sri M. Balasundaran spent a week at Toxicology Research Institute, Lucknow in relation to transmission electron microscopy.

Visitors

Dr. F. T. Last Institute of Terrestrial Ecology Bush Estate, Near Periwick Midlothian, Scotland UK	26-10-1984
Dr. K. Gopalan, Vice Chancellor University of Cochin. Cochin.	26-11-1984
Dr. Andrew M. Greller Associate Professor Deptt. of Botany Queen's College, Flushing New York USA	10-01-1985
Prof. S. Balasubramaniam Associate Professor of Botany University of Peradeniya SRI LANKA	10-01-1985
Dr. I. A. S. Gibson Moor Cottage Ninfield, Sussex England	30-01-1985
Dr. David Cooke Ist Secretary, Science British High Commission British Council Division New Delhi	31-01-1985
Dr. Charles R. Hatch Forestry Adviser USAID, New Delhi	15-03-1985
Dr. Lennart Ljungman Senior Forest Specialist C/o World Bank P. O. Box 416, New Delhi	15-03-1985
Dr. A. K. Banerjee World Bank, New Delhi	15-03-1985

Papers presented by the Scientists of Kerala Forest Research Institute at the Seminar on Ecodevelopment of Western Ghats (17-18-October, 1984)

Alexander T. G., Balagopalan M., Thomas P. Thomas, Mary M. V., and Sankar S. Soils in relation to anthropic disturbances : A case study from the Western half of Attappadi.

Jayson E. A. Eco-development of wildlife sanctuaries in the Western Ghats of Kerala.

Menon A. R. R. The forest denudation of Kerala : A case study of the Trichur Forest Division.

Nair C. T. S. Ecodevelopment : A meaningful alternative or a fashionable slogan ?

Nair K. K. N. Conservation of genetic diversity of *Dalbergia* species in the Western Ghats with special reference to Kerala.

Nair N. G. Endemic trees and their key role in the phytogeography of Western Ghats.

Nair P. V. K., Ramachandran K. K. and Easa P. S. Characteristics of three populations of elephants of the Western Ghats.

Ramachandran K. K. Ecology and distribution of the arboreal mammals of Western Ghats.

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