


TOWARDS INTEGRATED MANAGEMENT OF WESTERN GHATS

EWRG-IISC

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WATER KNOWS NO RELIGION!

In all human traditions water is sacred

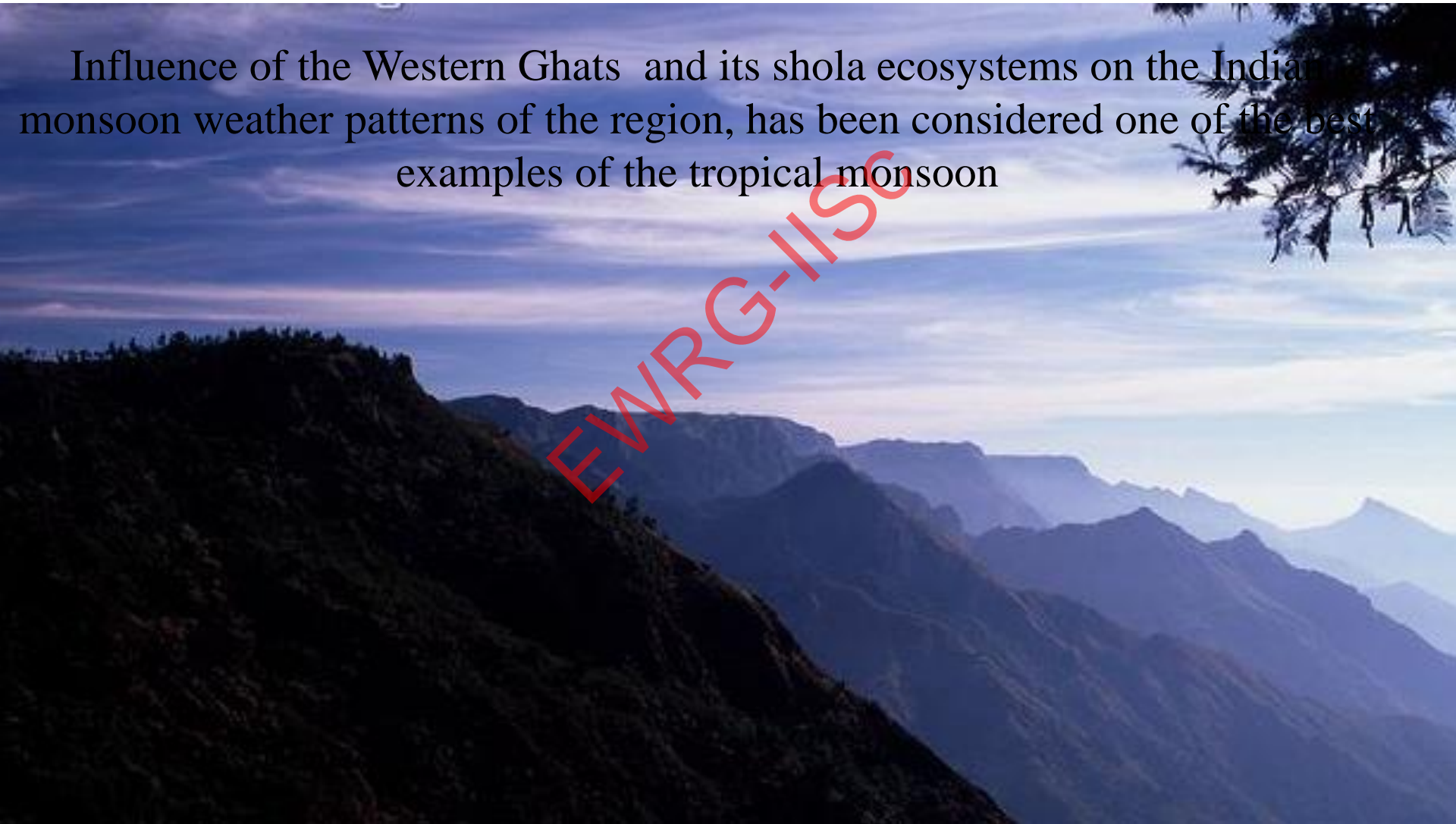


Water is key environmental issue of 21st century. Streams from forested mountains are sources of most potable water.



WESTERN GHATS : WATER TOWER FOR PENINSULAR INDIA

Influence of the Western Ghats and its shola ecosystems on the Indian monsoon weather patterns of the region, has been considered one of the best examples of the tropical monsoon

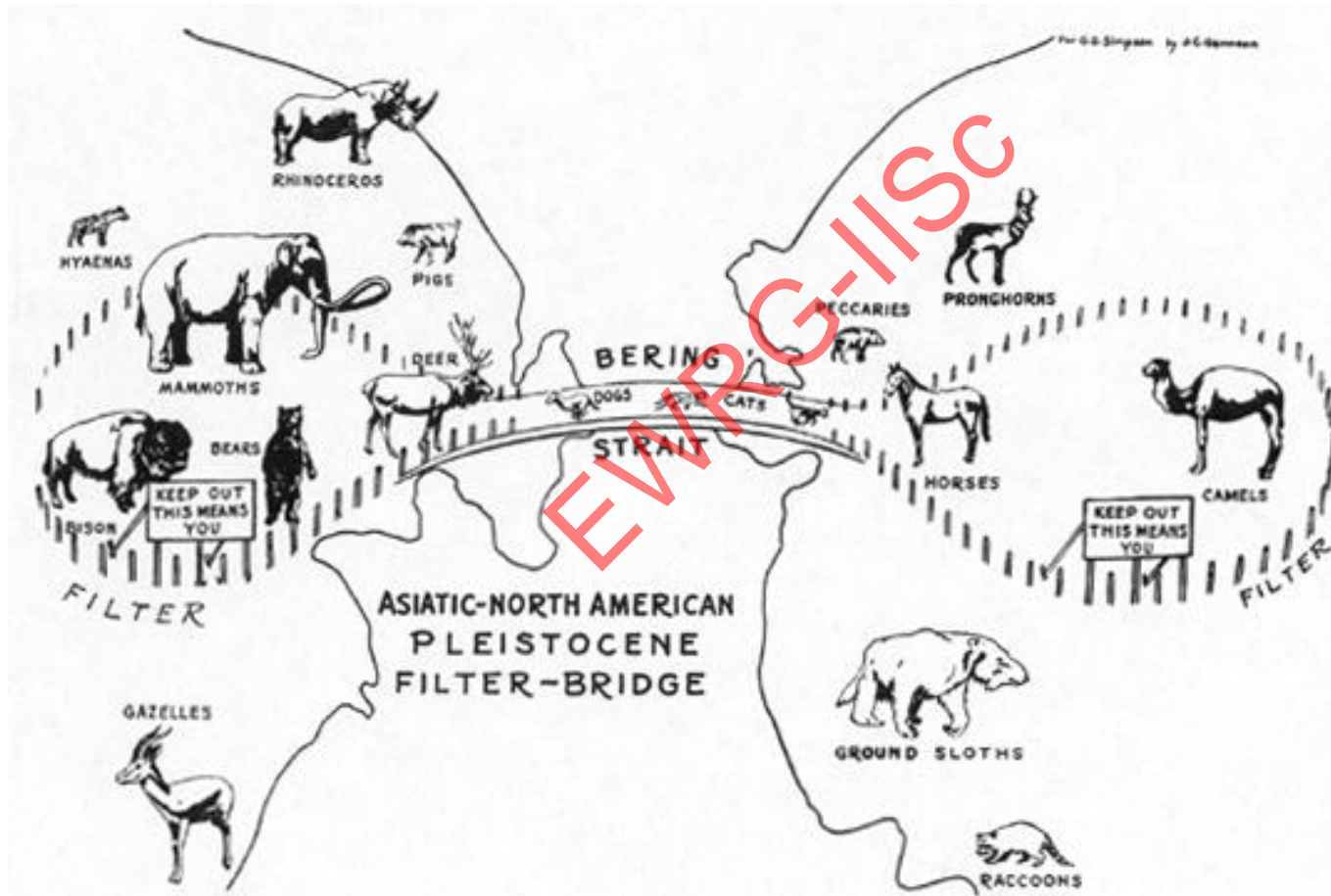


What do we have?

- Western Ghats – 90million years old – Biodiversity hotspot
- Water-tower of peninsular India

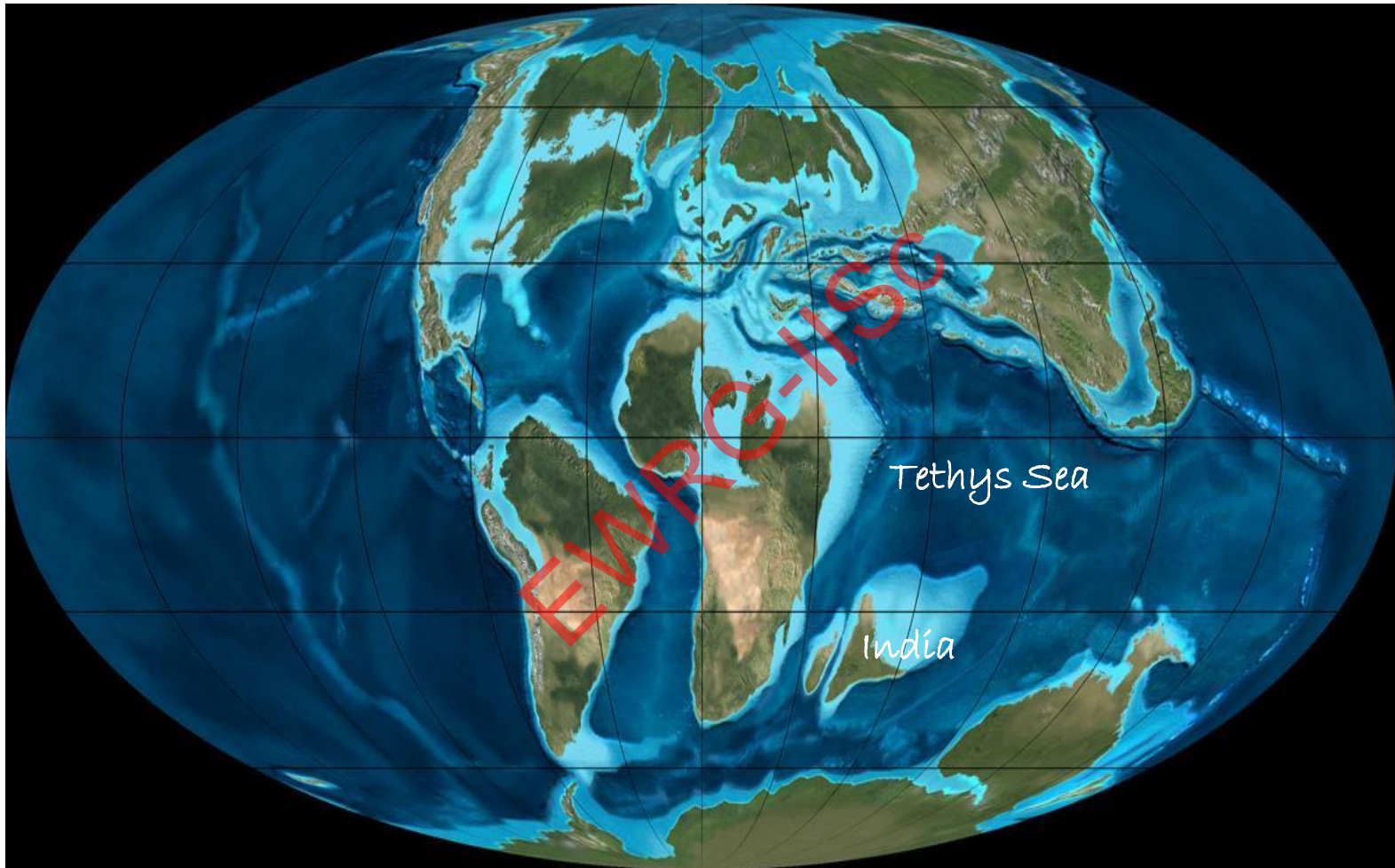


Biogeography : distribution of species and ecosystems in geological time. Organisms and biological communities vary in a regular fashion along geographic gradients of latitude, elevation, isolation and habitat area.



Which species? Where? Why? Why not?

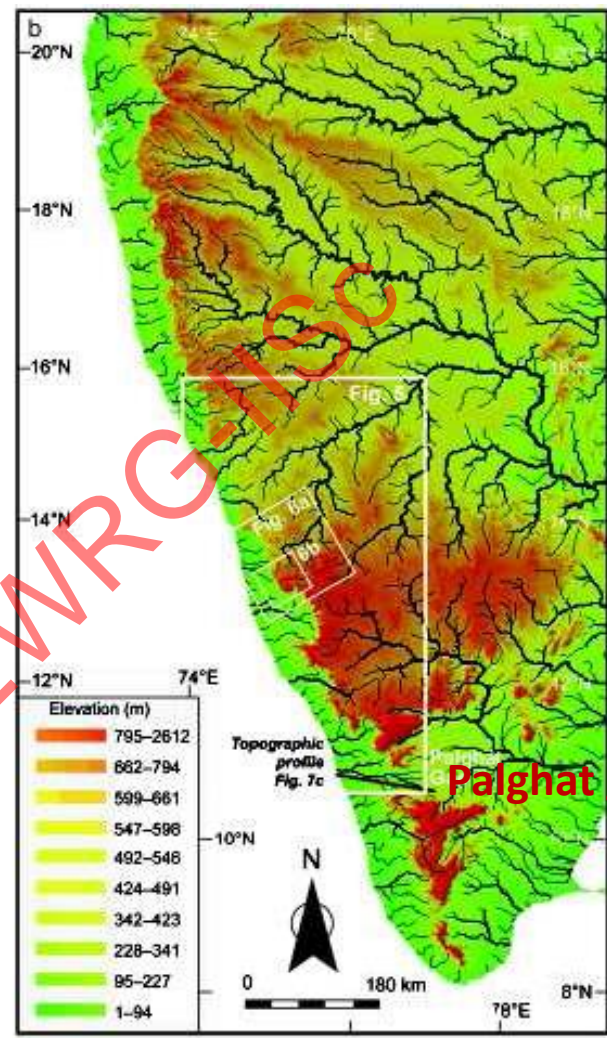
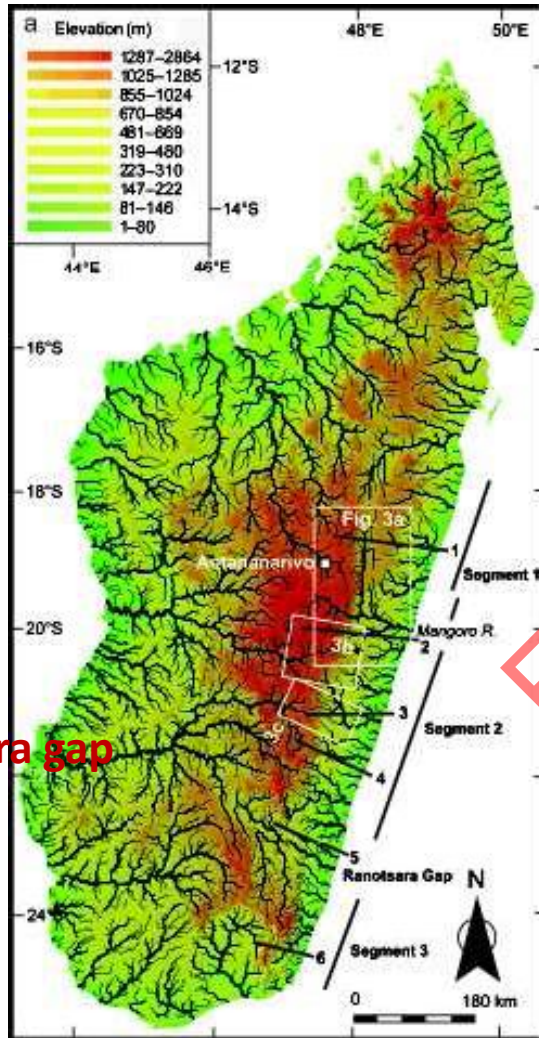
ORIGIN OF WESTERN GHATS



About 88 million years ago: India's separation from Madagascar

An upliftment or vertical split?

Gunnell & Harbor, 2008



Ranotsara gap

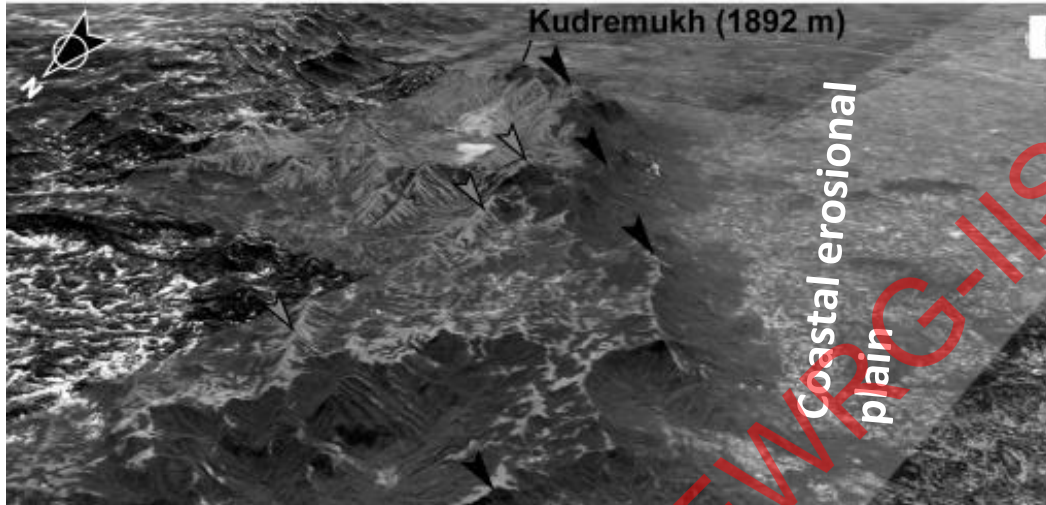
Palghat gap

1600 km long

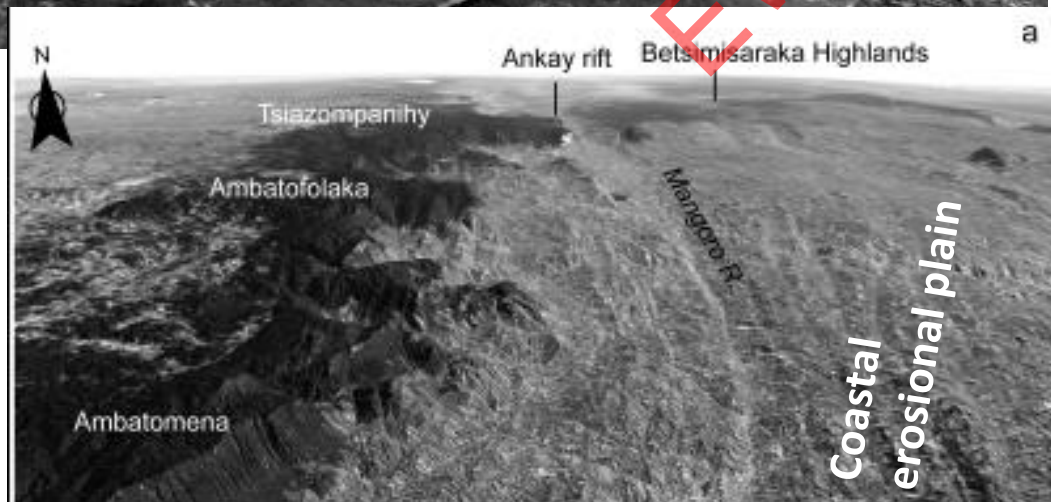
Western Ghats: one of the classic examples of passive margin great escarpments in the world (?)

-V.S. Kale, 2010

Or: Is it due to the vertical split of a mountain that linked Madagascar and Indian Peninsula (?)



Indian west coast & W. Ghats

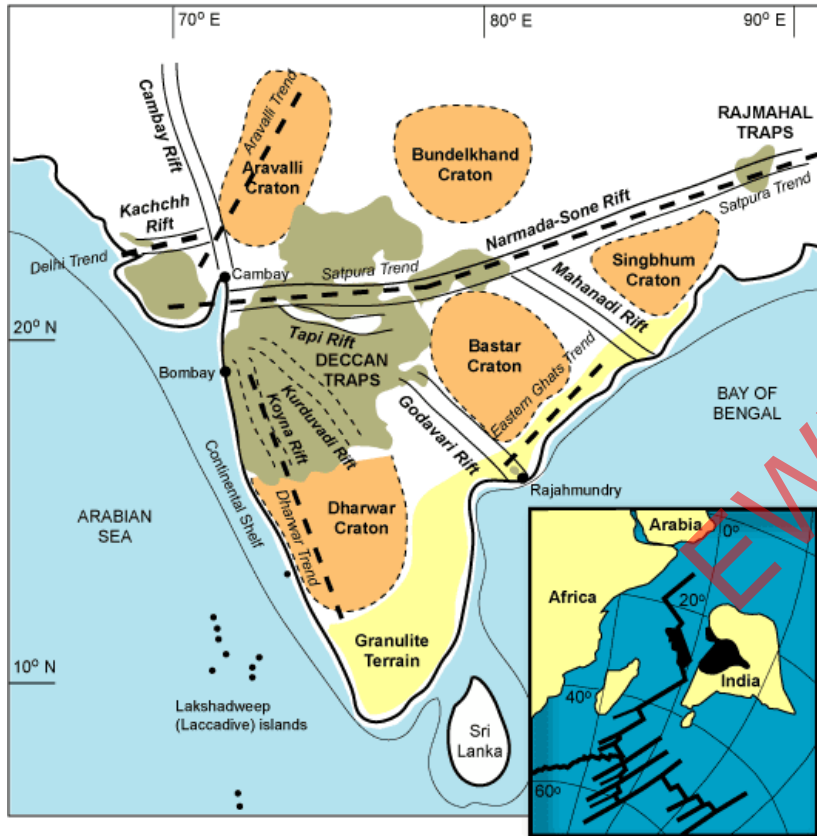


Madagascar east coast & mountain

K/T BOUNDARY -DECCAN VOLCANISM-SEPARATION FROM SEYCHELLES

—

65 Ma massive volcanism produced - largest continental lava deposit (Deccan Traps) in 200 Million years. covering 500,000 sq. km.



Deccan volcanic province

<http://www.largeigneousprovinces.org.07may.html>

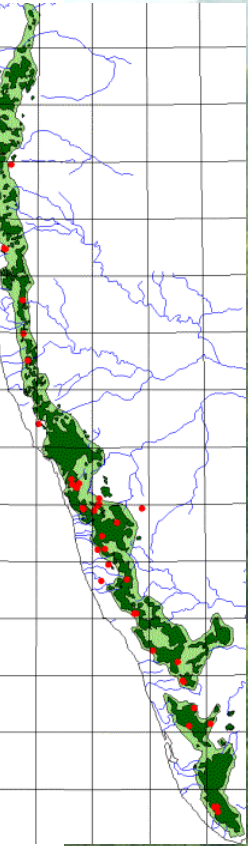
View of the 1200-m-thick Deccan flood basalt sequence exposed in Mahabaleshwar



Photo: Hetu Sheth

CLIMAX RAIN FORESTS

Dipterocarps in South and central W Ghats



Rain forests:
Madagascar



REFUGIA IN SOUTHERN WESTERN GHATS

- S. W. Ghats: High degree of endemism. Rainfall throughout the year. Old lineages of plants and frogs.
- **Changanassery fossils:** 40,000 yrs ago – Late Quaternary pollen deposit of moist evergreen forest & deciduous forest – when xeric glacial climate prevailed in Indian peninsula.
- Survival of Tertiary rain forests as **riparian vegetation** – rejuvenated in Holocene as modern extant flora (Farooqui et al., 2010)



Sharavathi flowing through ancient rain forests

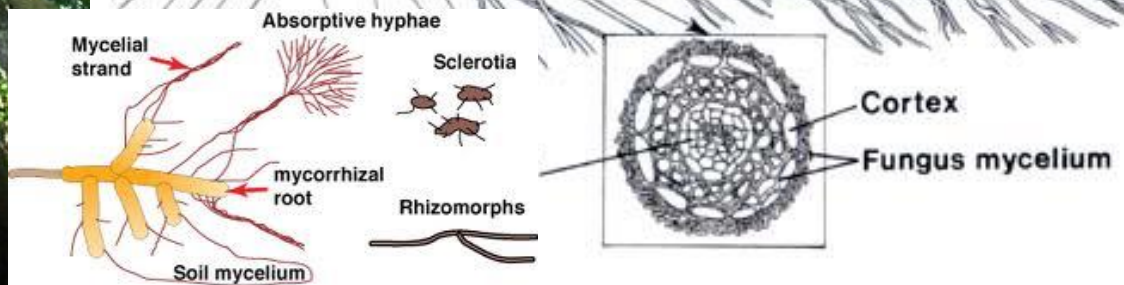
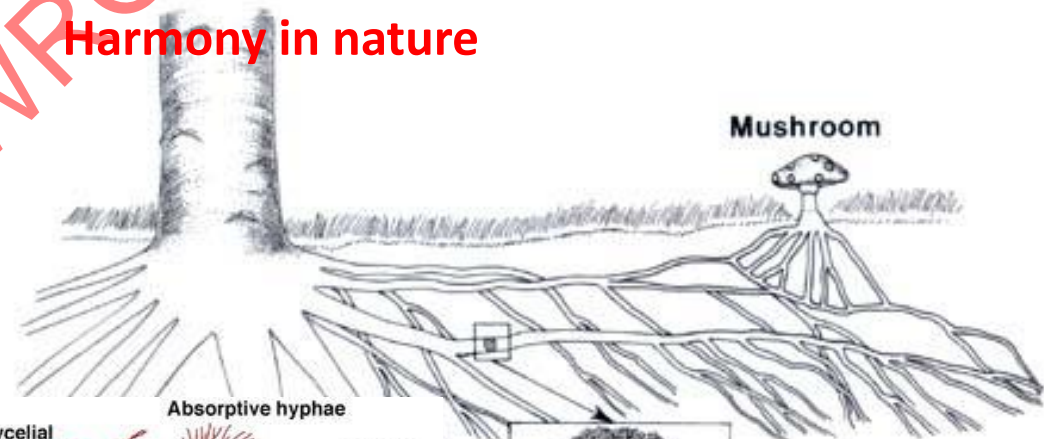
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Information packing & natural association in tropical rain forest



Harmony in nature



SIMPLIFICATION OF ECOSYSTEMS OPPOSITE PROCESS



EARLY PEOPLES' EFFORTS FOR HARMONY WITH NATURE

- Forest cutting for agriculture was a necessity
- Hunting was necessity
- War was necessity
- Sacred groves & sacred trees
- Sacred animals
- Vedic roots of Ahimsa
- Upanishads strengthen the concept
- Jainism & Buddhism took it to greater heights
- Mahabharata: "Ahimsa Paramo-dharma"

Mountains merge with estuaries along the west coast

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AHGHANASHINI ESTUARY: LIVELIHOODS



ANNUAL PRODUCTION: 22,000 TONS (IN 2008)

PEOPLE ENGAGED: 2500

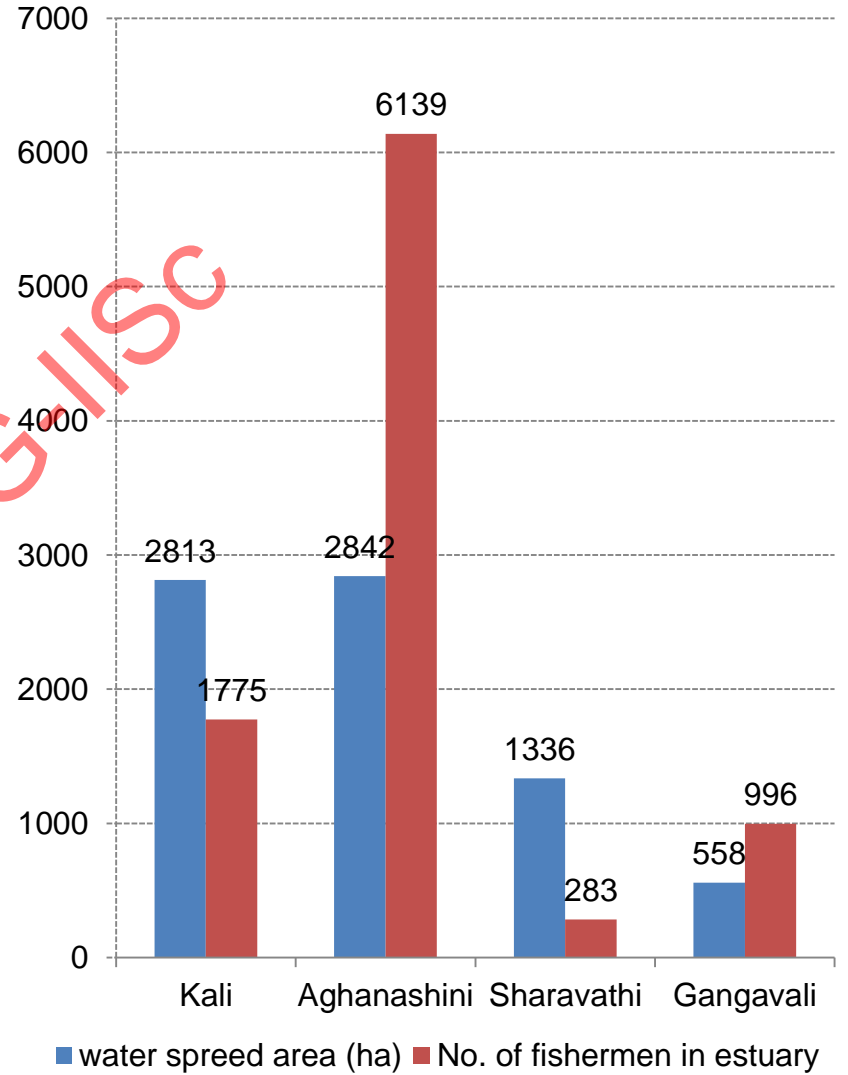
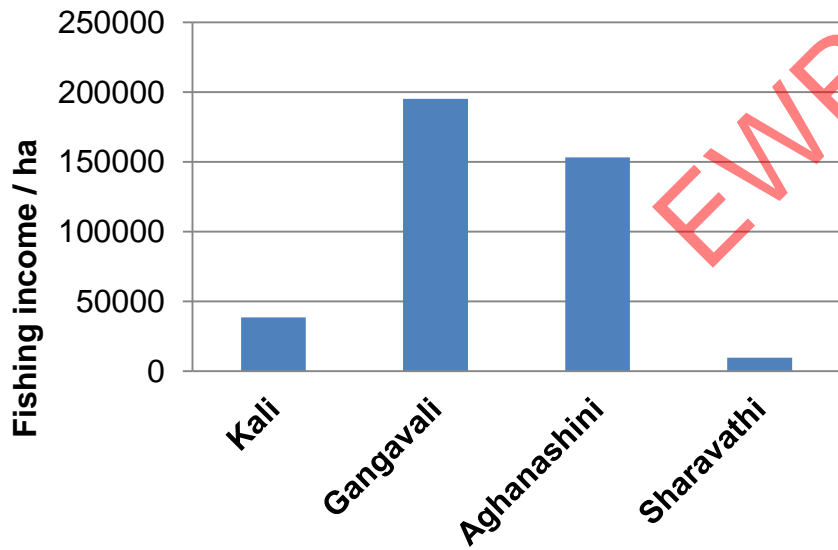
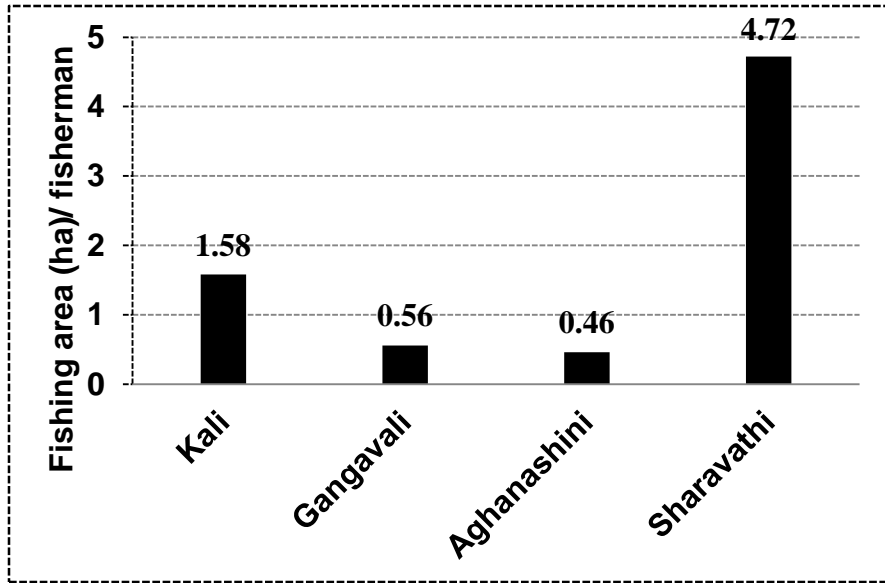
(WOMEN : ABOUT 700)

ANNUAL PRODUCTION: RS. 66 CRORES

➤ **HERITAGE SITE STATUS FOR CLAMBEDS OF AGHANASHINI ESTUARY**

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ESTUARIES	WATERSPREAD (Ha)	NO OF FISHERMEN	NO OF FISHING DAYS
KALI -Dams	2813	1775	307,320
GANGAVALI	558	996	246,060
AGHANASHINI	2842	6139	1,497,200
SHARAVATHI-Dams	1336	283	41,420

EWREGIISC



Mangroves (L)
& Fresh water
swamps (R).
Plant roots in
saturated soils



Dry months increase with latitude & decrease with altitude

-

Legend



LAT ° N	DRY MONTHS ALTITUDE (M)			
	0-300	300-600	600-1200	>1200
19-20	8	7	7	
18-19	8	7	7	
17-18	7	7	6.5	6
16-17	6.25	6		
15-16	5.75	5.5	6	
14-15	5.5	5.5	5.5	
13-14	4.25	5	4	3.5
12-13	4	3.75	3.5	3.5
11-12	3.75	3	2.75	2.5
10-11	2.8	3	2.75	2.25
9-10	2.5	2.3	2.25	
8-9	2.5	2.1	2	2

	8-10	10-12	12-14	14-16	16-18	18-20
Dipterocarpus bourdillonii	P	P	P			
D. indicus	P	P	P	P		
Hopea canarensis			P			
Hopea erosa	P	P				
Hopea glabra	P	P				
Hopea parviflora	P	P	P	P		
Hopea ponga	P	P	P	P	P	
Hopea racophloea	P	P				
Hopea utilis	P	P				
Vateria indica	P	P	P	P	P	
Vateria macrocarpa	P	P				
TOTAL	10	10	6	4	2	0



Last Dipterocarpus : in a Tirthahalli kan

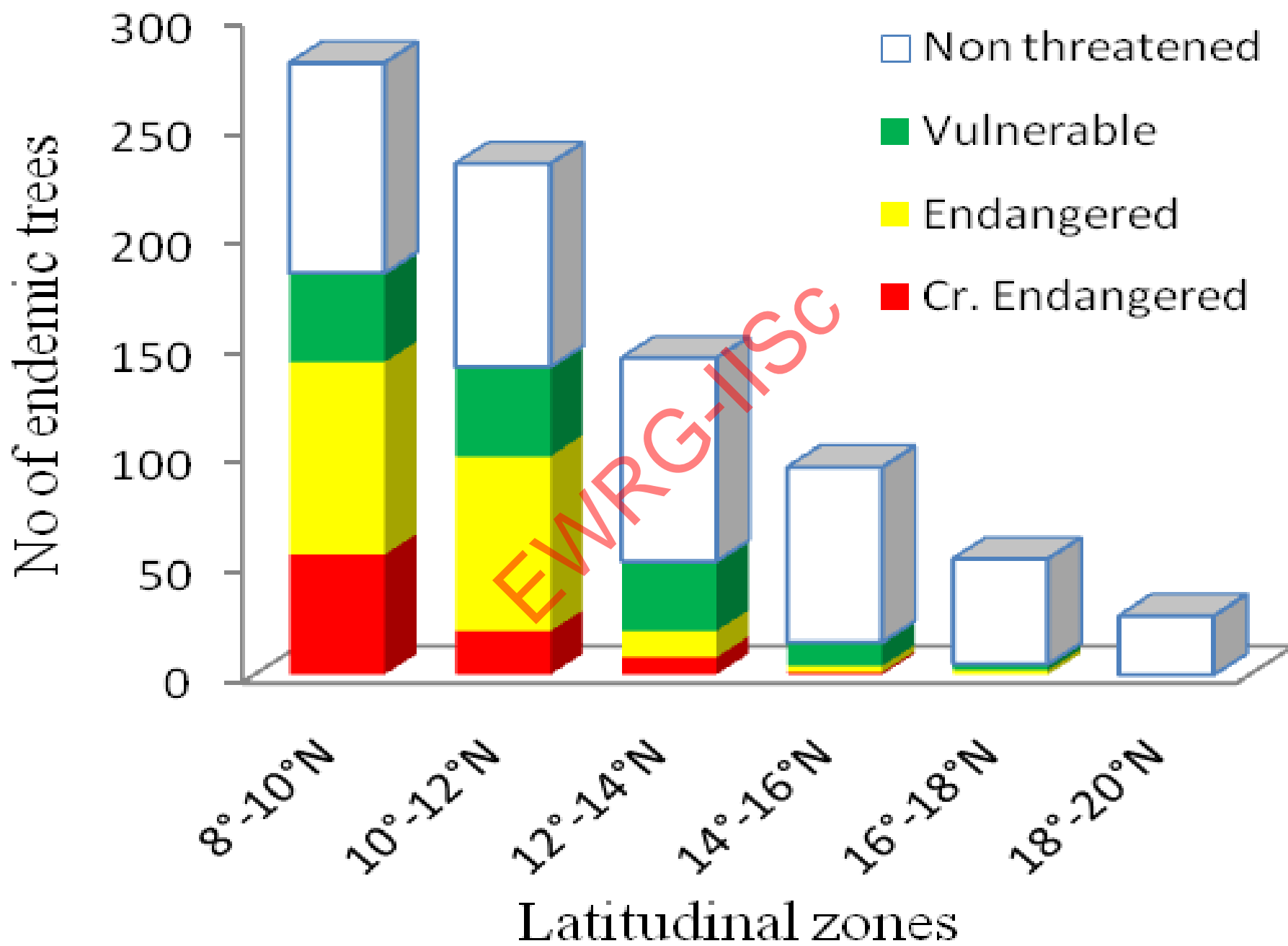
EWRGILLS

FRESH WATER FISHES: LATITUDINAL DECLINE

Threat- ened	Threat status	Latitudinal distribution (in degrees N)					
		8-10	10-12	12-14	14-16	16-18	18-20
	CE	--	02	03	01	01	02
	EN	20	22	16	07	06	06
	VU	06	10	08	05	03	02
Total threatened		26	34	27	13	10	10
Total endemics		76	95	76	40	34	31

Total fishes of Western Ghats: 176 NE+116 endemics

Latitudinal decrease in of tree endemism in Western Ghats





CONGREGATIONS OF AMPHIBIANS IN SWAMP FORESTS: 14°N

Amphibian groups	No. of species	Habitat	Endemic status	IUCN status
Caecilians	2	Semi-aquatic: 2	Endemic: 2	DD: 2
Toads	2	Terrestrial: 1 Arboreal: 1	Non-endemic: 1 Endemic: 1	EN: 1 LC: 1
Frogs	31	Semi-aquatic: 17 Aquatic: 6 Arboreal: 8	Non-endemic: 8 Endemic: 23	CR: 1 EN: 4 VU: 5 NT: 2 LC: 12 DD: 7



**Philatus
ponmudi (CR)**

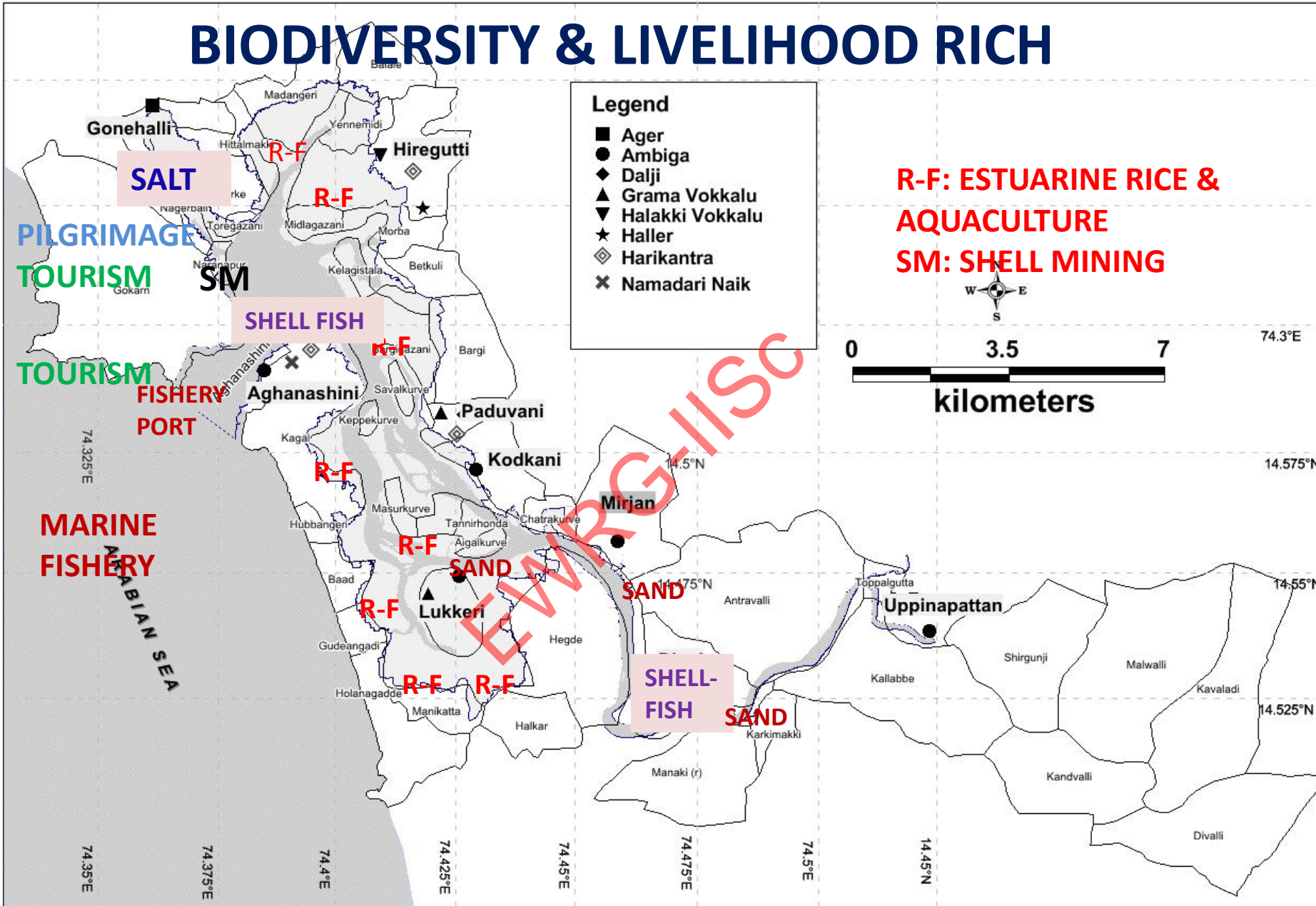
CR–Critically endangered, EN–Endangered, VU–Vulnerable, NT–Non-threatened, LC–Least concern, DD–Data deficient

BIODIVERSITY & LIVELIHOOD RICH

Legend

- Ager
- Ambiga
- ◆ Dalji
- ▲ Grama Vokkalu
- ▼ Halakki Vokkalu
- ★ Haller
- ◇ Harikantra
- ✕ Namadari Naik

R-F: ESTUARINE RICE & AQUACULTURE
SM: SHELL MINING



TORME: SG WITH MYRISTICA SWAMP

HIGH ENDEMISM
PRIMEVAL NATURE
RICH HYDROLOGY
NEW SPECIES: SEMECARPUS KATHALEKANENSIS

EMRG-150





Myristica fatua
Endangered



Semecarpus kathalekanensis
Newly discovered



Gymnacranthera canarica
Vulnerable



Syzygium travancoricum
Critically Endangered



Dipterocarpus indicus
Endangered

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**Lineages to
Gondwanaland
Hydrologically rich-
behaving like rain
forest**

Amphibians of Kathalekan

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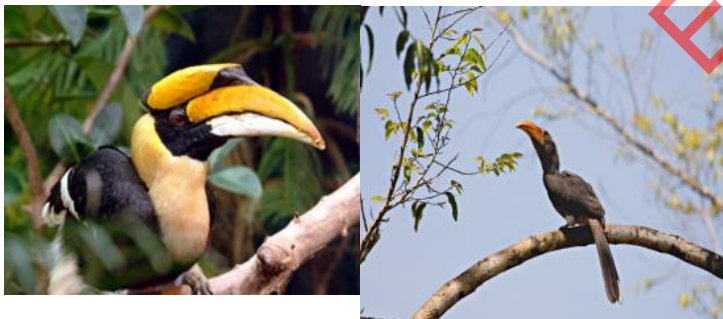
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LTM



Philatus ponmudi

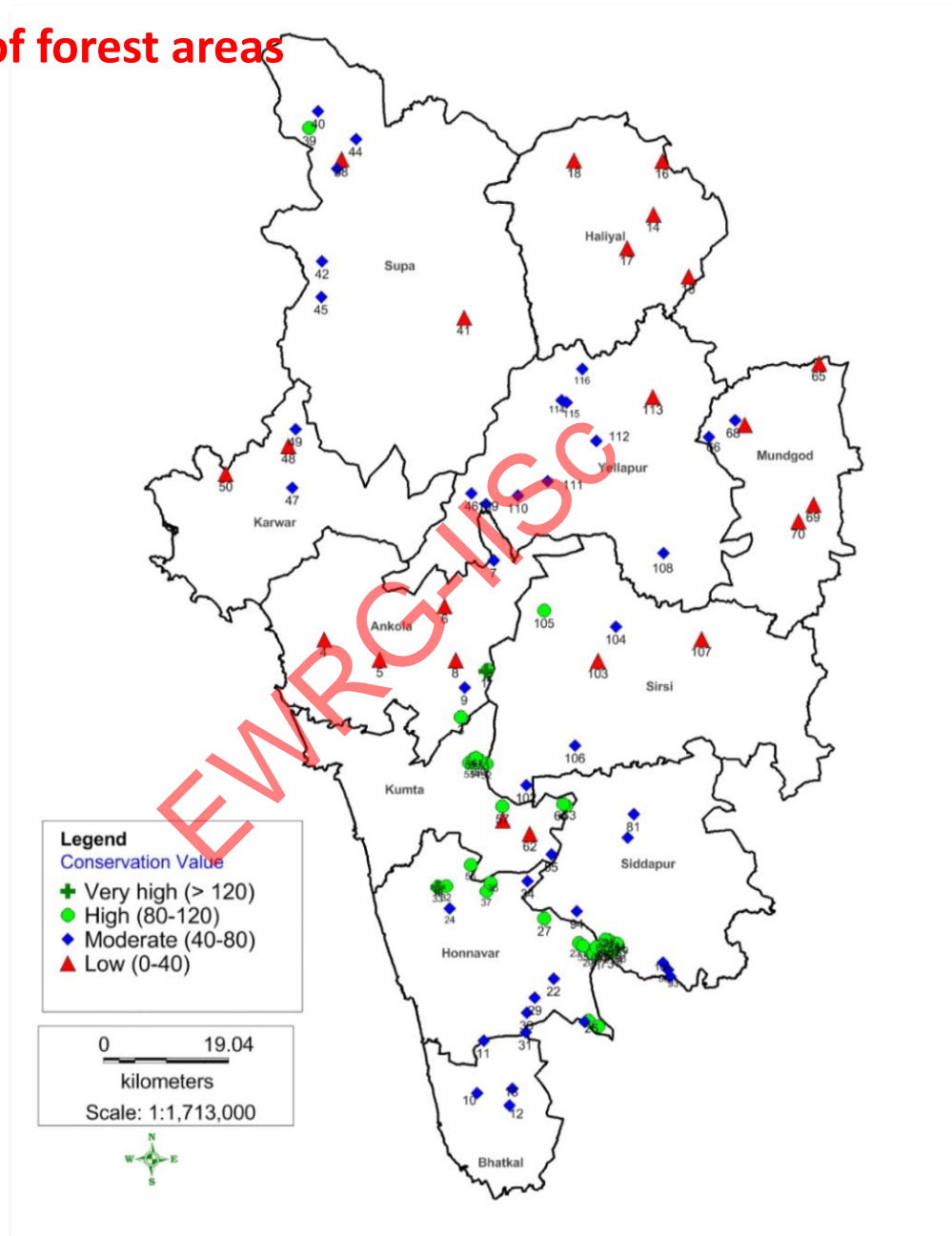


Great pied & Malabar grey hornbills: Dispersers of swamp nutmegs

Conservation values of forest areas

SGs among highest conservation value sites

CV based on
endemism,
threatened sp
Basal area
Tree heights
Diversity



RANKING FOR CONSERVATION VALUES

