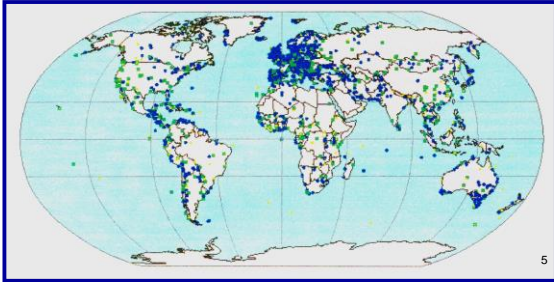


IUCN: (International Union for the Conservation of Nature)

- Recognized protected areas from 1990-2000: 6,931 to 28,442
- Presently **30,000 protected areas**. Total coverage of Protected Areas and Biosphere Reserves: 803 million hectares to 1,115 million hectares.



Forestry in India 1878 - Present: An Abbreviated History

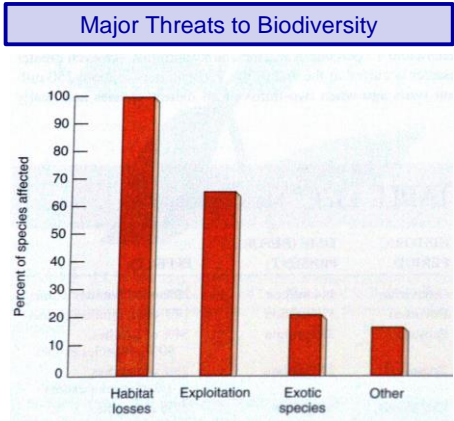
World Bank Initiatives	Year	Gov of India Initiatives	Local Actions and Restrictions
Biodiversity Act	2002	Formation of NBA	Still Half Way
	2002	Central Empowered Committee	Closes all Reserves
OED Evaluation	2000		Coordinated Inventories
	1998	Draft Natural Ecosystems Act	Village Forest Protection Committees
Forestry Portfolio Review	1996		Conservation & Biodiversity Priorities
India Incentives for JFM	1994	Environment Action Plan	
Conditional Lending in Forestry	1993	Natl Conservation Strategy	
Forest Sector Review	1992	Amended Wildlife Act	Wildlife Sanctuary development
Forest Paper Review	1991	Circular Promoting JFM	
	1988	1988 Policy	Curbs commercial exploitation
	1984	Amended Wildlife Act	Prevents trade in wild animals
	1980	Forest Conservation Act	Limit state power of land conversion
Forest Policy Paper	1978		
	1976	Commission on Agriculture	Commercial forestry and fuelwood
	1972	Wildlife Act	
	1952	Forest Policy	Industrial Forestry; rights limited
	1927	Indian Forest Act	
	1878	Indian Forest Act	State acquires control

Type of protected area's in India to conserve the Biodiversity

Type of Protected Areas	India	Rajasthan
Biosphere Reserves	14	Nil
National Parks	100	3
Wildlife Sanctuaries	514	25
Community Reserves or Conservation Reserves	17	4



7



11

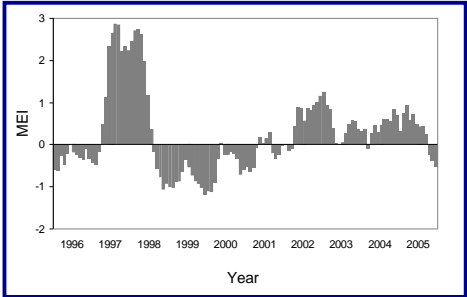
But now India's biodiversity is severely threatened for variety of reasons like:

- Habitat destruction and loss
- Over-exploitation
- Inappropriate process of development
- Mismanagement of natural resources.
- Exotic plants and animal species
- Natural calamities
- **Climate change**

(Amanishah Nullah)

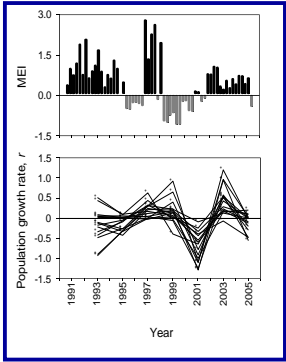
12

Time series of the Multivariate El Niño Southern Oscillation Index (MEI) showing the major 1998-2000 La Niña event

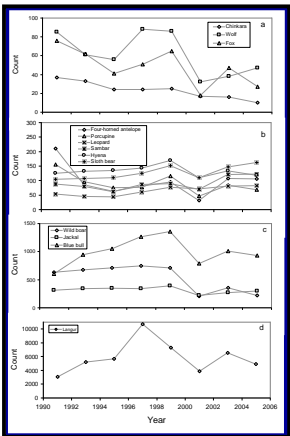


13

Multivariate ENSO Index (MEI) during the monsoon season, 1991-2005 and Population growth rates for 13 mammal species in the Kumbhalgarh Wildlife Sanctuary.

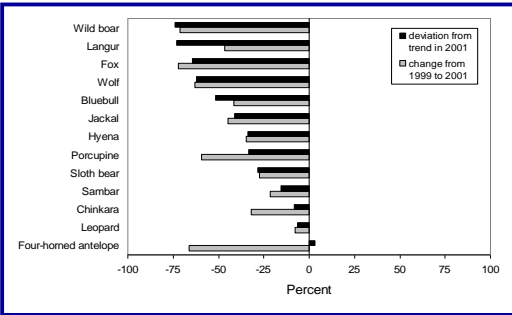


14



15

Apparent impact of the 1998-2000 La Niña event on each of 13 mammal species in Kumbhalgarh Wildlife Sanctuary



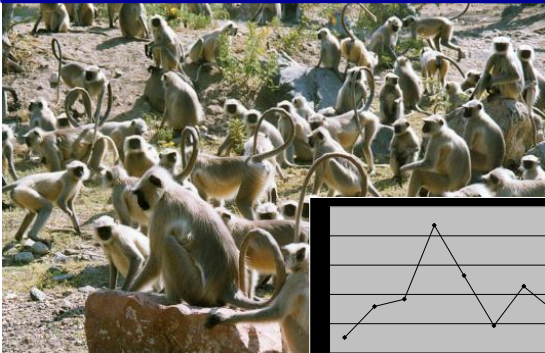
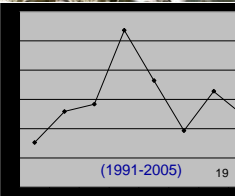
16

Change in the populations trend due to La Niña event				
Species	Scientific name	1991	2005	Δ
Langur	<i>Presbytis entellus</i>	3071	4894	59%
Sloth Bear	<i>Melwasus ursinus</i>	105	162	54%
Blue Bull	<i>B. tragocamelus</i>	604	931	54%
Leopard	<i>Panthera pardus</i>	54	82	52%
Sambar	<i>Cervus unicolor</i>	88	122	39%
Jackal	<i>Canis aureas</i>	312	300	-4%
Hyaena	<i>Hyaena hyeana</i>	125	119	-5%
Mongoose	<i>Herpestes smithi</i>	162	149	-8%
Wild Cat	<i>Felis chaus</i>	76	65	-14%
Grey Jungle Fowl	<i>Gallus sonneralii</i>	629	430	-32%
Wolf	<i>Canis lupus</i>	85	47	-45%
4-H Antelope	<i>T. c. quadricornis</i>	211	106	-50%
Wild Boar	<i>Sus scrofa</i>	631	223	-65%
Chinkara	<i>Gazella bennetti</i>	37	10	-73%

Habitat		
Jackal	<i>Canis aureas</i>	Edge
Wild boar	<i>Sus scrofa</i>	Edge
Wolf	<i>Canis lupus</i>	Edge
Blue bull	<i>Boselaphus tragocamelus</i>	Edge, Core
Leopard	<i>Panthera pardus</i>	Edge, Core
Langur	<i>Presbytis entellus</i>	Edge, Core
Sloth Bear	<i>Melwasus ursinus</i>	Edge, Core
Hyaena	<i>Hyaena hyeana</i>	Edge, Core
Sambar	<i>Cervus unicolor</i>	Core
Mongoose	<i>Herpestes smithi</i>	Core
Chinkara	<i>Gazella bennetti</i>	Core
Grey Jungle Fowl	<i>Gallus sonneralii</i>	Core
Four horned antelope	<i>Tetra cerus quadricornis</i>	Core
Wild Cat	<i>Felis chaus</i>	Core

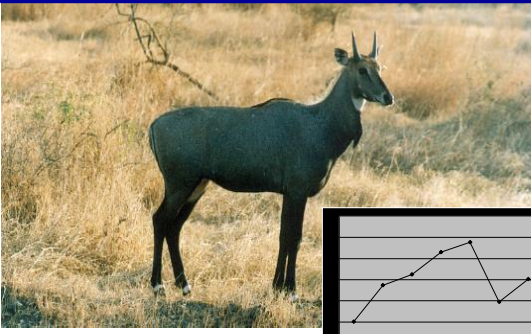
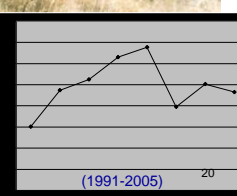
18

Langur *Presbytis entellus* (+59%)

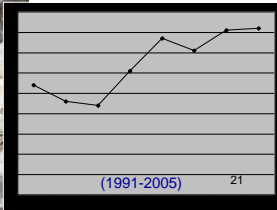
(1991-2005) 19

Blue Bull *B. tragocamelus* (+54%)

(1991-2005) 20

Sloth Bear *Melwasus ursinus* (54%)



CROP RAID AND ADAPTATION ON THE EXOTICS



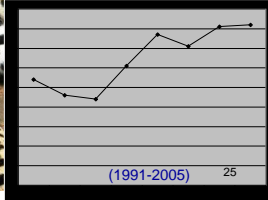
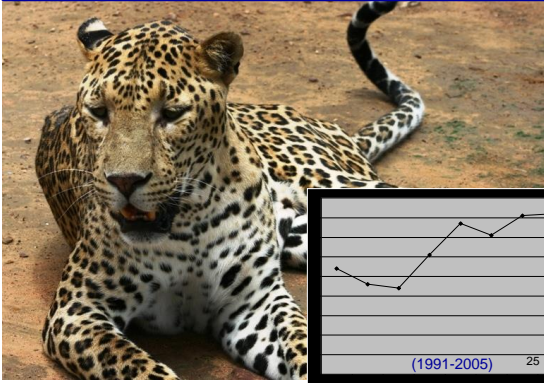
Increase in exotic plants: *Lantana Camara*



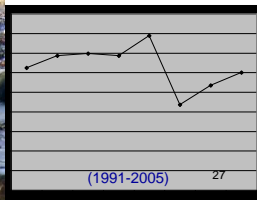
Increase in exotic plants : *Prosopis juliflora*



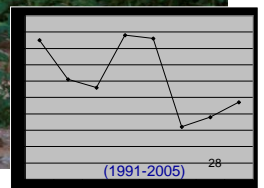
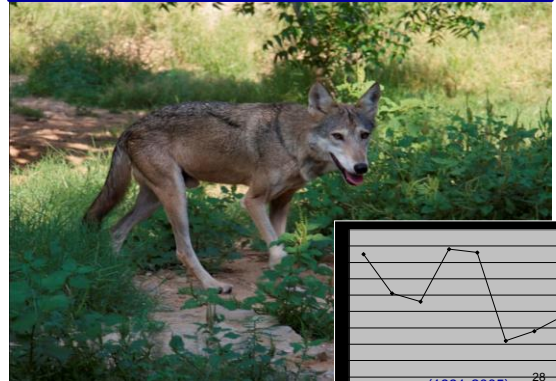
Leopard *Panthera pardus* (+52%)



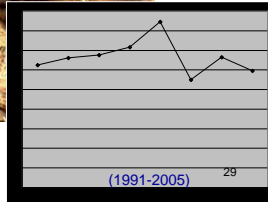
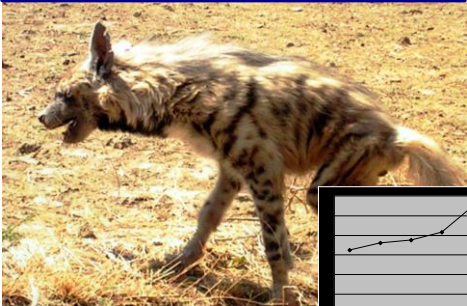
Jackal *Canis aureas* (-4%)



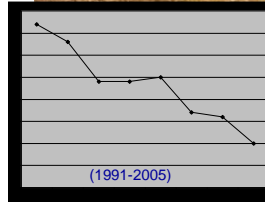
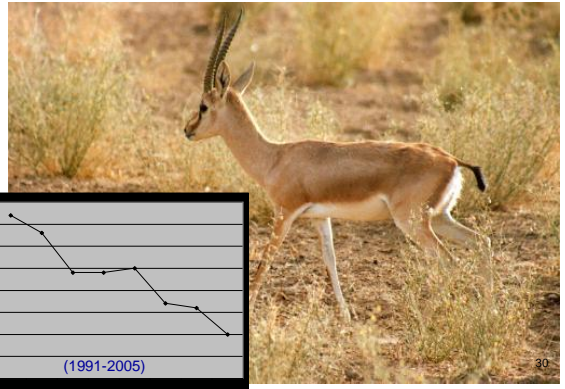
Wolf *Canis lupus* (-45%)



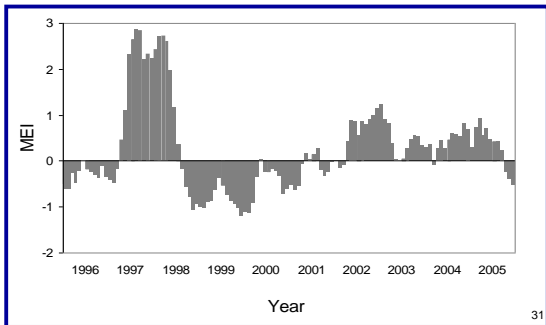
Hyena *Hyaena hyeana* (-5%)



Chinkara *Gazella bennetti* (-73%)



Time series data also showing effect on the vultures during the major 1998-2000 La Niña event



Seven species of vultures in this part of the country. This includes white-backed vulture (*Gyps bengalensis*), Long-billed vulture (*Gyps indicus*), Slender-billed vulture (*Gyps tenuirostris*), Red-headed vulture (*Sarcogyps calvus*) and Egyptian vulture (*Neophron percnopterus*) as resident species and Himalayan Griffon (*Gyps himalayensis*), Eurasian Griffon (*Gyps fulvus*) and Cinereous vulture (*Aegypius monachus*) as migrants.

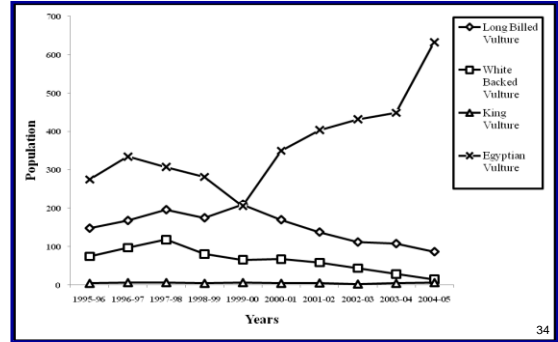


Red headed vulture (*Sarcogyps calvus*)



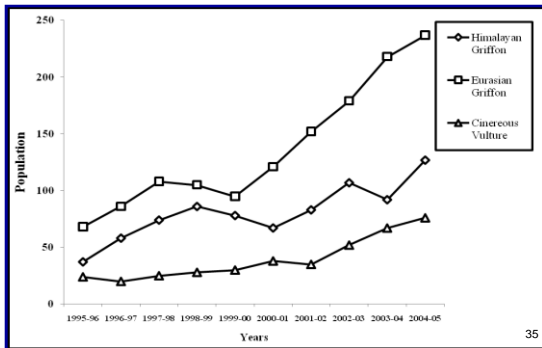
33

Impact of La Niña event on the resident vulture populations in Rajasthan



34

Impact of La Niña event on the migratory vulture populations in Rajasthan

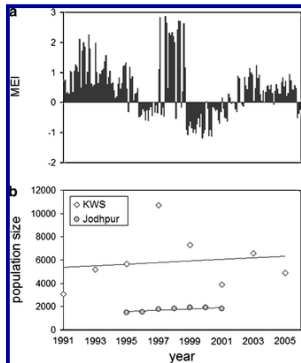


35

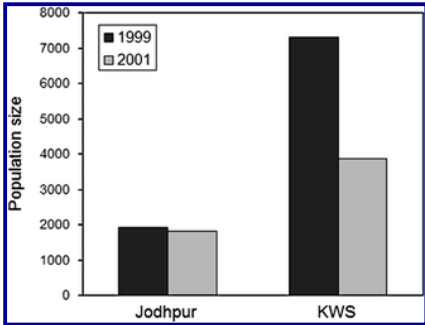
Buffered Jodhpur Langur Population and Human Subsidy



36



Time series of climatic and population dynamics data, 1991–2005
 Estimated size of langur populations in Kumbhalgarh Wildlife Sanctuary (KWS) and Jodhpur. (KWS: $\rho = 0.09$, $P = 0.77$; Jodhpur: $\rho = 0.23$, $P = 0.064$). 37



Estimated size of langur populations in KWS and Jodhpur before (1999) and after (2001) the drought of 2000.
 The KWS population suffered a catastrophic die-off (46.8%), while the Jodhpur population declined minimally (5.4%). 38

Publications

- ❖ Waite, T.A; Campbell, L.G; **Chhangani, A.K.** and Robbins, P. (2007): La Niña's signature: synchronous decline of the mammal community in a 'protected' area in India. *Diversity and Distributions, U.S.A.* 13(6): 752-760.
- ❖ Waite, T.A; **Chhangani, A.K.**; Campbell, Lesley G; Rajpurohit Lal S. and Mohnot, Surendra M. (2007) Sanctuary in the city: Urban monkeys buffered against catastrophic die-off during an ENSO-Related drought. *Eco-Health, U.S.A.* 4(3): 278-286.
- ❖ **Chhangani, A.K.**; Robbins, P. and Mohnot, S.M. (2008) Crop raiding and livestock predation at Kumbhalgarh Wildlife Sanctuary, Rajasthan, India. *Human Dimension of Wildlife, U.S.A.* 13:1-12.
- ❖ **Chhangani, A.K.** (2010) La Niña Induced Drought and Vulture Population Dynamics in Western Rajasthan. IMPACT OF CLIMATE CHANGE ON BIODIVERSITY AND CHALLENGES IN THAR DESERT. in the **PROCEEDINGS OF NATIONAL SEMINAR** ed. by Ramakrishna et al. DRC, ZSI, Jodhpur pp: 62-72.
- ❖ JONATHAN C. HALL, **A. K. CHHANGANI**, TOM A. WAITE and IAN M. HAMILTON (2011) The impacts of La Niña-induced drought on Indian Vulture Gyps indicus populations in Western Rajasthan. *Bird Conservation International, U.S.A.* Available on CJO 2011 doi:10.1017/S0959270911000232

These studies provides some hope for biodiversity conservation in the under pressure protected areas and in the rapidly urbanizing world, particularly for holy and commensal species. Through human subsidy

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