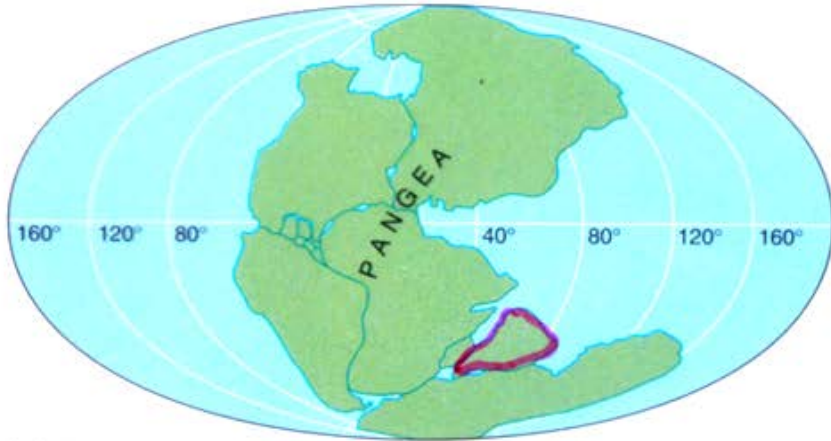


# **BIODIVERSITY & ENVIRONMENT**

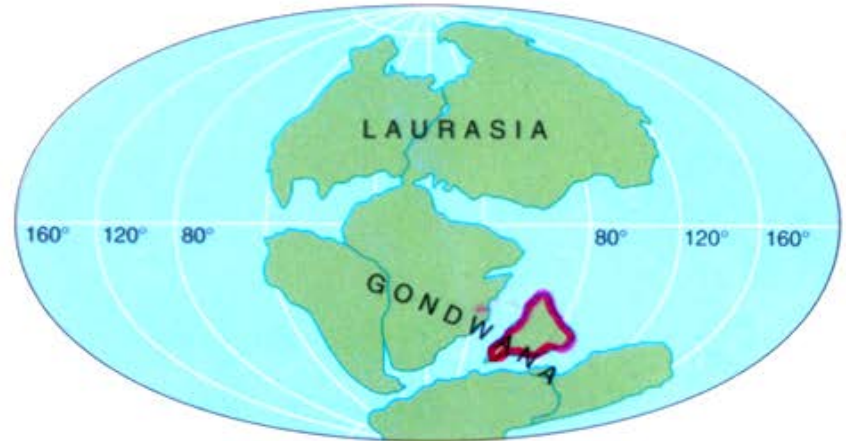
**D. NARASIMHAN**

**Center for Floristic Research  
Department of Plant Biology & Plant Biotechnology  
Madras Christian College (Autonomous), Chennai  
[narasimhand@gmail.com](mailto:narasimhand@gmail.com)**

# Continental Drift



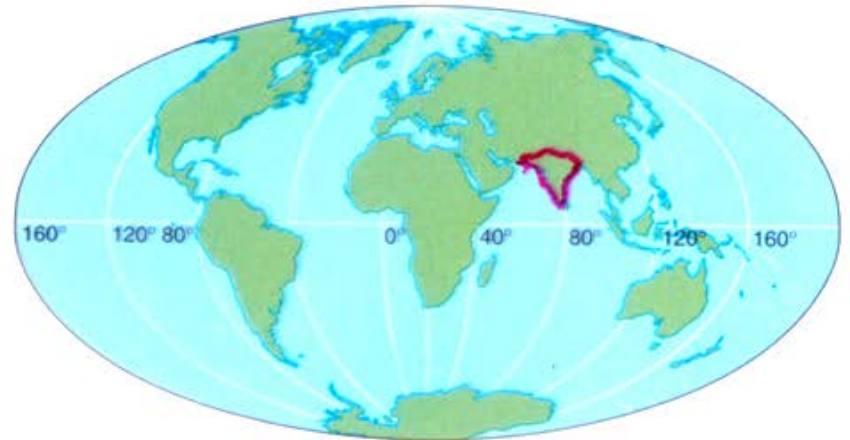
(a) 225 million years ago: Triassic



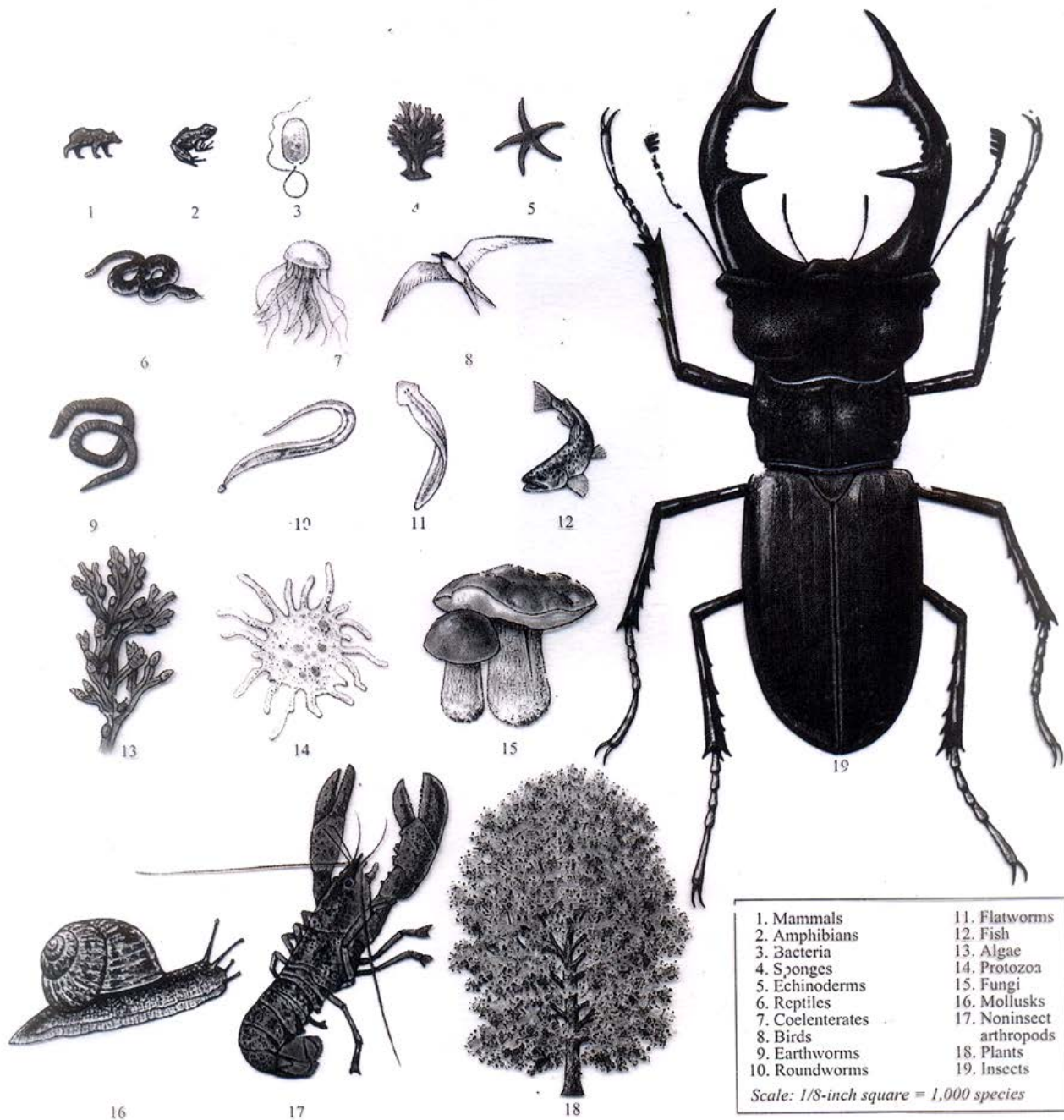
(b) 135 million years ago: Cretaceous



(c) 65 million years ago: Paleocene



(d) Present



1. Mammals	11. Flatworms
2. Amphibians	12. Fish
3. Bacteria	13. Algae
4. Sponges	14. Protozoa
5. Echinoderms	15. Fungi
6. Reptiles	16. Mollusks
7. Coelenterates	17. Noninsect arthropods
8. Birds	18. Plants
9. Earthworms	19. Insects
10. Roundworms	

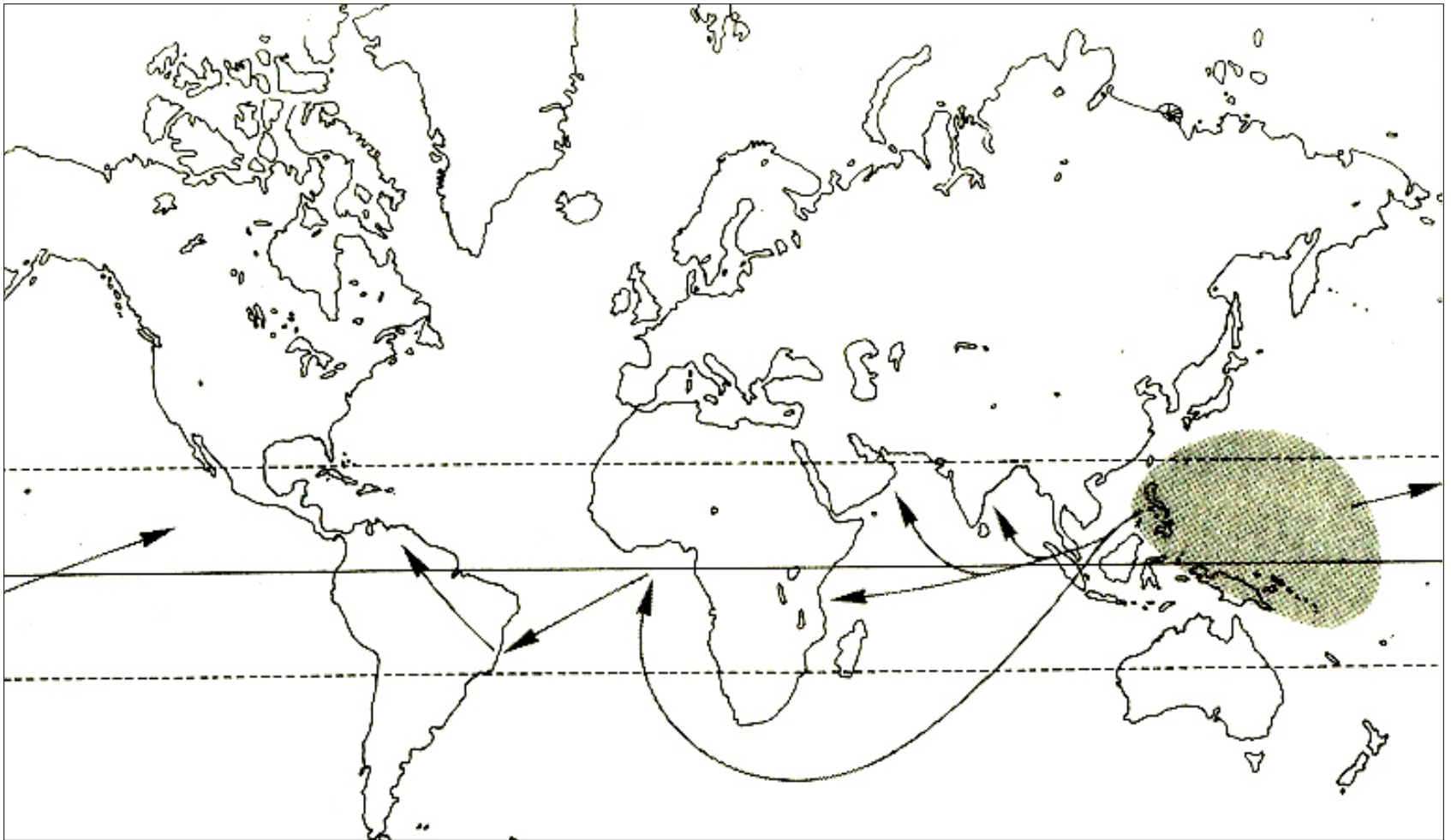
Scale: 1/8-inch square = 1,000 species



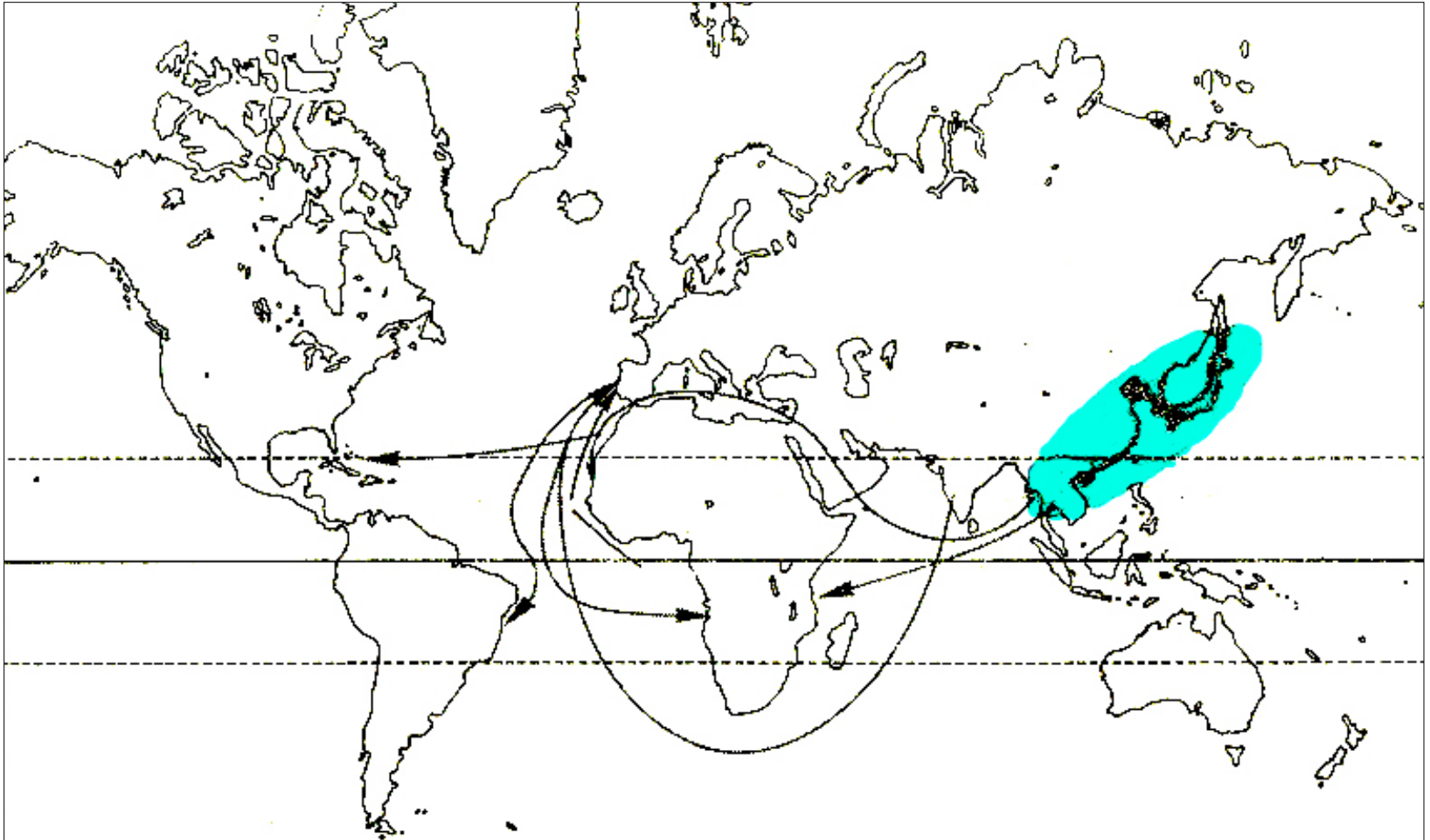




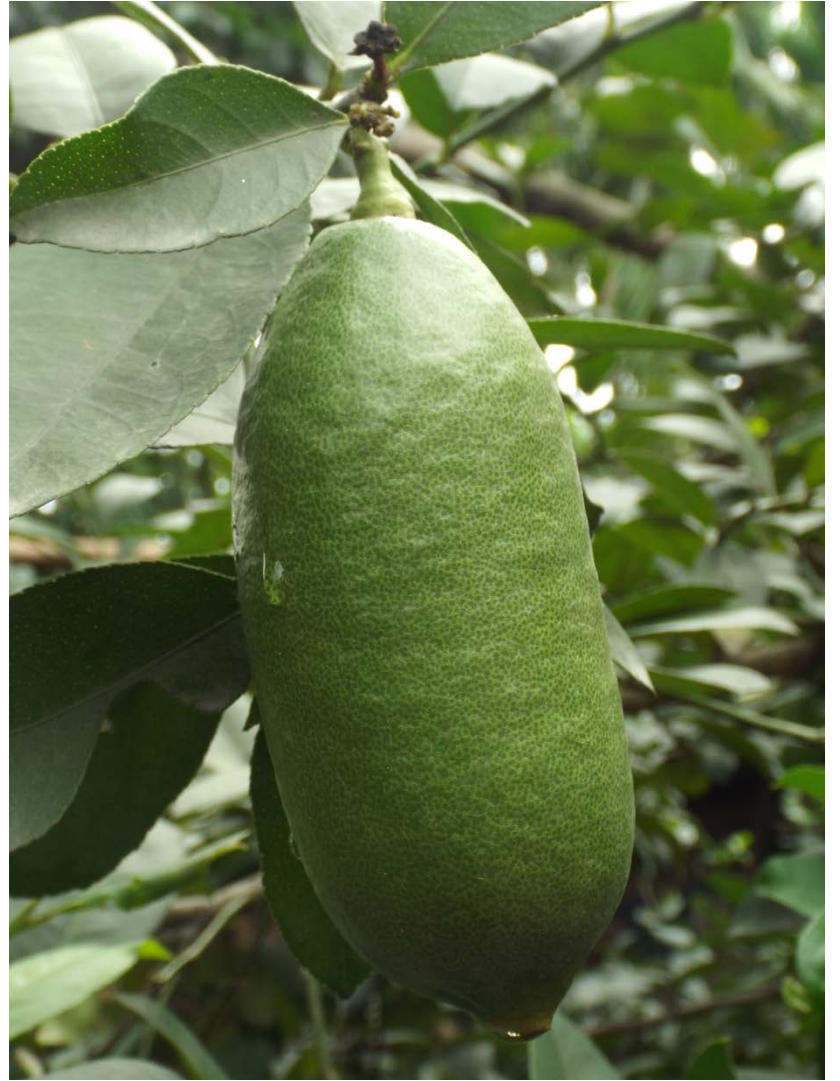
# COCONUT



# CITRUS









# Per capita Ecological Footprint

2.23 ha



World

6.60 ha



Industrial  
Countries

2.52 ha



Upper - Middle  
Income

1.81 ha



Lower - Middle  
Income

0.88 ha



Low Income

# Economic Values of Biodiversity

## Use Values

### Direct Use Values    Indirect Use Values

- Fish and meat
- Fuelwood
- Timber & other Building material
- Medicinal Plants
- Edible wild fruits & plants
- Animal fodder

- Flood control
- Soil fertility
- Pollution control
- Drinking water
- Transportation
- Recreation & tourism (eg. Bird- watching)
- Education
- Biological services (pest control, pollination)

## Option Value

### Future Products:

- Medicines
- Genetic Resources
- Biological Insights
- Food Sources
- Building supplies
- Water Supplies

## Existence Value

- Protecting biological diversity
- Maintaining culture of local people
- Continuing ecological and evolutionary processes

# CULTURE AND KNOWLEDGE ON RESOURCES

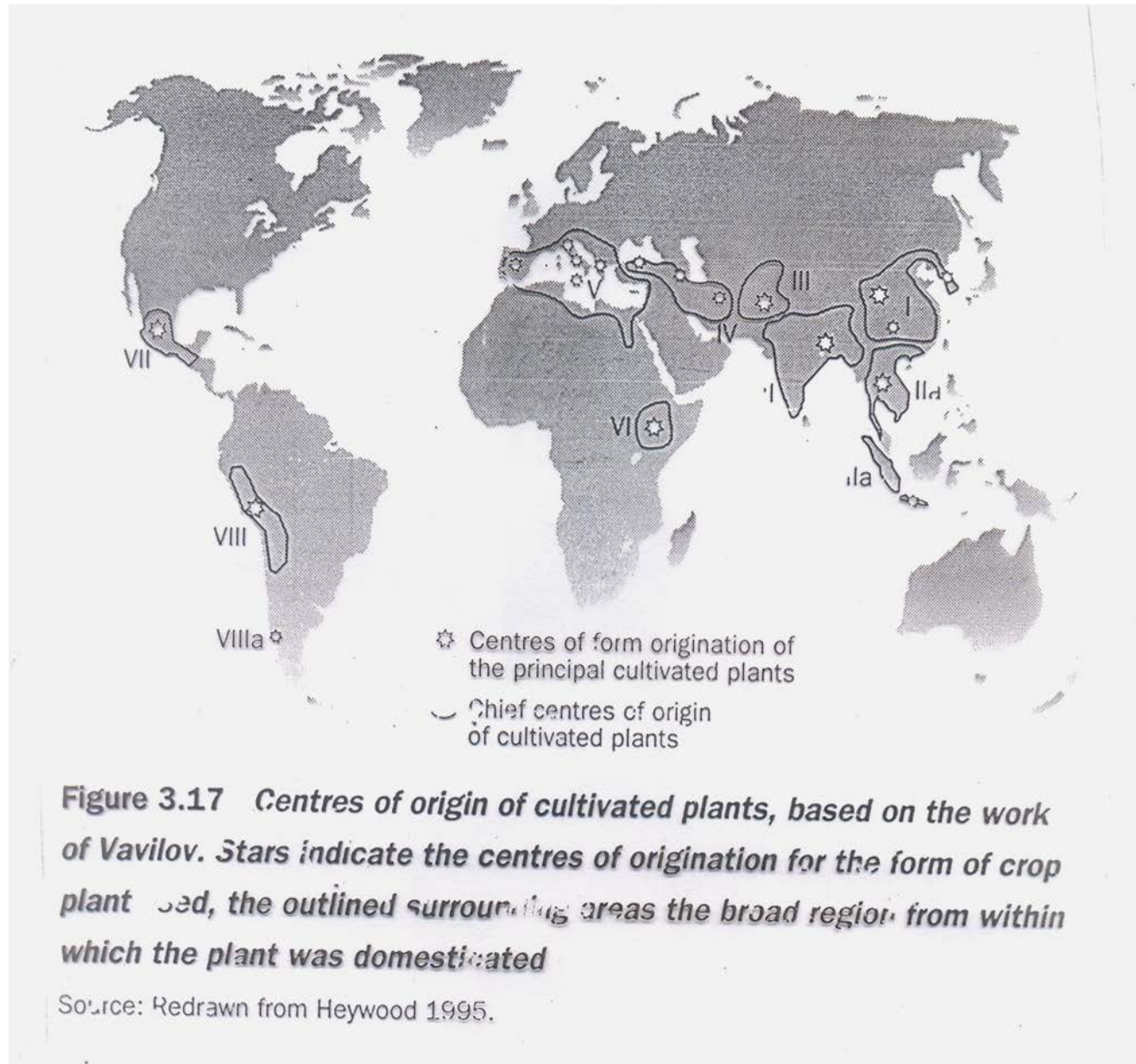
**Ethnically Rich**

Papua New  
Guinea  
Nigeria  
Cameroon

**Bio – Ethnically Rich**   **Biodiversity  
Rich**

Brazil  
Mexico  
Indonesia  
India  
Australia  
Zaire

Peru  
Malaysia  
Columbia  
Equator  
China  
Madagascar



**Figure 3.17 Centres of origin of cultivated plants, based on the work of Vavilov. Stars indicate the centres of origination for the form of crop plant used, the outlined surrounding areas the broad region from within which the plant was domesticated**

Source: Redrawn from Heywood 1995.



- **Earth contains about 75,000 edible plants**
- **People use around 3000 plants**
- **Only about 150 are cultivated**
- **Just 3 grasses supply food for 60% of the world's population  
(Wheat, Rice & Maize)**

# Cereals



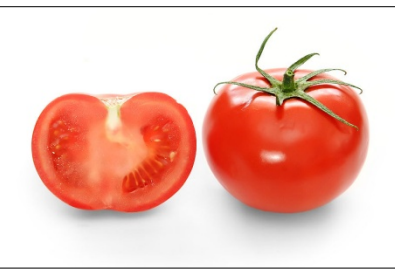


# SOUTH AMERICA

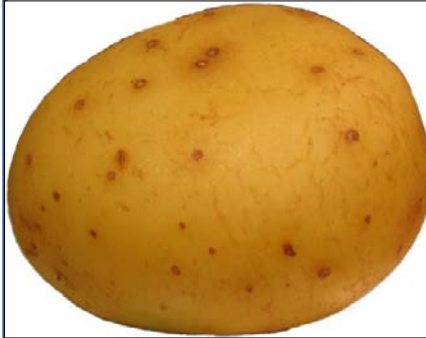
## Capsicum



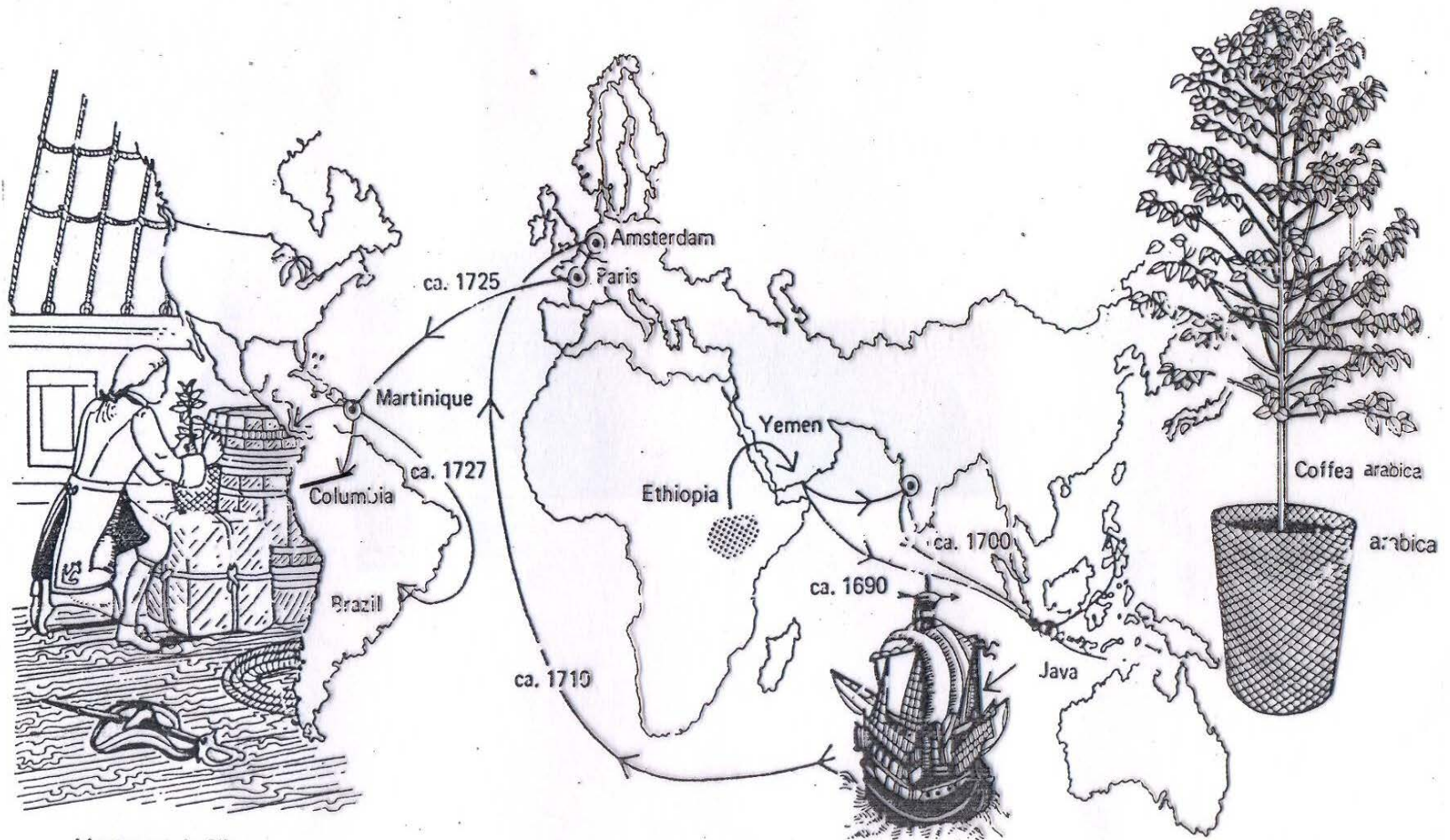
## Tomato



## Potato



# Coffee, Wealth and Slavery



Lieutenant de Clieu  
ca. 1720



# **SATISFACTORY CURES REMAIN TO BE DEVELOPED FOR:**

- **Viral diseases such as Herpes, AIDS and certain Cancers.**
- **Diseases of unknown Etiology, including Arthritis, some Cancers, Muscular Dystrophy and Parkinsonism.**
- **Self-inflicted diseases namely Alcoholism, Liver disease, Drug-dependency, Obesity, Smoking and the like.**
- **Genetic diseases ranging from Cystic Fibrosis and Hemophilia to Sickle Cell disease.**
- **The control of symptoms such as Pain, Elevated Cholesterol levels, Hypertension, and the general susceptibility to disease of various kinds.**

# PHARMACEUTICAL COMPANIES AND RESEARCH ORGANIZATIONS INVOLVED IN SCREENING PLANTS FOR NEW NATURAL PRODUCTS SHOWING SOURCES OF SUPPLY

<b>ORGANISATION</b>	<b>STATUS OF PLANT SCREENING PROGRAMME</b>	<b>SUPPLIED BY</b>	<b>REGION OF ORIGIN</b>
<b>Merck, Sharp Dohino Research Laboratories</b>	<b>Marine Organisms, plants and micro – organisms</b>	<b>New Yoek Botanical Garden, Work with INBio. Costa Rica</b>	<b>South America</b>
<b>Monsanto/Searle</b>	<b>Micor-organisms and plants</b>	<b>Missouri Botanical Garden</b>	<b>North America</b>
<b>Shaman Pharmceuticals</b>	<b>Plants based on ethnobotanical information</b>	<b>Individuals, Institutions and government departments</b>	<b>Tropical South America, Africa and South East Asia.</b>
<b>Glaxo Smithkline Beecham</b>	<b>Marine organisms, Plants and mirco - organisms</b>	<b>Biotics Ltd., private indiviuals and own collectors</b>	<b>Malaysia and Micronesia</b>

## PHARMACEUTICAL COMPANIES AND RESEARCH ORGANIZATIONS INVOLVED IN SCREENING PLANTS FOR NEW NATURAL PRODUCTS SHOWING SOURCES OF SUPPLY

ORGANISATION	STATUS OF PLANT SCREENING PROGRAMME	SUPPLIED BY	REGION OF ORIGIN
American National Cancer Institute (NCI)	Large Scale screening of plants, also marine organisms	Missouri Botanical Garden, New York Botanical Garden, University of Illinois, Private contractors	Africa, Madagascar, Central and South America, South East Asia, Australia.
Bristol – Meyers	None at present. Evaluating whether to include plants or not. Developed taxol from Pacific Yew ( <i>Taxus</i> )	Not applicable	Taxol material from USA
Glaxo	Natural products discovery department. Many therapeutic areas	Commercial and academic institutions, Royal Botanic Gardens, Kew.	South America, Africa

# COST AND TIME OF SCREENING AND PRODUCT DEVELOPING PROGRAMMES

Sector	Year to develop	Cost (US\$ m)
<b>Pharmaceutical</b>	<b>10 -15+</b>	<b>800</b>
<b>Botanical Medicines</b>	<b>&lt; 2 -5</b>	<b>0.15-7</b>
<b>Commercial agricultural seed</b>	<b>8-12</b>	<b>1-2.5</b>
<b>Transgene</b>	<b>4+</b>	<b>35-75</b>
<b>Ornamental Horticulture</b>	<b>1 - 20 +</b>	<b>0.05-5</b>
<b>Crop Protection (Biocontrol agents)</b>	<b>2 -5</b>	<b>1-5</b>
<b>Industrial Enzymes</b>	<b>2-5</b>	<b>2-20</b>
<b>Personal care and Cosmetics</b>	<b>&lt; 2-5</b>	<b>0.15-7</b>

# **BIOTECHNOLOGY PHARMACEUTICALS**

- **More than 2000 Biotechnology companies in the world**
- **Biotech product sales will increase from 11% – 17 % by 2010**
- **Biopharmaceutical require access to genetic resources including**
  - Genes from Humans and Domestic Animals**
  - Genes from Plants**



# WHAT IS BIOTECHNOLOGY?

- It is both new and old
- Three generation of biotechnology

**First generation biotechnology - beer brewing and bread making**

**Second generation biotechnology - Production of antibiotics, tissue culture, plant and animal breeding**

**Third generation biotechnology - Genetic engineering, Transgenic organisms**



## **Dams & Displacement of Tribal people**

<b>Project</b>	<b>State</b>	<b>Population facing displacement</b>	<b>Tribal people as % of displaced</b>
<b>Karjan</b>	<b>Gujarat</b>	<b>11,600</b>	<b>100</b>
<b>Sardar Sarovar</b>	<b>Gujarat</b>	<b>200,000</b>	<b>57.6</b>
<b>Maheshwar</b>	<b>M.P</b>	<b>20,000</b>	<b>60</b>
<b>Bodhghat</b>	<b>M.P</b>	<b>12,700</b>	<b>73.91</b>
<b>Icha</b>	<b>Bihar</b>	<b>30,800</b>	<b>80</b>
<b>Chandil</b>	<b>Bihar</b>	<b>37,600</b>	<b>87.92</b>
<b>Koel Karo</b>	<b>Bihar</b>	<b>66,000</b>	<b>88</b>
<b>Mahibajaj Sargar</b>	<b>Rajasthan</b>	<b>38,400</b>	<b>76.28</b>
<b>Polavaram</b>	<b>A.P</b>	<b>150,000</b>	<b>52.9</b>
<b>Maithon &amp; Panchet</b>	<b>Bihar</b>	<b>93,874</b>	<b>56.46</b>
<b>Pong</b>	<b>H.P</b>	<b>80,000</b>	<b>56.25</b>
<b>Inchampalli</b>	<b>A.P -Maharasthra</b>	<b>30,100</b>	<b>76.28</b>
<b>Upper Indravati</b>	<b>Orissa</b>	<b>18,500</b>	<b>89.2</b>



**Forest people Vs Agricultural People**

**Ecosystem People Vs Biosphere People**

**Ecological Refugees**

**Forest dwellers & Tribal Rights Act**

# Death of a Lake



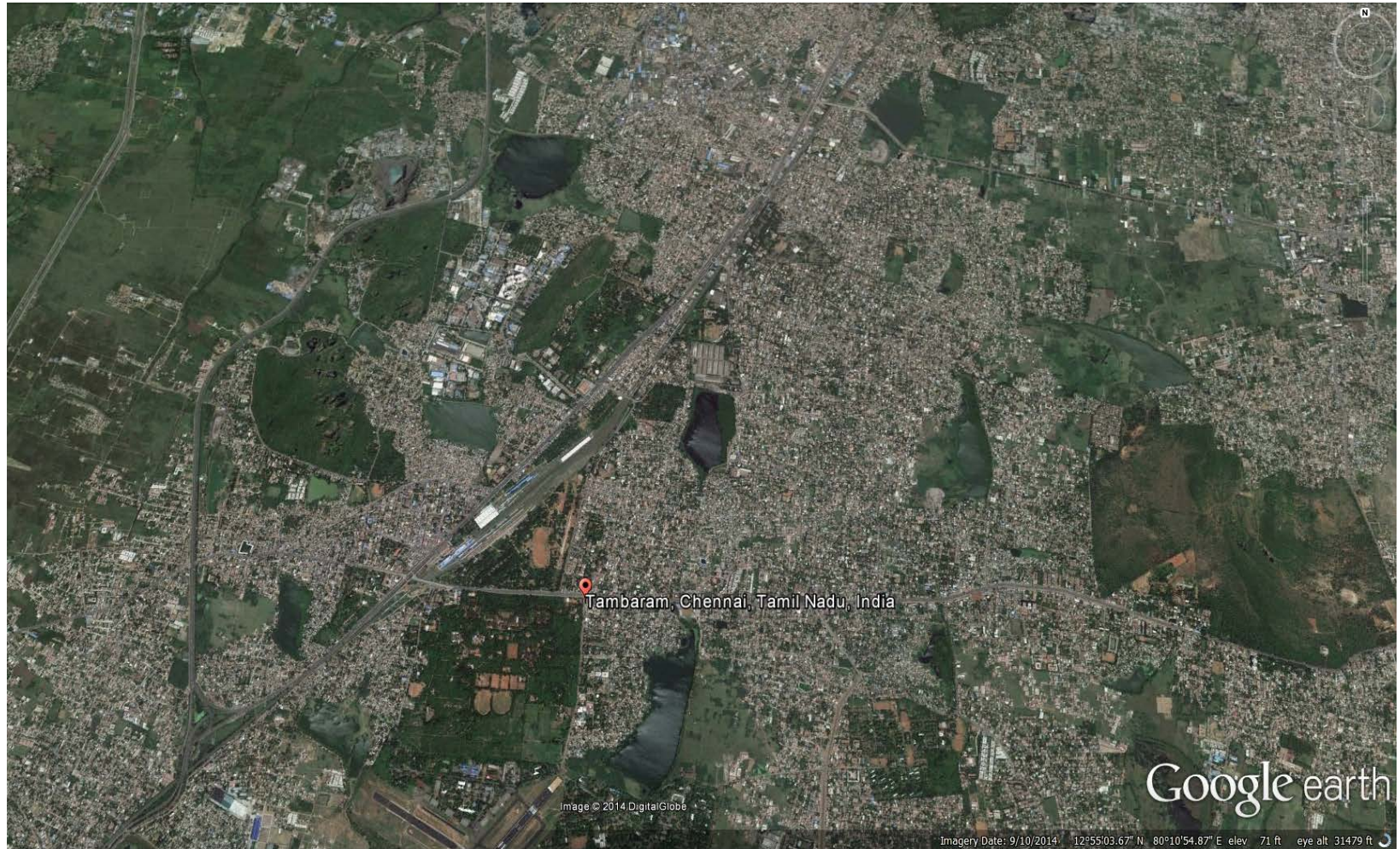


# Dead Lake





# Tambaram, Chennai, Tamil Nadu





# Lakes, Agriculture and Livelihood



# Invasive Species and Wetlands

*Eichhornia crassipes* (Mart.) Solms-Laub



*Ludwigia peruviana* (L.) Hara



*Typha angustifolia* L.



*Ipomoea carnea* Jacq.



# A few temperate weeds were introduced from Mediterranean Region and East Africa

*Rorippa nasturtium - aquaticum* (L.) Hayek.



*Zantedeschia aethiopica* (L.) Spreng.



***Alternanthera philoxeroides* (C. Martiu) Griseb. – rapidly spreading wetland invasive species**





*Sphagneticola trilobata*  
a potential marsh land invasive species









# *Butea monosperma* - ಮುತ್ತುಗ







# Longan Fruit

*Dimocarpus longan*













## Endemic genera of Angiosperms in India: A Review

Sheeba J. Irwin\* and D. Narasimhan

Centre for Floristic Research, Department of Botany, Madras Christian College (Autonomous),  
Tambaram, Chennai – 600 059, Tamil Nadu, India.

\*E-mail: sheebajirwin@gmail.com

### Abstract

This is an earnest effort to review the earlier recorded endemic genera of angiosperms in India and assess those present within the political boundaries of India. It is concluded that only 49 genera are endemic to India, of which 36 are unispecific. Peninsular India has a high concentration of endemic genera (40 genera). Four are confined to Indian Himalaya and three to Andaman & Nicobar Islands. Genus *Hardwickia* is widely distributed in the dry deciduous forests of Peninsular and North India, excluding Northeast India. *Bentinkia* which is distributed in Peninsular India and Nicobar Islands is the only genus with disjunct distribution. About 71% of the genera are herbaceous and their concentration is more in wet evergreen forests and grasslands. Threat assessment has not been made for majority of the species of these genera. There is an urgent need for an assessment based on current IUCN Criteria.

**Keywords:** Angiosperm, Conservation, Endemic Genera, India

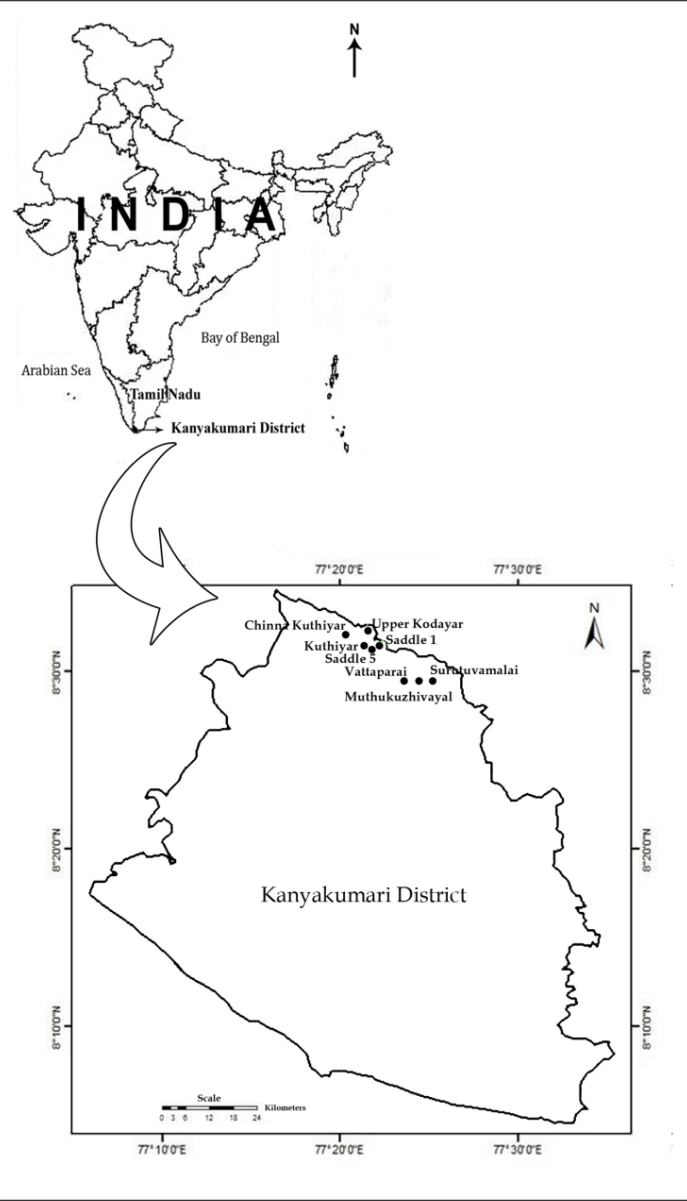
### Introduction

Tropical forests show a high degree of species richness and endemism (Orsini & Groom, 2005). Endemic taxa are restricted to specific areas such as oceanic islands, peninsular regions, mountain peaks and unique geographical areas. Globally 'botanically interesting' areas are rich in endemics, especially islands (Richardson, 1978). Regions with high concentration of endemic species are classified as 'Biodiversity Hotspots' by the Conservation International (CI). Of the 34 hotspots recognized by the CI, the following four hotspots fall within the Indian political boundaries (Mittermeier *et al.*, 2004): 1. Indo-Burma covering Mizoram, Manipur, Nagaland, Meghalaya, Tripura and Andaman Islands, 2. Himalaya covering Jammu & Kashmir, Himachal Pradesh, Uttarakhand, northern part of West Bengal (Darjeeling), Sikkim, northern part of Assam and Arunachal Pradesh, 3. Western Ghats falls within the states of Tamil Nadu, Kerala, Karnataka, Goa, Maharashtra and Gujarat and 4. The Sundaland covering the Nicobar Islands. Of the 20,074 taxa of angiosperms reported from India (Karthikeyan, 2009), 5752 (29%) taxa are endemic and are distributed in three major phytogeographical regions, viz., Indian Himalaya, Peninsular India and Andaman & Nicobar Islands (Nayar, 1996). India harbours a large number of endemic species. However, the number of endemic genera is less and no family is endemic to India.

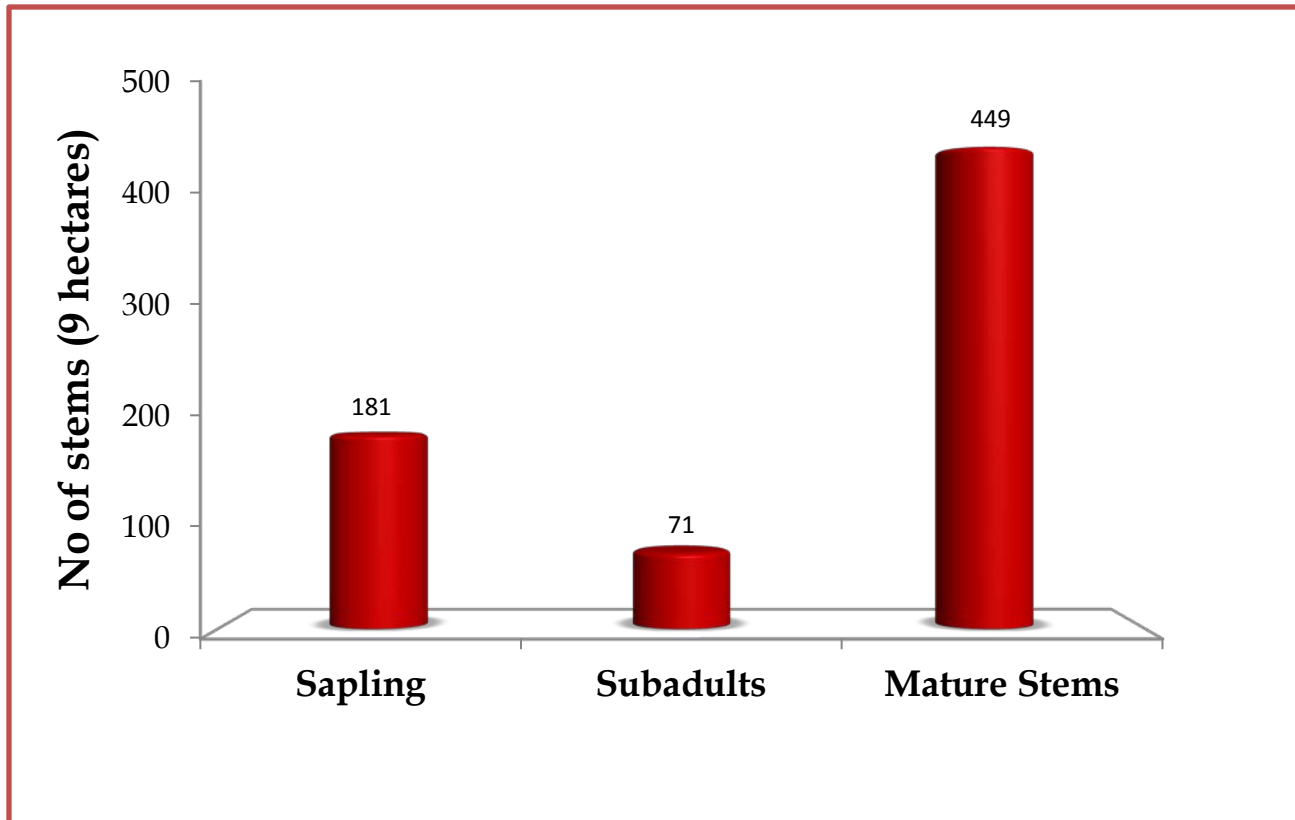
### Methodology

Information on endemic genera of angiosperms were collected from the available literature (Cooke, 1901 – 1908; Chatterjee, 1939; Bor, 1949, 1954, 1958, 1960; Airy Shaw, 1952; Clifford, 1967; Ansari & Hemadri, 1971; Rao, 1972, 1979; Mukherjee & Constance, 1974; Saldanha, 1974; Sohmer, 1976; Hong, 1980; Chakraborti, 1981; Clayton, 1981; Nair *et al.*, 1982, 1983; Panigrahi & Das, 1983; Uniyal & Pal, 1983; Chakrabarty & Rao, 1984; Pandurangan *et al.*, 1984; Bhat, 1986; Mukherjee & Constance, 1986; Rao & Chakrabarty, 1986; Takhtajan, 1986; Ahmedullah & Nayar, 1987; Kumar & Shetty, 1987; Deshpande *et al.*, 1989; Eriksson, 1990; Matthew, 1991; Mill, 1991; Mathew & Lakshminarasimhan, 1994; Kumar, 1995; Sarkar, 1995; Uniyal, 1995; ING, 1996 (<http://botany.si.edu/ing/>); Nayar, 1996; Sharma *et al.*, 1996; Kumar & Rasmussen, 1997; Shivamurthy & Sadanand, 1997; Yoganarasimhan *et al.*, 1997; Rao, 1998; Kumar & Coomar, 1999; Ahmedullah, 2000; Janarthanam *et al.*, 2000; Singh *et al.*, 2001; Yadav & Sardesai, 2002; Fonseca & Janarthanam, 2003; Sasidharan, 2004; Daniel, 2005; Govaerts, 2005 (<http://www.kew.org/wcsp>), 2006 (<http://www.kew.org/wcsp/monocots>); Nayar *et al.*, 2006; Venu, 2006; Balakrishnan & Chakrabarty, 2007; Mitra & Mukherjee, 2007; Rajkumar & Janarthanam, 2007; Anderberg & Pandey, 2008; Mabblerley, 2008;

**Population sites of *Elaeocarpus venustus*  
in Kanyakumari District, Tamil Nadu**

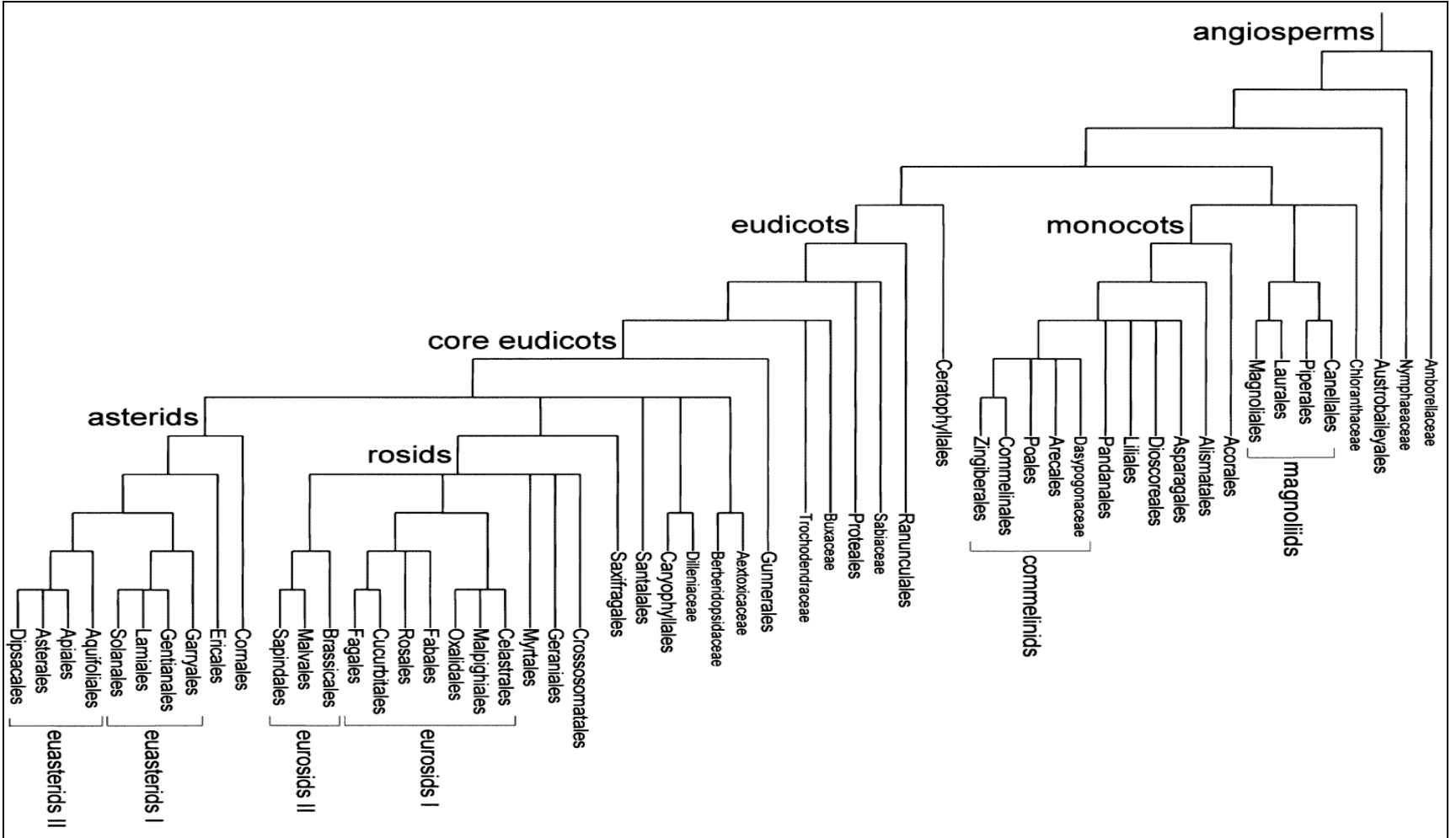


# Population Structure of *Elaeocarpus venustus* in Kanyakumari District





# APG CLASSIFICATION



**We think too much but feel little**

Charlie Chaplin in the Movie The Great Dictator, (1940)



**Thank you**