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e-planet

A Complete Journal on Environment

ORGANISATION FOR PROTECTION OF ECOSYSTEM
ENVIRONMENT AND ENDANGERED SPECIES

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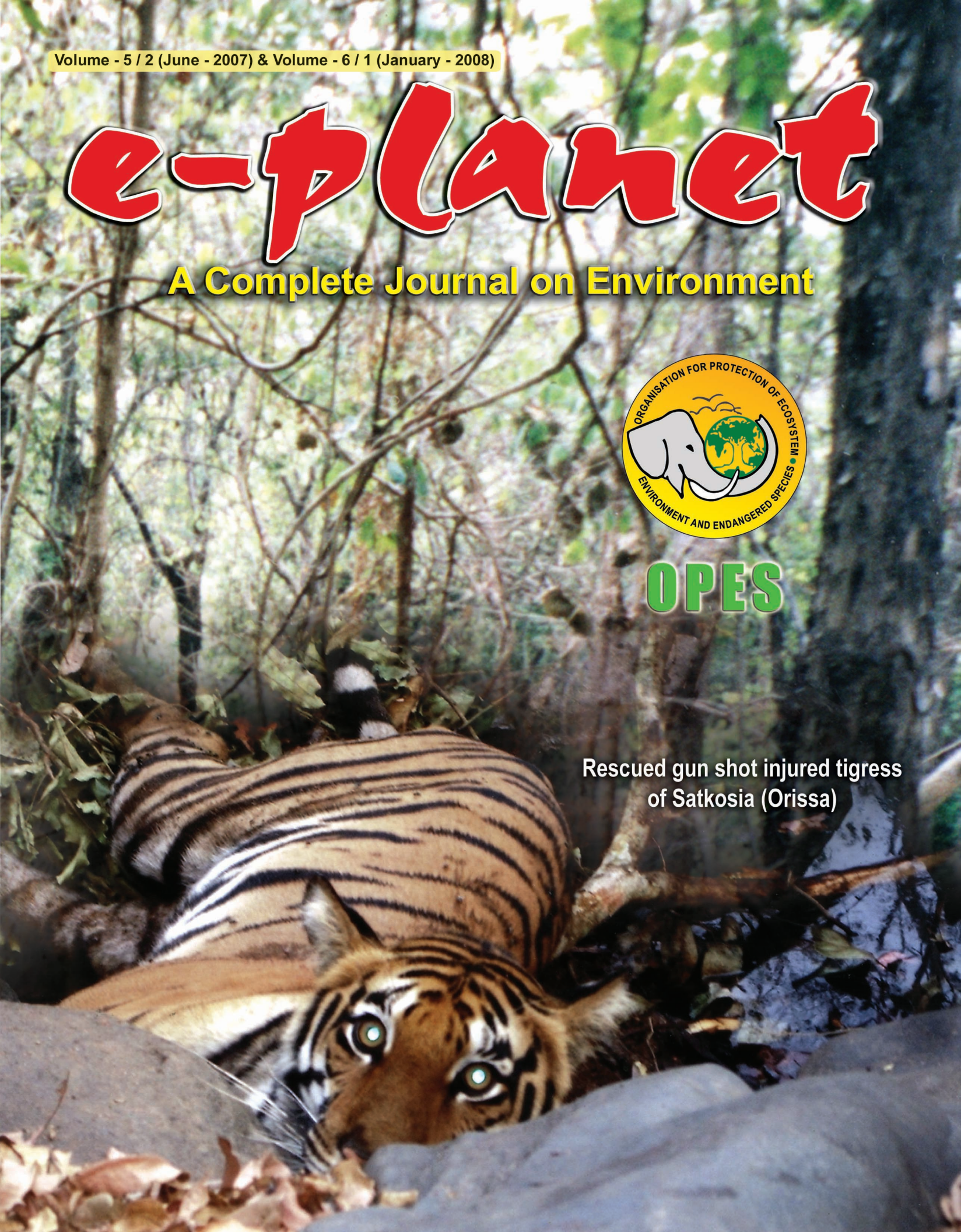

Rescued gun shot injured tigress of Satkosia (Orissa)

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Logo Description : It symbolizes an elephant within an ecological frame of peace and harmony moving towards prosperity and posterity.
Cover photo description : An injured wild tigress of Satkosia Gorge Sanctuary, Orissa sustaining multiple gun shot injuries fallen to a waterhole at Kankanajora nala of Asurakhola area of Purunakote Reserve Forest, Compartment No. 9 before successful rescue and rehabilitation to Nandankanan.

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EDITORIAL

e-planet has flourished into 6th year of its publication. It endeavours to bring greater environmental issues to the fore front for better debating and discussion. I think, it is the proper time to bring the hottest issue; '' the global warming'' in the ensuing issue of the journal. The indication of global warming can be taken up from numerous instances. Glaciers have started vanishing often converted into flood prone lakes and perennialice routes are diminishing due to melting. In our country even the ice lingam of Amarnath has completely melted this year. New Delhi's temperature has gone up beyond 40 degree Celsius. Climate change due to human activity has become un-imaginable inviting increased vulnerability to drought, flood, rising coast lines, infectious diseases, food shortages etc. In fact, ice plays a critical role in shaping our planet's environment. Ice in form of sea ice, glaciers, ice caps and snow reflects some of the sun's heat to cool the planet. Fast depletion of ice would mean substantial increase of temperature. Scientists predict that large iceberge of Antarctica would soon disappear exposing large number of aquatic animals to peril. Mainly increasing concentration of carbon di-oxide, methane, chloro-fluoro carbon and other radio-active gases affect the radiation balance at the earth's surface. One of the largest contributors to global warming is thermal power plants. Also there's this transport sector, industries, air traffic and human settlements that increase the generalized surface temperature of the earth.

Under this scenario, e-planet urges upon to take some of the smaller steps by the general mass to heal the already wounded world in their own ways. It is established that a train on an average creates barely one third, the CO_2 emissions of a plane. Hence, travel by flight needs to be minimised. For recycling of water one can harvest rain water locally with available technology. You can shut down computer when not in use, have drip irrigation for your garden, avoid more usage of shower during bath, unplug the charger after charging is finished , use solar heater, change the bulbs in your house to possible CFL (Compact Fluoroscent Lamps), use organic food, eco-paints, convert your vehicles to CNG, practise use of cycles more often, design your house with proper thermography technology etc.

In fact, Al Gore and his Oscar-winning movie, An '' Inconvinient Truth'' made a beginning by revealing the truth behind global warming. Then Stern Committee's warnings, the startling report of the United Nation's International Panel on Climate Change (I.P.C.C) have spread the message like never before. Then the terms like eco-crimes, carbon-neutral campaigns, carbon sink, carbon quotient, water woos have become the front line agenda of Government and private sectors. World Wide Fund for Nature (WWF) sent the message that by 2050, human being needs more earths than one to sustain its greed. Fact remains that United States is the worlds biggest producer of green house gas emissions but refused to ratify the Kyoto Protocol, China cries for growth but not green, enhancing educational standard has become Australia's prime agenda, United Kingdom more so strengthens its defence. Instead, countries should show interest and work together for a better Earth to live in. There should have been a global drive towards reversing global warming through a host of scientific, regulative and community based programmes. Developed and developing countries should go hand in hand.In fact, under a recent study it has been established that Indians are more concerned towards global warming and topping the list way ahead of counties like U.K. and Germany. Hence, e-planet visualize that India would come up as the leading country to find solutions to the global environmental crisis.

Editor-in-chief

(R. K. Samantaray)

CONTENTS

January 2008 *e-planet 5 (2) & 6 (1): 01-04*

OVERVIEW OF WIRELESS COMMUNICATION TECHNOLOGIES

S. Mittal[1] and C. Rama Krishna[2]

ABSTRACT

Wireless communications have become a way of life. It has penetrated into common man's life and hence to make best out of it, one should have knowledge about the existing and emerging technologies. This paper attempts to provide an overview of wireless communication technologies for high and low data rates, and for short and long-range transmissions.

Key word : PDA, modem, PCS, WANS, LANS, bluetooth

INTRODUCTION

Wireless communication means transmitting signals or messages over invisible radio waves instead of wires. Garage door openers and television/stereo remote controls were the first wireless devices to become a part of everyday life. Now the cordless keyboard, mouse, personal digital assistants (PDAs), and cellular phones have become common uses. Wireless technologies are used for things as simple as making a phone call or as complex as letting the sales force get information from an ERP application. Once reserved for only the most mission-critical and esoteric applications, wireless communication has entered the mainstream as vendors refine the throughput, stability, security and affordability of an ever-growing range of supported wireless applications. In the wireless world, your dear ones' whereabouts become totally transparent as you remain persistently connected with one another in time - even if some of them are flying cross-country. The ubiquity of wireless communication is confirmed. For any business, wireless technology means new ways to stay in touch with customers, suppliers and employees. The future of wireless lies in faster, more reliable methods of transferring data and, to a lesser extent, increased use of voice commands and audio improvements. Mobile just means portable. A laptop is a mobile device, as is a PDA or a cell phone. A desktop would be a mobile device if you had the inclination to carry it around with you. A wireless device has some sort of network connectivity. A cell phone is wireless, and a laptop or PDA would be wireless if they had a wireless modem.

WIRELESS TECHNOLOGY CATEGORIES

Wireless technologies can be divided into the following categories:

Fixed wireless

The operation of wireless devices or systems in fixed locations, such as homes and offices, come under this category. A typical example would be equipment connected to the internet via specialized modems.

Mobile wireless

The use of wireless devices or systems aboard motorized, moving vehicles can be called mobile wireless; examples include the automotive cell phone and personal communications services (PCS).

Portable wireless

This catagory covers the operation of autonomous, battery-powered wireless devices or systems outside the office, home or vehicle; examples include handheld cell phones and PCS units.

IR wireless

The use of devices that convey data via infrared radiation can be called infra red wireless. Examples are portable wireless devices that normally derive their power from batteries.

Wireless data is predominately transferred over two kinds of networks: wide area networks (WANs) and local area networks (LANs). These networks are similar to their wired counterparts, but they just use radio waves instead of copper or fiber. WANs can cover areas as large as several

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countries. BSNL, TATA Indicom, Airtel, Reliance are among the carriers that use wireless WANs. Wireless LANs (WLANs), already popular in airports, coffee shops and hotels, are often used to replace or enhance wired LANs. WLANs can cover 1.25 miles indoors and up to 4.35 miles outdoors in extreme cases, but work best in the 500-/ feet range. They may serve a smaller area than their WAN cousins, but LANs can transfer data much faster, with speeds of 54 Mbps now possible. Many companies are switching to WLANs for Voice over IP (VoIP) [2].

WANS

WANs have many acronyms, mainly because carriers use different standards. The first generation of wireless mobile communications was based on analog signaling. Analog systems, implemented in North America, were known as Analog Mobile Phone Systems (AMPS), while systems implemented in Europe and the rest of the world were typically identified as a variation of Total Access Communication Systems (TACS). Analog systems were primarily based on circuit-switched technology and designed for voice, not for data.

Today's wireless technology-cellular networks

Cellular communication system is shown in Figure -1. Cellular networks fall into two main camps: code division multiple access (CDMA) and global system for mobile communication (GSM). While GSM has become dominant in most parts of the world, CDMA has proven to be providing clearer voice quality with less background noise, fewer dropped calls, enhanced security, greater reliability and greater network capacity. The second generation (2G) wireless networks mentioned above are mostly based on circuit-switched technology. 2G wireless networks are digital and expand the range of applications to more advanced voice services, such as called line identification. 2G wireless technologies can handle some data capabilities such as fax and short message service (SMS) at the data rate of up to 9.6 kbps, but it is not suitable for web browsing and multimedia applications.

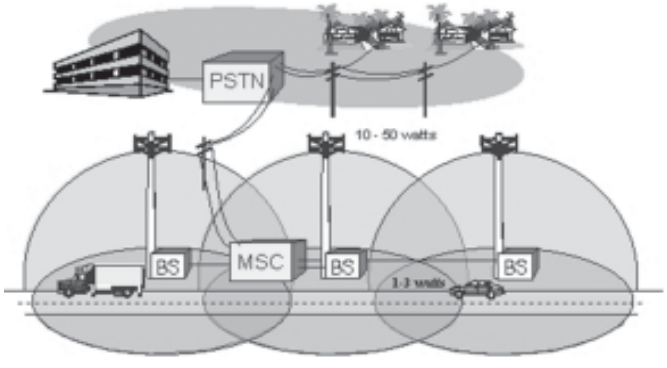

Fig.1 : A cellular communication system

Tomorrow's wireless technology-second generation (2G+) wireless networks

GSM, PDC and other TDMA-based mobile system providers and carriers have developed 2G+ technology that is packet-based and increases the data communication speeds to as high as 384kbps. These 2G+ systems are based on the following technologies: high speed circuit-switched data (HSCSD), general packet radio service (GPRS) and enhanced data rates for global evolution (EDGE) technologies. HSCSD is one step towards 3G wideband mobile data networks. This circuit-switched technology improves the data rates up to 57.6 kbps by introducing 14.4 kbps data coding and by aggregating 4 radio channels timeslots of 14.4 kbps. GPRS is an intermediate step that is designed to allow the GSM world to implement a full range of internet services without waiting for the deployment of full-scale 3G wireless systems. GPRS technology is packet-based and designed to work in parallel with the 2G GSM, PDC and TDMA systems that are used for voice communications. EDGE technology is a standard that has been specified to enhance the throughput per timeslot for both HSCSD and GPRS. The enhancement of HSCSD is called ECSD, whereas the enhancement of GPRS is called EGPRS.

Third generation (3G) wireless networks

3G wireless technologies represent the convergence of various 2G wireless telecommunication systems into a single global system that includes both terrestrial and satellite components. One of the most important aspects of 3G wireless technologies is its ability to unify existing cellular standards, such as CDMA, GSM, and TDMA under one umbrella. The following three air interface modes accomplish this result: wideband CDMA (WCDMA), CDMA 2000 and the universal wireless communication (UWC-136) interfaces. WCDMA is compatible with the current 2G GSM networks prevalent in Europe and parts of Asia. W-CDMA will require bandwidth between 5 MHz and 10 MHz, making it a suitable platform for higher capacity applications. It can be overlaid onto existing GSM, TDMA (IS-36) and IS-95 networks. The second radio interface is CDMA 2000 that is backward compatible with the second-generation wireless technologies. CDMA IS-95 standard is predominantly used in US. The third radio interface, universal wireless communications - UWC-136, also called IS-136HS, was proposed by the TIA and designed to comply with ANSI-136, the North American TDMA standard. 3G wireless

networks consist of a radio access network (RAN) and a core network.

Data only connections

Following three new technologies provide data-only connections: There are (i) Flash orthogonal frequency division multiplexing (OFDM), (ii) The Institute of Electrical and Electronics Engineers' (IEEE) 802.16 (popularly known as WiMax), (iii) Universal mobile telecommunications system's telecommunications display device (UMTS-TDD)

WIRELESS LANS

A wireless LAN (WLAN) is a local area network (LAN) without wires. WLANs have been in use for more than a decade, but are just beginning to gain momentum because of falling costs and improved standards. WLANs transfer data through the air using radio frequencies instead of cables. They can reach a radius of 500 feet indoors and 1000 feet outdoors, but antennas, transmitters and other access devices can be used to widen the coverage area. WLANs require a access point (AP) that plugs all the wireless devices into the wired network. In the following sections we describe the most popularly used WLANs based on IEEE 802.11:

802.11b

This protocol, which uses the 2.4 GHz spectrum, dominated the market first, earning it the nickname Wi-Fi. It's a busy spectrum, full of baby monitors, cordless phones and microwave ovens. More the traffic the greater is the chance for interference and drops in speed. An 802.11b user can get connection rates of up to 11 Mbps from up to three different information sources at a time - for maximum throughput availability of 33 Mbps before interference becomes a problem.

802.11a

A competing wireless LAN standard that operates in the 5 GHz spectrum allows speeds of up to 54 Mbps from up to eight different access points at a time, giving it a greater range and maximum speeds up to 13 times faster 802.11b. The primary reason for one to choose 802.11a one is the need for high bandwidth, for example; for transmitting voice or video over your network. IEEE 802.11a equipment is not good for portability.

802.11g

This is the next generation of 802.11b, promising the price and range of 802.11b (it operates on the same 2.4 GHz spectrum) with the speed of 802.11a. It is compatible with existing 802.11b infrastructure.

OTHER WIRELESS STANDARDS

Various other wireless standards also exist that can be compared according to the data rates they support. Figure - 2 enumerates few more contemporary technologies e.g., Local multipoint distribution service (LMDS) that is used to send data over 3-16km. ZigBee and Bluetooth are the standards defined for short range communications.

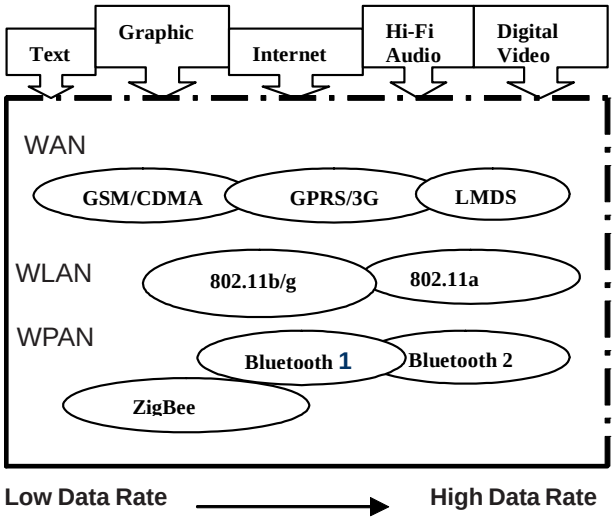

Fig. 2 : Various wireless standards

Figure - 3 shows an example of a wireless personal area network (WPAN). In this, the personal digital assistant (PDA) device is synchronizing (deleting, changing, and adding) addresses with a laptop computer. The laptop computer is also connected to the internet through a bluetooth enabled access node. A mobile phone is also synchronizing its phone book listing with the laptop

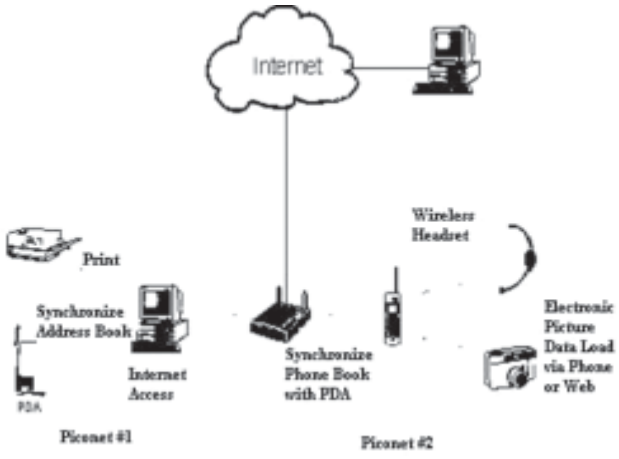

Fig. 3 : Example of a WPAN

computer. However, because it is out of direct range of communicating with the laptop, it communicates through the access node. The mobile phone is also communicating with a wireless headset.

BENEFITS, LIMITATIONS AND SOME CHALLENGES

In the following sections, we explain the benefits and limitations of wireless communication technologies. We also list out some of challenges that need to be addressed to make wireless communication technologies a success.

Benefits

Wireless communication technologies dramatically improve the convenience, reliability and timeliness of communication by allowing people to:

- Remain persistently connected with others regardless of anyone's location and without being plugged into anything
- Saves time and money by saving seconds off of regular tasks such as locating people, scanning items and receiving mission-critical alerts
- Conduct daily chores effortlessly via a conveniently pocket-sized PDA
- Reap the benefits of a rapid pace of innovation in a fast-growing market full of vendors scrambling to make people's lives easier.

Limitations

When it comes to WANs, bandwidth is still limited. The size of the device that's accessing the information is also still an issue. Even the most recent phones and PDAs have small screens often only a couple of inches in diameter and it is hard to read large documents on them. Many applications need to be reconfigured if they are going to be used through wireless connections. Most client/server applications rely on a persistent connection, which is not the case with wireless. Transactional systems require safeguards for dropped wireless connections. Remedies for all of these shortcomings cost money. Security is one of the biggest barriers to any kind of wireless initiative-whether it's implementing a WLAN in a remote office or rolling out wireless handheld with application capabilities such as e-mail or CRM data.

Some Challenges

- So many choices-the options are many; the differences can be confusing.
- Wireless throughput is generally limited compared to the wired alternatives.
- Uncertainty as to which technologies will remain viable for a long-term. Each camp (CDMA and GSM) has several iteractions of high-speed wireless service, with carriers choosing different versions and implementing them at different times. The situation prevents customers from counting on universal access to a given service
- Security is still an issue in a wireless environment
- Dropped connections reflect the inherent limitations of wireless signals easily obstructed by physical barriers such as tunnels, mountains and buildings as well as radio noise and the absence of cellular towers in a given region
- Small screens in PDAs and other wireless devices limit how much a user can view at once
- Short battery lifespan mean that users must be conscientious about charging their batteries

Another major implication of wireless communications that is being raised, following the enormous increase in the use of wireless mobile telephony throughout the world is about mobile phone radiation and health concerns. The World Health Organzation (WHO) has concluded that serious health effects (e.g. cancer) are very unlikely to be caused by cellular phones or their base stations (BS). However, some national radiation protection authorities(NRPA) recommend people to minimize radiation. Recommendations are:

- Use hands-free to decrease the radiation to the head.
- Keep the mobile phone away from the body
- Do not make a call within a car without an external antenna

CONCLUSION

The benefits of wireless communications are self-evident. As free human beings, we don't like being tied to wires. This has led to a large number of wireless service providers. This is a win-win situation for the public, state government, and for wireless providers. The health risks involved are under close scrutiny and companies are trying to nullify them so as to tap and enjoy the real advantages of going wireless.

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DEMONSTRATION ON COMPOSITE FISH CULTURE

B. R. Samantaray[1] and C. P. Khuntia[2]

ABSTRACT

Sonepur is situated between 20^0 30' and 21^0 11' North latitude and 83^0 27' and 84^0 16' East longitude, and on the confluence of river the Mahanadi and the Tel. Geographically it is located on the western part of Orissa and has rich fishery resources. Demonstration was extended on composite fish culture by Krishi Vigyan Kendra (O.U.A.T), Sonepur in adopted village ponds (each of 0.4 ha) based on the suitability and interest of the farmers. Highest percentage of survivality (82.82 %) and maximum weight gain of catla fish (754gm) and minimum weight gain of Rohu fish (212g) was achieved. The average production was found to be 2.77tonne/ ha within ten months of culture period in the demonstrated ponds.

Keywords : Composite fish culture, KVK, compatible fish species, polyculture, prestocking operations, fingerlings.

INTRODUCTION

The importance of fish farming has been realized recently in the face of mounting pressure on land resources and scarcity of animal protein for the ever increasing human population. Out of the total animal protein supply in the Asian region, 31% is in the form of fish protein. In order to reach the protein demand and maximize yield, the composite fish culture is the best suitable pisciculture method. Fresh water aquaculture has been identified as the key area for meeting the growing demand for fish in the country. Carp culture is the principal component of this sector and has tremendous potential for growth in near future. Higher production from this sector can be realized by bringing more area under culture not only to increase the production per unit area but also utilize the available resources keeping the carrying capacity of the pond in mind. The main principle behind composite fish culture is the polyculture of fast growing compatible fish species with complementary feeding habits occupying different ecological niches in the pond (Rabanal, 1968). The technology makes use of three Indian major carps *viz*: catla (*Catla catla*), rohu (*Labeo rohita*) and mrigal (*Cirrhinus mrigala)* along with three other exotic carps *viz:* silver carp (*Hypophthalmichthys molitrix*), grass carp (*Ctenopharyngodop idella)* and common carp *(Cyprinus carpio)* based on their feeding habits **(**Alikunhi, 1971).

MATERIALS AND METHOD

Selection of ponds

For demonstration of composite fish culture, 5 village ponds, each extending over an area of 0.4 ha were selected (4 ponds from, Panisiali and other one from the nearby village Lakarma) based on the suitability and interest of the farmers (Sinha,1990). Before selection of ponds, proper field survey and collection of information regarding the previous year's yield and method of farming were done.

Prestocking operations

In prestocking operations preparation of the pond embankments, removal of aquatic weeds, predatory fishes and correction of physicochemical properties of soil and water were being done (Jhingran, 1975). Aquatic weeds were removed manually, where as removal of predatory fish was done by complete dewatering of the pond followed by application of lime, mahua oil cake, complete ploughing and leveling of the pond. The pond was refilled and manured with raw cow dung @3-4 tonnes/ha 15 days prior to stocking.

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Selection of species for stocking

Based on the suitability and local availability, six species of carps *viz*: catla, rohu, mrigal, silver carp, grass carp and common carp were considered as ideal combination for the culture practices and distributed accordingly (Fig.1).

Fig.1: Distribution of fish fingerlings among villagers

The fingerlings (40-61mm) were stocked @ 9100 nos/ ha. The fishes were stocked in the stocking pond very well with proper supervision for better acclimatization of the fingerlings to the pond environment in order to avoid any post stocking mortality. The total number of fishes to be stocked was calculated by the following method (Chakrabarty *et al*, 1979 b)

$$\text{Number of fishes per unit area} = \frac{\text{Total expected increase in weight}}{\text{Expected increase of wt. of individuals fish}} + \text{mortality (not more than 10\%)}$$

The different species combination and their stocking ratio in the demonstrated pond are mentioned in the Table-1

Post stocking operations

Pond fertilization was done with both organic (cowdung @ 0.5 tonne/ha) and inorganic (urea @10kg/ha and single super phosphate @ 15 kg/ha) fertilizers at fortnightly interval. Mixture of ground nut oil cake and rice bran at 1:1 by weight was used as supplementary feeding (Sinha, 1979). The feed was given twice daily (morning and evening) in the feeding trey in form of small balls. Checking of feed utilization was done through proper supervision and regular checking of the feeding trey. During the first month of culture feeding was done at 5% of the stocked biomass followed by sliding rate of 2-3% of the estimated biomass in subsequent months.

Fig. 2: Fish sampling made with proper supervision

The biomass of the fish was estimated through monthly sampling with the formula: Biomass = Average weight of fish x total number of fish stocked x % of survival (Fig.2).The total amount food to be provided was calculated by the following formula (Huet, 1975).

Table -1: Species Combination and Stocking ratio of fish fingerlings

Species combination	**Catla** 20-30%	**Silver carp** 10–15%	**Rohu** 15–30%*	**Mrigal** 15–20%	**Common carp** 20–25%	**Grass carp** 5–15%	**Depth of water (m)**	**Name of the demonstrated village**
6 species culture	**Surface feeder**		**Column feeder**	**Bottom feeder**		**Macrophyte feeder**	**2-2.5**	**-**
POND-1 (0.4 ha)	910	364	546	728	728	364	3640	Panisiali (Adopted village)
POND-2 (0.4 ha)	910	364	546	728	728	364	3640	Panisiali (Adopted village)
POND-3 (0.4 ha)	910	364	546	728	728	364	3640	Lakarma
POND-4 (0.4 ha)	910	364	546	728	728	364	3640	Panisiali (Adopted village)
POND-5 (0.4 ha)	910	364	546	728	728	364	3640	Panisiali (Adopted village)
Total =2ha	**4550**	**1820**	**2730**	**3640**	**3640**	**1820**	**18200**	5 numbers of demonstration

Table - 2 : Percentage of survival of fish fingerlings in the demonstrated pond

Species stocked	Fish fingerlings														
	Pond1			Pond2			Pond3			Pond4			Pond5		
	Initial nos	Final nos	% of Survival	Initial nos	Final nos	% of Survival	Initial nos	Final nos	% of Survival	Initial nos	Final nos	% of Survival	Initial nos	Final nos	% of Survival
Catla	910	682	74.94	910	652	71.64	910	715	78.57	910	692	76.04	910	732	80.43
Silver carp	364	273	75.0	364	242	66.48	364	251	68.95	364	259	71.15	364	265	72.82
Rohu	546	412	75.45	546	382	69.96	546	355	65.01	546	423	77.47	546	392	71.79
Mrigal	728	510	70.05	728	603	82.82	728	573	78.70	728	567	77.88	728	532	73.07
Common carp	728	546	75.0	728	505	71.63	728	600	82.41	728	534	73.35	728	565	77.60
Grass carp	364	279	76.64	364	264	72.52	364	259	71.15	364	267	73.35	364	232	63.73
TOTAL	**3640**	**2702**		**3640**	**2648**		**3640**	**2753**		**3640**	**2742**		**3640**	**2718**	

Amount of food per hectare = Growth per hectare due to artificial feeding x FCR. Regular health monitoring was assessed during monthly sampling. Harvesting was done after successful culture of ten months.

RESULTS AND DISCUSSION

Out of the total number of fingerlings stocked (18,200 nos) in the demonstrated ponds, in pond (1-5) the percentage of survival on an average 74.52 % (13,563 nos) was achieved. The maximum percentage of fingerling survivality found in pond 3 (75.63 %) and minimum in pond 2 (72.74%). The maximum percentage of survivality of catla, silver carp, rohu, mrigal, common carp and grass carp found in pond 5, pond 1, pond 4, pond 2, pond 3,pond 1 and the lowest percentage of survivality found in pond 2, pond 2, pond 3, pond 1, pond 2 and pond 5 respectively.

After harvesting maximum weights of sampled fish of catla, silver carp, rohu, mrigal, common carp and grass carp were found in pond 3, pond 1, pond 5, pond 1, pond 2, and pond 1 and the lowest weights were found in pond 1, pond 5, pond 1, pond 3, pond 1, pond 5 respectively (Table - 2). Similarly maximum yield was obtained from pond 3 and the minimum yield was from pond 1 (Table-3). It is easily marked that there is very poor growth of rohu in all the demonstrated ponds and also the percentage of survivality varied a great in both pond 2 and pond 3. Similarly the production from pond 1 and from pond 2 are lower than the average production. So if the farmers adopt the technology there is no doubt of increasing the production than before (Chaudhuri *et al,* 1974).Due to periodic sampling there is increase in production (Chakrabarty *et al*, 1974). During harvesting by netting the species count was also carried out (Chakrabarty,1975 a). Evaluation of the harvesting was done as per Jena *et al* (2002) and compared with the results of Chaudhuri *et al* (1978). It was found that with the implementation of composite fish culture method, the production enhanced from the traditional to a extent of 2.77 tonne/ha of fish fingerlings with the period of ten months with the proper utilization of the available resources.

Table- 3 Average weight and total yield species wise and pond wise

Species stocked	Av. wt. of 10 nos of fish sample from each pond (gm)					Total wt. of sample during harvesting (gm)	Av. wt. of sample during harvesting (gm)	
	Pond1	Pond2	Pond3	Pond4	Pond5			
Catla	658	700	754	685	732	3529	705.8	4
Silver carp	315	308	290	312	305	1530	306	8
Rohu	201	245	265	218	260	1160	232	8
Mrigal	345	320	314	339	318	1636	327.2	1
Common carp	324	380	369	350	330	1753	350.6	1
Grass carp	361	342	329	353	313	1698	339.6	1
TOTAL	**2215**	**2295**	**2291**	**2257**	**2248**			**1**

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TRENDS IN COLLABORATION : ECONOMIC RATIONALE IN JOINT FOREST MANAGEMENT

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ABSTRACT

The article considers the theories of collective action as it relates to participatory management of forest areas under Joint Forest Management(JFM) in Madhya Pradesh, India. Article reinforces the notion of the pre-dominance of economic motivations in collective action for acquiring the desired level of participation in Joint Forest Management. Financial benefit to community, plays a major role in their commitment to forest protection and conservation, which influences the participation. Communities have to invest in forest protection before the benefits from timber and other products materialize.Attempts should be made to make the forest areas economically viable which will motivate the communities for forest conservation and management.

Key word : Common property resource, stake-holders, CFM, JFM, selfhelp group, social fencing

INTRODUCTION

There is much interest in the development theories and policies at community level institutions for the management of natural resources. This is clearly articulated in the field of collective action and common property resource management (CPRM), where a focus on getting the institutions' right requires the establishment of organizational structures in form of user groups, associations and committees. Such organizations require both drawing on and creating social capital in pursuance of optimal resource management. There is an emerging critique of such approaches, both from the theoretical and policy view point which considers the historic and political nature of such conceptions of community management (Mosse, 1997), often static and simplified concept of social relations and traditions (Adams *etal* 1997). As it is often argued that institutional functioning relates to user's motivation for compliance and defection and the role of the external environment. Thus attention should be given to processes as well as conditions. Consider the case of management of state forests, by local stakeholders, most of which have been provided for domestic use. Much theory about collective management of forests concentrates on productive aspects, thereby reinforcing notions of the pre-dominance of economic motivations in collective action. Concentrating on domestic needs necessitates a clearer consideration of gendered interests and actions, and the placing of resource management in the context of complex livelihood concerns and priorities. We reject the notions that public actions and interests can be separated from the private formal manifestations of management from informal.This article shows the embeddedness of institutions in social relations, drawing on ideas of the interaction of agent and structure (Giddens, 1984, 1989; Long, 1992), of the embeddedness of economic transactions in social life (Granovetter, 1992). Incentives to co-operate are based on exigencies of daily life. Due to structural constraints, individuals adopt varying strategies in relation to resource management and reciprocity, gender, age, kinship relations and wealth are key factors.

INSTITUTIONS OF RESOURCE MANAGEMENT

As stated by Nelson and Ostrom (1990,1995) the predominant model of institutions in common property resource management literature is essentially bureaucratic; ascribing value to formal manifestations of association and to unilineal progressions from weak to robust forms.(Nelson, 1995; Ostrom, 1990). A functionalist and normative approach to institutional development is implied in the literature, which emphasizes design principles (Bromley and Cernea, 1989; Ostrom, 1990; Wade 1988). Principles include desirability of clarity in boundaries of the resource-using group and of authority structure, the importance of a rigorous applications of graduated sanctions against free riders and transparent decision making codified in written records. And underlying all such models is the privacy of productive and economic benefits in determining the incentives to co-operate with institutional arrangements.

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INSTITUTIONALIZED FOREST MANAGEMENT IN INDIA

In ancient period, most parts of India were covered with some kind of vegetation. The advent of civilization and sedentary agriculture marked the beginning of deforestation in India. With a view to prevent large scale deforestation and to conserve the forest resources for meeting the state's requirement, the British government introduced Scientific Forest Management(SFM) in India. The introduction of Scientific Forest Management in India has consisted of imposing a uniform, centralized and bureaucratic management system upon a wide diversity of local situations. This has included a diversity not only in vegetation and ecology, but also in types and levels of economic dependence of local peoples on forest resources, and their autonomously devised local resource management systems.Traditional communal resource management institutions in India have included the kans in Uttara Kannada, the sacred groves in the Himalayas, the orans in Rajasthan, the shamilat forests in the Punjab, the supply and safety forests in Mizoram and the cumindade lands in Goa (Chakravarty- Kaul, 1992; Gadgil, 1989). There is a wealth of evidence that, traditional self -initiated Community Forest Management (CFM) systems that existed during the pre-colonial and colonial periods in the past have largeley disappeared. These systems of community-based forest management become heavily (although not entirely) eroded as communal resources were steadily appropriated by the colonial state. Anderson (1995) suggested that the area appropriated by the colonial state increased from 14,000 sq. miles in 1878 to 81,400 sq. miles of Reserved Forest and 8300 sq. miles of Protected Forest (PF) by 1900. A dramatic increase in state revenue ensued. It was accompanied by a significant loss of entitlements to natural resources among dependent communities, except in areas such as Himachal Pradesh and the Shivalik hills, where users retained their rights (Anderson, 1995) and van panchayats of Uttar Pradesh. But over the last two decades, a large number of diverse, self-initiated CFM systems have been re-emerging in many locations in India in response to severe degradation of forests and grazing land, and bio-mass shortages. Communal grazing and forest resources were and still of great importance to the livelihoods of especially the poorer sectors of society, particularly those with little access to productive assets such as landless families.The nationalization of forests in the post independence era and the forest policy of 1952 continued the process of expanding state control over forest areas. Another institutional upheaval was formation of gram panchayats, which grouped several villages for administrative convenience, on existing communities as the new structure of local governance. These interventions rather weakened local institutions and their authority by redefining the community itself. Panchayat representatives by the bureaucracy and hence traditional community control was replaced by state regulated ' representative democracy at village level (Sarin, 1993). Immediate consequence of this was progressive alienation of local villages from the forests, weakening and near destruction of traditional community resource management systems, and vast degradation of country's forests. Even though still conflict continues to characterize the forest department community relationship, consensus is beginning to emerge in favor of collaborative forest management between forest departments and groups of local villages. Joint Forest Management (JFM) develops a participatory approach between local institutions and forest departments for sustainable management of forests areas on the basis of mutually defined rights. During the last few decades, three broad types of local institutions involved in forest conservation and management have developed in various states. The first type has developed as a result of local initiative (self-initiated community institutions with minimal or no role of forest department), emerged primarily due to response to severe degradation of forests and associated hardships of scarcity faced by local villagers. The local villagers continue to have strong economical dependence on forest produce and where a tradition of community resource management still survives. The second type of community organization engaged in forest management is state promoted community organizations in which forest department do play role in formation and functioning of the institutions. Versions of this are forest co-operative societies in Kangra district of Himachal pradesh [HP] and the van panchayats in the hills of Uttaranchal former Uttar Pradesh. Third type of local institution are Non Governmental Organisations or NGO sponsored institutions for performing more general development tasks to whom the responsibility for forest protection and/or management has also been assigned.

BACKGROUND TO RESEARCH AREA

Primary data collection for the study took place in two districts Jabalpur and Hoshangabad located in Madhya Pradesh, a province in central part of India. This geographical region is characterized by 100 cm to 150 cm of rainfall with a mean maximum temperature of 43º C and minimum temperature of 13ºC and average humidity is 60% to 65%. The soil composition is black clay and sand (40:60). The forest in the area can be distinguished in two categories. In the Northern part of the territory mostly mixed forest is found belonging to the 'Champion and Seth'i.e Type 5A/C-3. The rest of the area is occupied by teak forests. Teak forms 20% to 30% of over wood in the teak area. The average stock density of forest area is 0.5 to 0.6. Data collection of the study took place in five village level institutions viz village forest committee at Roriya and at Jaipuri in Jabalpur circle and forest protection committee at Jolleykheda, Jamaikalan and village forest committee at Hiranchapra in Hoshangabad circle. In all the selected villages, about 97% of the population is of tribal peoples primarily of gond tribes. There exists a social homogeneity in that sense. Occupation is basically agriculture; however, few households hold subsidiary occupations like vegetable farming, fishing and off time labour. Major non-timber forest products collected from the forests which are mainly utilized for domestic purposes are Mahua (*Madhuca jongifolia),* Char (*Buchananja lanzan),* and Tendu, a nationalized NTFP (*Diospyros melanoxylon).* In addition to this dependency on the forests there is also for fuelwood, fodder, bamboo and timber.

METHODOLOGY AND MODES ANALYSIS

Two districts were chosen in close proximity to one another i.e. Jabalpur and Hoshangabad comprising of five village level institutions i.e F.P.C. Hiranchapra. Criteria for the selection of the institutions were: (i) At least four years of registration of the committee, (ii) Involvement of donor agency i.e under the world bank funded M.P. forestry project, (iii) Involvement of women self help group [WSHG], (iv) Involvement of NGO with the village level committees, (v) On the basis of afore-mentioned criteria, the institutions were selected on the basis of stratified random sampling, informal conversations with the forest department officials and other practical issues. Data was collected using combination of methods. Three types of tools were used for collecting information on the functioning of the committees, the context of their operation and the village conditions respectively. In order to obtain information on the committees, intensive semistructured interviews were conducted with focused group of specific members of the committee. In addition, the group meetings were attended for verifying the information obtained. In addition, several types of background information on the context of operation of the committee and forest quality was collected using various documents such as : (i) Forest department records. (ii) Microplan documents (iii) Census abstracts. An average of 17 to 25 interviews were conducted for each committee. For that purpose the committee was sub-divided into various strata like general and executive body and male and female members. Separate interviews were conducted to solicit the point of view of each category. The interviews conducted were focused towards ascertaining the institutional maturity and issues such as representation and formation as well as users' motivation in participation. As it is argued that a pre-requisite for effective forest management is that there should be an well organized local organization. Ostrom's design principles illustrated by long-enduring institutions are commonly used to assess the robustness of such local forest management organizations. Ostrom's Design Principles illustrated by long-enduring CPR institutions

Clearly defined boundaries

- Individuals or households who have rights to withdraw resource units from the CPR must be clearly defined, as must the boundaries of the CPR itself
- Congruence between appropriation and provision rules and local conditions.
- Appropriation rules restricting time, place, technology, and /or quantity of resource units are related to local conditions and to provision rules requiring labour material and /or money

Collective-choice arrangements

Most individuals affected by the operational rules can participate in modifying the operational rules

Monitoring

Monitors, who actively audit CPR conditions and appropriator behaviour, are accountable to the appropriators or are the appropriators

Graduated sanctions

Appropriators who violate operational rules are likely to be assessed by graduated sanctions (depending on the seriousness or context of the offence) by other appropriators, by officials accountable to these appropriators or by both

Conflict resolution mechanisms

Appropriators and their officials have rapid access to low cost arenas to resolve conflicts among appropriators and officials

Minimal recognition of rights to organise

The rights of appropriators to devise their own institutions are not challenged by external governmental authorities

For CPRs that are part of larger systems nested enterprises

Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises.On the basis of above theoretical considerations the following criteria of institutional maturity designed by ODA & KOSEVEG (1994) were used for assessing the institutional functioning. The criteria are based entirely on the considerations of design principles of Ostrom.These are (i) No. of groups formed, (ii) No. of members and drop out rates,(iii) Community agreements on memberships, (iv) Frequency of and attendance at meetings, (v) Attendance of women at meetings, (vi) Percentage of women on committees and other decision making bodies, (vii) No. of groups forming cluster links with others,(viii) Attendance of group members at leadership and skill training workshops, (ix)Clarity in, and understanding of roles, responsibilities and relationships, (x) Members labour and material contribution to group activities,(xi) Users take responsibility for forest protection without externally funded forest watchers,(xii) Democratic changes in leadership,(xiii) Consensual production of microplans and implementation of workplans, (xiv) Negotiated access to other forest areas for products not supplied in own forest,(xv) Evidence that workplans have been adhered to and specific outputs achieved, (xvi) Consensual revision of microplans, (xvii) Evidence of conflict resolution without recourse to external arbitration,(xviii) Effective application of skills to maintain group assets (pruning, singling, planting, weeding etc.), (xix) Mutual support between group members for other non project activities, (xx) Collective bargaining with local elite's, (xxi)Ability to access external agencies for support and services as required.The above criterias were used as analytical framework for our study.

DIVERSITY TRENDS IN MANAGEMENT SYSTEMS

India is experimenting with diverse management systems to produce bio-mass, and protect and regenerate its forests. Village commons and degraded lands, some of the approaches employed are; Forest department managed systems, Joint forest management, industry promoted forestry, community forestry and farm forestry.Traditional self-initiated community forestry management systems that existed in past have largely disappeared, but due to severe degradation of forests, grazing lands and bio-mass shortages self-initiated CFM systems are re-emerging in many locations in India. At the national level a conservative estimate shows that over 13,833 CFM's are present, with Orissa and Uttar Pradesh having 5622 and 4058 CFM systems respectively (according to study conducted by EERN, 2000). Major difference between the JFM and CFM systems lies in structure and functions of organization and management committee, modes of selection of management committee members and function of the general body. In JFM, the government order dictates the structure and functions of the FPC, the mode of selection of its executive committee members and the term of membership. Under the JFM system, the rules, regulations and the term of membership. Under the JFM system, the rules, regulations and practices are all defined in the order, However in self-initiated CFM systems, local communities design specific regulations and the system evolves as a result of local socioeconomic situation and traditions.In our study it was found that self initiated committees are gradually becoming incorporated in the official JFM program. The traditional CFM institutions are gradually changing by incorporation of specific features of JFM. This concerns notably a better arrangements for control and provisions for equitable involvement of all stakeholders.

WOMEN'S PARTICIPATION IN JFM

The role of women as collectors, processors and gatherers of NTFP's make their participation in JFM crucial and thus requires an optimum representation of women in such committees. The prescribed percentage of women members in the committee is 50 according to JFM resolution, however their representation in the studied areas varied from 34 to 48% In majority of the cases the participation of women was found to be marginal or absent in regular committee activities. They hardly play and role in decision making processes, however women being he dominant firewood and NTFP gatherers, Their participation in the decision making process will reduce conflicts and promote sustainability of the institutions, Recent

guidelines issued in Feb'2000 recommends 33% of women representation thus encouraging women participation. Limited involvement of women reflects the underlying causes deep rooted in the social and cultural factors of the rural society, the characteristic double work burden [Boserup, 1970] as most tribal women carry household chores in addition to agricultural activities. In financially poorer families the females have an additional burden as they work as laborers and contribute to family's net income. These factors limits their participation in other community activities.

GRADUATED SANCTIONS

Success of community organizations lies in enforcing regulations. Our study revealed that regulations on extraction of forest produce and grazing activities have been successfully enforced in most of the locations, although they differ slightly in being location specific. The forest department is not involved in day to day guarding and patrolling activities. The offenders are punished and in case of serious offences fined by the forest department, however as stated earlier, the final authority in all the cases is C.F (Conservator of Forests). Firewood is the most common product extracted, its unregulated extraction is likely to damage the growing stock as well as regeneration to certain extent, village communities seem to attach ample importance to firewood as compared to other forest products. In all the locations communities sem to have no restriction on collecting fallen dry twigs and dry leaves, head load of wood is permissible to every member. Access to green wood extraction for firewood of poles is not allowed in any location.

Forest protection practices

The protection of forests to be practised are (i) Protection of forests by group of members guarding the forest twice a week, (ii) On a rotation basis as in Jamaikalan, Jolleykheda and Jaitpuri villages, (iii) On a voluntary basis, (iv) Paid guard either in cash or kind at Roriya village forest committee, (v) Social Fencing the entire community shoulders the responsibility to protect the forest, in general applied to all the cases, (vi) Physical barriers such as cattle proof trenches in Jamaikalan.

INCENTIVES FOR PROTECTION

A deciding factor which definitely affects the people's participaiton is regarding the incentives and benefits provided to them in lieu of forest protection and management.

Main factors stimulating motivation to participate in JFM were found to be, (i) Forest degradation, (ii) Employment opportunities in form of paid labor, (iii) Income generating projects of NGO's,(iv) Fuelwood, fodder, small timber and MFP's, (v) Entitlement to share in the Final harvest, (vi) Promotion by forest department.

While forest degradation and biomass shortages (Firewood, leaf manure, fodder and MFPs) seem to be the dominant motivating factors for the protection and management of the forest in all the studied locations even though the direct financial benefits to the households must become more, if the community is to feel motivated, and have a sustained commitment to forest protection which in turn effects the participaiton in institutional functioning and the program.In our study it was observed that in general attendance at the community meetings is low, women participaiton is negligible, the reasons could be attributed to lack of enthusiasm among the members as many of their demands have not been met. Communities face a considerable degree of uncertainty and vulnerability under current JFM arrangements. The Forest Department (FD) in most states, for example, have refrained from conceding legal status to FPCs (Pattnaik and Dutta, 1997), Gujarat and Haryana being refuse to recognize the legitimacy of their rules (Pattnaik and Dutta, 1997). Another important factor is incentive related factor that is the level of benefits communities derive from the forest prior to JFM. At the places where this is low, the villagers have little interest in participation in protecting the forest (Agrawal, 1996). The problem is exacerbated by the fact that JFM is an option for managing the 'degraded forest areas'.

CONCLUSION

Institutional functioning of the forest management institutions and participation of local people depends entirely on the stake and interests of the people in forest management. It has been stated that forest areas chosen for JFM are the degraded or lowest value forest areas (Poffenberger, 1996), which do not contribute much towards the livelihood. Extent of dependence of rural and indigenous communities on forest; percentage of households extracting forest products and quantity extracted is an important issue to be addressed. Agriculture and labour are the main occupations of the villagers in the study areas. All socio-economic groups, including large and small farmers and the landless depend on the forests for firewood, that too in varying degrees. Wooden poles are required for house construction or repair. Also flowers, fruits and seeds are required for many other purposes. Minor forest products especially mahua *(Madhuca longifolia)* and tendu (*Diospyros melanoxylon*) leaves are much in demand. Financial value realized from NTFP is low, marketing arrangements for NTFPs are poorly developed (except for nationalized NTFPs such as Tendu). The low financial value

of NTFPs collected is a reflection of either, (i) The low levels of availability of NTFPs or (ii) The lower rates of extraction or (iii) Lower market value.

However, income could be higher if the processed products are marketed instead of raw materials and suitable marketing facilities are available. The financial output and benefits to the household relates to their commitment to forest protection and management and thus relates to degree of participation. Attempts should be made to make the forest economically viable; employment and income generation from protected forest areas could be increased so as to motivate the peoples for forest protection and management.

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ARTIFICIAL HATCHING OF COMMON COBRA EGGS AND ITS RELEASE TO NATURE : A CASE STUDY AT BHUBANESWAR SUBURB IN ORISSA.

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ABSTRACT

This paper reflects a case study of Bhubaneswar that resulted in natural breeding of cobra - a female cobra laid 13 eggs in an earthen pot in the dump of a residential area. Since there were chances of predation and other damages, the snake was carefully rescued. There it was kept inside a well-ventilated plastic bucket with the lid covered putting dry leaves and straw. Incubation and feeding management were carefully handled. Finally, it was having successful hatching on 42nd day. On 49th day the mother and hatchlings were released into a natural habitat nearer to a water source.

Key word : .Cobra, breeding, hatchling, immobilized prey,litter, incubation, sheddingssss.

INTRODUCTION

The Spectacle cobra *(Naja naja)* is a medium sized beautiful snake, with smooth scale, black eyes, wide neck and head. The cobra's most recognizable feature is its hood, a section of its neck which it can flatten outwards in a threat display. Most of the snakes can flatten their necks to some degree but cobras usually flatten. The colour may vary from dark brown or black to yellowish white. The dorsal side of the snake is usually white or yellowish with wide dark neck band. The body is generally covered with a speckled white or yellow pattern, some time forming ragged bands.The hood with a spectacled classic design is very famous, which may or may not be found. (Fig.1)

Fig.1 : Spectacle mark on the hood of cobra.

The cobras are usually confused with the Indian rat snake *(Ptyas mucos)* which has a much thinner neck and head. They generally grow up to 3 meters long. The cobras kill their prey by injecting a neurotoxin through their hollow fangs (Fig.2).

Fig.2 : Hollow fangs of cobra

The neurotoxin venom (a complex protein compound) block the synaptic communication between the victim's neurons and muscles, thus stopping movement and muscle control. The cobras predator include the mongoose, some raptors and some birds of prey.

DESCRIPTION AND DISTRIBUTION

Detail systematic position of cobra is presented in Table-1.

Table - 1: Classification of common spectacled cobra.

1.	Kingdom	Animalia
2.	Class	Reptilia
3.	Order	Squamata
4.	Family	Elapidae
5.	Scientific name	*Naja naja*

The most common cobra is the Indian cobra or spectacled cobra *(Naja naja)* native to the Indian sub-continent. They are generally associated with snake

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charming activities. The black cobra (*Naja oxiana*), found in Pakistan and North India, is generally considered to be a sub-species. The second most common cobra species is the Monocled cobra *(Naja kouthia)* wide spread in Asia. Cobra can thrive well upto an altitude of 2000 meter from mean sea level (MSL). In Orissa, it is widely distributed.

BIOLOGY

The cobra is diurnal, mostly active during evening and early morning. It may enter human dwellings when hunting. It restlessly moves from one place to another in search of prey, which mainly consists of mice, rats, poultry and frogs. On sensing danger, it lifts anterior part of its body to have a good look at its surroundings. If not provoked, it lets fall its body and slips quietly away. However, if provoked it hisses loudly and sways its hood to advertise its presence, and displays the hood markings as a sign of aggression. It fixes its eye to the source, keenly following its movements. However, all the time to lookout have to chance to avoid slip away. The swaying of hood with dorsal spectacle mark and away. The swaying of hood with dorsal spectacle mark and ventral yellow ocellus, coupled with loud hiss, arc measures to just look as fear some and as big as possible to made the enemy scared. It may give number of strike repeatedly. This snake can be exceptionally quick moving and agile. The fans and venom glands of both sub-species are large. The venom is highly toxic. Snake bite symptoms begin approximately 8 minutes after bite. Victims experience anxiety, the pulse rate initially increased, then decreased and becomes irregular later on. The victim may soon falls into deep coma.

ORISSA, A NATURAL HABITAT OF SNAKES

In Orissa snakes are found abundantly. The capital city Bhubaneswar was established in the year 1970. Before it was fully covered with various types of flora and fauna. At that time There was dense forest area which was suitable habitat for snakes and other wild lives. Over the passage of time city's population increased rapidly followed by much of habitat destruction not only due to heavy biotic pressure but also due to anthropogenic activities like urbanization, deforestation, industrialization etc. As a result, the population of different wild lives get reduced badly and some migrated to its adjoining forest areas like Chandaka which lies at north-western side of the city.

But some of the animals like rhodents, lizards and snakes get acclimatized with human habitat and often found distributed randomly. Cobra frequents different habitats : grasslands vegetation along tilled fields, along water courses, monumental ruins with grassy growths and around villages. It is abundant in paddy growing areas, where it is attracted by mice. Also it is attracted to poultry and seen in living houses. It climbs up the branches of trees in search of nesting birds. Often it becomes resident in rat holes after consuming its occupant.

BREEDING STATUS

The month of May-July is the approximate time of oviposition. Usually, the female cobra lays 12-30 eggs. It mostly lays eggs in a rat hole or termite mound. The incubation period is about 60 days. It rarely goes for feeding during the incubation period. The reason being it is very possessive of its eggs. Mostly it guards the eggs till it successfully hatches. After hatching the mother remains with the young for about a week or two and usually dispersed there after.

A CASE STUDY

Cobras are commonly found in and around residential areas of Bhubaneswar. Recently several cobras from around Bhubaneswar locality have been rescued. On 22.05.2007 at about 5.00 p.m. we received a telephonic call from a residential area for rescuing a snake. Immediately we rushed to the site. On reaching the site we could see that a female cobra of about 4 feet length relaxed with its eggs (Fig.3) inside an earthen pot in the dump-yard of that residence.

Fig.3 : Female cobra relaxing in earthen pot with its Egg.

Usually, cobra live in rat hole or termite mound and lay 12-30 eggs there. But this rescued cobra had laid 13 eggs in an earthen pot. We rescued the snake along with 13 numbers of eggs.The cobra showed much aggression during the course of rescue operation (fig.4).

The snake was a female cobra measuring 4 feet 2 inches.After rescuing it we were in dilemma whether to release the snake in its natural habitat or take a chance of artificial hatching. But then we feared that the snake may be fleeing away leaving the eggs due to human interference. Finally we decided to release the nearates in its natural habitat after successful hatching of the eggs. The cobra was kept inside a well ventilated plastic bucket with a well ventilated lid. The bucket was filled with dry soil, straw and leaf litter to evenly maintain a constant temperature. The eggs and cobra were transferred inside the bucket and the lid was covered. Feed was supplied time to time and regular observations were recorded on the activities of the snake as well as its eggs as described below (Table-2).

Table - 2 : Record of observations during incubation

Sl. No.	Day	Behaviour	Feeding	Operation Technique	Remark
1.	Day-1	It showed hyperactivity as she felt exotic in side the bucket	No	Dry soil, straw and leaf litter was provided in the bucket	Hyper activity
2.	Day-2	It get acclimatized inside the bucket	A mechanically Immobilized frog was provided as feed	The straw and leaf litter was removed as it obstruct the body contact with egges	The food was not taken
3.	Day-6	The behaviour was some What calm.	No	Water had been Provided for drinking	water was not taken by the snake.
4.	Day-9	She roll the eggs continuously	A mechanically immobilized rat was provided as feed		The rat was taken as feed.
5.	Day-12	Normal behaviour, it guards its eggs			Normal
6.	Day-15	Normal		Soil inside the bucket was wet partially (small part)	Normal
7.	Day-18	The temper seemed to be mild.	A mechanically immobilized frog was provided as feed		The frog was taken as feed.
8.	Day-21	Colour seemed darker	-	-	Change in body colour of snake.
9.	Day-24	She completely hid all of the eggs	-	-	Normal
10.	Day-27	The tongue movement was frequent	-	Soil inside the bucket was wet partially (small part)	Frequent tongue movement
11.	Day-30	The snake stated shedding its scales	A mechanically immobilized rat wasprovided as feed	-	Feed was not taken, shedding of scale started
12.	Days-32	The behaviour was calm			Normal
13.	Day-34	She exhibite mild activities		Water had been provided for drinking	Water was taken by the snake.
14.	Day-36	Normal			Normal
15.	Day-40	She showed some what virulent activity in her behaviour			Virulent behaviour.
16.	Day-42	3 hatchling were found inside the bucket out of Which one was dead and the other two in live condition.		The bucket was made cleaned.	Eggs are hatched
17.	Day-43 to 48	The snake and hatchling were showed normal behaviour	They were provided with frogs and small insects as feed.		Normal
18.	Day-49	We released them into natural habitat nearer a water source			They quickly dispersed in their habitat.

Fig.4 : Cobra showed aggression while rescuing it

DISCUSSION :

i) The snake was in a well ventilated plastic bucket because.
   (a) It minimized the risk of escape since it was kept in a residential area.
   (b) The temperature could be maintained well.
   (c) Easy to clean, so that no foreign organism could affect it.
   (d) We could have kept the snake in other material like bamboo basket. But the edges of the basket might hurt the snake.Fig. 5

Fig.5 : Hatchling after eggs being hatched

ii) We had provided mechanically immobilized prey to minimize the disturbance of the eggs both by the snake in the process of prey immobile and the process of escape.

iii) We had kept near our residential are a for easy observation.

iv) We released them near water body so that they can get enough food and water a better habitat to live in.

v) We kept them for a week because in natural conditions, usually the young dispersed from their mother after a week.

Fig.6 : Releasing the snakes on the natural habitat

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A BREEDING PLAN FOR THE TIGERS AT NANDANKANAN ZOO, ORISSA, WITH AN ATTEMPT TO MINIMIZE INBREEDING

Attiwilli Suman

ABSTRACT

NandanKanan Zoo is famous worldwide for its Royal Bengal tigers and its white tiger safari. However, at present there is very little breeding of tigers at the Zoo and there is an immediate need for a breeding plan. Breeding is necessary to restock the tiger population or there will be a serious deficit of tigers at the Zoo just after ten years. The paper suggests a breeding plan for the tigers based on there inbreeding coefficients.

Keywords: Inbreeding, inbreeding coefficient, genetic drift, founder effect, genetic management.

INTRODUCTION

Unlike earlier times when zoos kept a few specimens of exotic species mainly for entertainment, in the past few decades, zoos have assumed an important role as centers of education and conservation of endangered species. For many threatened species, captive populations act as insurance against extinction in the wild. With populations of many species declining and getting fragmented in the wild, the objective of modern captive breeding programs is not merely increase in number of individuals of such species, but to preserve them as dynamic evolutionary entities and to maintain their genetic diversity, both for their long term viability and if possible for their subsequent release to their natural habitats. However all zoos and captive breeding centers have limited space and can only maintain a certain number of individuals. Captive populations face the same problems as small populations of animals in the wild i.e. loss of genetic diversity due to bottlenecks/founder effect, genetic drift, inbreeding and can become potentially non-viable. And hence arises the need to manage captive populations in zoos. This incorporates best husbandry practices and planned captive breeding programs with the objective of retaining high levels of genetic diversity over long periods. The current recommended strategy for genetic management of captive populations is minimization of kinship. The kinship of two individuals is the probability that two alleles taken at random, one from each, will be identical by descent. It is directly related to inbreeding and is in fact the inbreeding coefficient of their offspring.

Nandankanan Zoo, Orissa is famous worldwide for its Royal Bengal Tiger population and its white tiger safari. Prior to 1980, all white tigers available in captivity had their origin from a male white tiger named Mohan and a coloured female named Begum, both captured from the forests of Rewa, Madhya Pradesh. The white tigers of this lineage suffered huge losses due to detrimental effects of inbreeding. Mating between close relatives like father-daughter, mother-son, brother-sister etc. practiced in the zoos housing these animals, resulted in reduced fertility and increased early mortality (Roychoudhary and Sankhala 1979). The white tigers at Nandankanan are from a different lineage (Roychoudhary and Acharjyo 1983). On 8-1-1980, three white tiger cubs (two females and one male) were born to normal coloured tigress Ganga and normal coloured tiger Deepak, result of a father-daughter mating. All tigers at Nandan Kanan have been founded by three normal wild-caught tigers (Pradeep, Sikha and Rani) and one white female (Diana/Subhra) of the Rewa lineage, obtained from the Delhi Zoo. With only four founders, it is inevitable that all their descendants become inbred in a couple of generations. The only option is to go for planned breeding of individuals, so that there is equal representation of the four founders and so as to minimize inbreeding and delay inbreeding depression. The objective of the paper is to analyze the genealogies of the current population of tigers at Nandankanan Zoo and suggest a breeding plan that minimizes inbreeding in the next generation. A planned breeding program is extremely important for the viability of the Nandankanan tigers.

METHODOLOGY

The objective was to come up with a breeding plan for the tigers i.e. to suggest which pairs of animals should be bred so that the offspring have the minimum inbreeding coefficient. This is done through the analysis of the pedigrees with the help of computer programs such as Single Population Analysis and Record Keeping System (SPARKS). With SPARKS, the kinship of each possible pair of live tigers can be calculated and compared. However due to non-availability of the computer program, inbreeding coefficients or kinship values of prospective breeding pairs were calculated manually through observation of the pedigree. In complex pedigrees such as this, the parents may be related through more than one common ancestor, or from the same ancestor through different paths. Each

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common ancestor and each path contributes to the kinship of the parents. A simple formula for calculation of inbreeding coefficients of individuals through observation of their pedigrees is as follows:

$$F = S\,(1/2)^{n}\,(1 + F_{ca})$$

Where n is the number of individuals in the path from one parent to a common ancestor and back to the parent, and F_{ca} is the inbreeding coefficient of the particular common ancestor. These contributions to inbreeding are summed for each different path linking both parents to each common ancestor. From the studbook data on tigers maintained at Nandankanan Zoo, information on the ancestry of the current population, going back to the founders was obtained. Detailed studbook information on the live tigers of Nandankanan has been presented below (see Table 1). The ages of the live animals ranged from 3 to 20 years. The oldest was Shriya 20, a white female, while the youngest were three year olds Rishi, Sitesh and Prachi, all white, born to Rohit and Sailaja. 14 individuals between 5 to 12 years of age were considered for further analysis as they were in the right breeding age. Kunti, a ten year old white female was operated upon and got a bent back after the operation and was unable to conceive. She was therefore not selected for further calculations. From the studbook data, genealogies of tigers selected for further analysis were constructed (see Figure 1). The inbreeding coefficient was calculated for each possible pairing of the selected animals using the formula stated above.

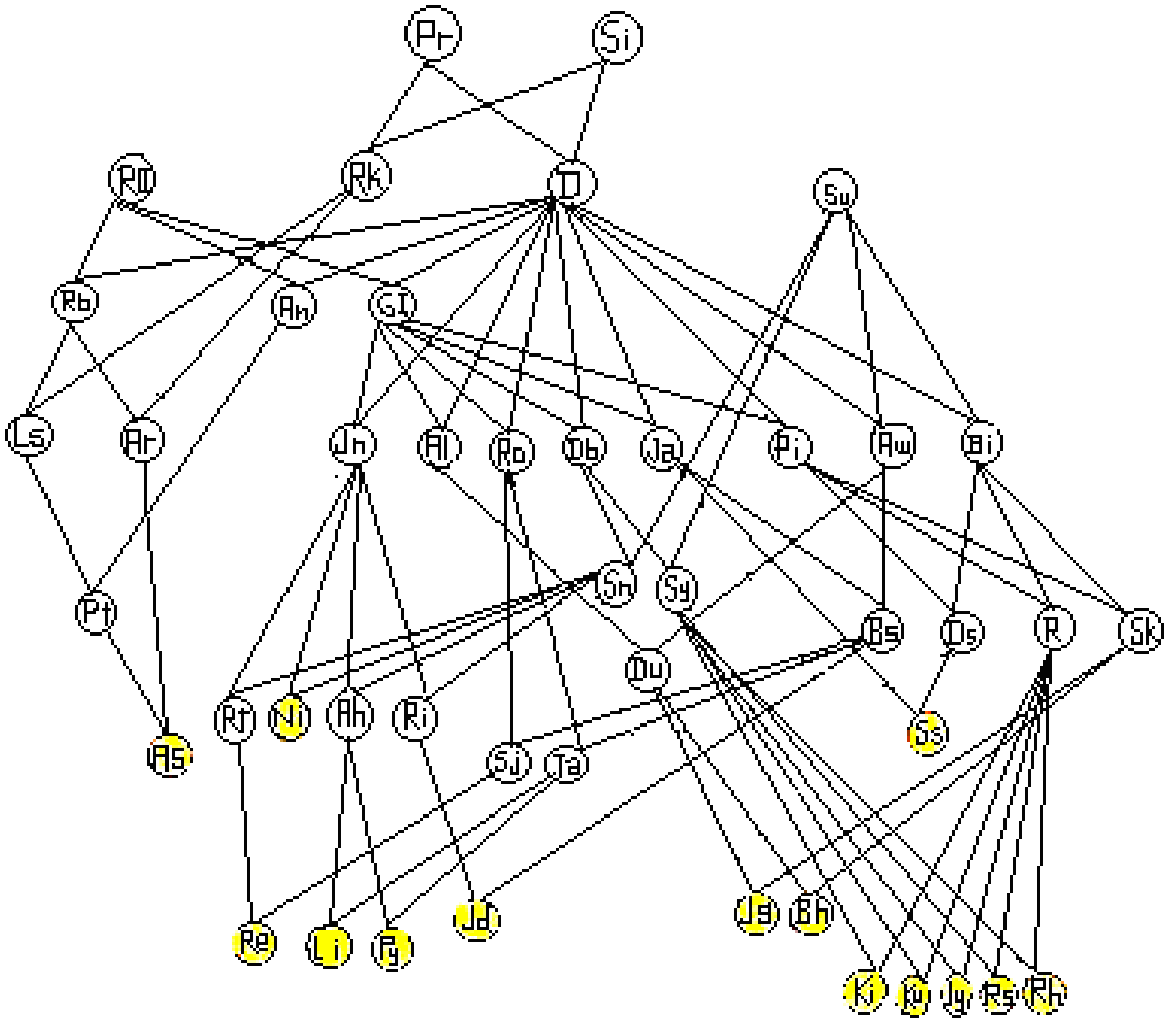

Figure 1: Pedigree of tigers selected for breeding. Pr Pradeep, Si Sikha, RII Rani II, Rk Rekha, D Deepak, Su Subhra, Rb Robin, An Anand, GI Ganga I, Ls Lipsa, Ar Anuradha, Jn Janhabi, Al Alaka, Ro Rohini, Db Debabrata, Ja Jamuna, Pi Pinaki, Aw Aswini, Bi Bisakha, Sn Sangram, Sy Sriya, Bs Biswamitra, Ds Debashis, R Rama, Sk Sukanta, Du Durga, Rt Rohit, Ni Nishant, Ah Ashok, Ri Rinky, Ss Sushma, As Anusuya, Sj Sailaja, Ta Tanuja, Re Rebati, Li Lilita, Py Priyanka, Jd Jagdish, Jg Jagat, Bh Bhagat, Ki Kishan, Ku Kusum, Jy Jyoti, Rs Roshan, Rh Rakhee

Stud book information on the current population of tigers at Nandan Kanan Zoological Park

Local stud	Date of birth	Phenotype	House name	Sire	Dam	Selected for pedigree analysis
101	23-08-87	WF	SHRIYA	DEBABRATA	SUBHRA	
135	01-06-89	HF	DEVII	SANGRAM	JANHABI	
165	26-08-90	HM	RAMA	PINAKI	BISAKHA	
199	21-08-92	HM	ROHIT	SANGRAM	JANHABI	
201	21-08-92	HF	RINKY	SANGRAM	JANHABI	
223	02-12-93	HF	SHAILAJA	BISWAMITRA	ROHINI	
224	02-12-93	HF	TANUJA	BISWAMITRA	ROHINI	
226	06-06-94	HM	ASHOK	SANGRAM	JANHABI	
248	07-08-95	NF	ANUSUYA	PRITAM	ANURADHA	√
250	19-12-95	NF	SUSHAMA	DEBASHIS	JAMUNA	√
254	26-02-96	NM	NISHANT	SANGRAM	JANHABI	√
268	15-07-97	WF	KUNTI	SAGAR	LAXMIPRIYA	√
284	14-04-98	WM	JAGADISH	BISWAMITRA	RINKY	√
294	15-09-98	WM	JAGAT	SUKANTA	DURGA	√
295	15-09-95	WM	BHAGAT	SUKANTA	DURGA	√
306	03-07-99	NF	REBATI	ROHIT	SHAILAJA	√
307	28-12-99	WM	KISHAN	RAMA	SHRIYA	√
308	28-12-99	WF	KUSUM	RAMA	SHRIYA	√
309	28-12-99	NF	JYOTI	RAMA	SHRIYA	√
311	25-03-00	WF	LILITA	ASHOK	TANUJA	√
314	25-03-00	NF	PRIYANKA	ASHOK	TANUJA	√
321	05-09-02	NM	ROSHAN	RAMA	SRIYA	√
322	05-09-02	NF	RAKHEE	RAMA	SRIYA	√
324	24-04-04	NM	SISIRA	ASHOK	TANUJA	
325	24-04-04	NF	SONIA	ASHOK	TANUJA	
327	24-07-04	NF	EPSITA	JAWAHAR	RINKY	
328	01-08-04	WM	RISHI	ROHIT	SHAILAJA	
329	01-08-05	WM	SITESH	ROHIT	SHAILAJA	
330	01-08-06	WF	PRACHI	ROHIT	SHAILAJA	

RESULTS AND DISCUSSION

Kinship was calculated for each possible pairing of adult tigers at Nandankanan (Table 2). Males and females born to same parents are not paired in the table since such brother and sister mating leads to highly inbred offspring. Males or females born to same parents are placed together since they have same genealogies. The kinships range from 0.1445 to 0.3437 with a mean of 0.2622, which is greater than 0.2500 that results due to a parent-offspring mating. It is observed that in general greater the number of common ancestors, greater the kinship value of the pair.

Table 2: Each possible pairing of tigers at Nandanakanan and their kinship values. Common ancestors for each pair are indicated along with their inbreeding coefficients.

Female/phenotype	Male/phenotype	Pr 0	Si 0	R II 0	D 0	Su .5	G I 0	Sn 0	Jn .25	Db .25	Ja .25	Pi .25	Aw 0	Bi 0	Bis .1875	No.of common ancestors
As/N	Ni/N	√	√	√	√											4
As/N	Jd/W	√	√	√	√											4
As/N	Ki/W, Rh/W	√	√	√	√											4
As/N	Jg/W, Bh/W	√	√	√	√											4
Re/N	Ni/N				√	√	√	√	√							5
Re/N	Jd/W				√	√	√	√	√						√	6
Re/N	Ki/W, Rh/W				√	√	√			√						4
Re/N	Jg/W, Bh/W				√	√	√						√			4
Li/W, Pr/N	Ni/N				√	√	√	√	√							5
Li/W, Pr/N	Jd/W				√	√	√	√	√						√	6
Li/W, Pr/N	Ki/W, Rh/W				√	√	√			√						4
Li/W, Pr/N	Jg/W, Bh/W				√	√	√						√			4
Ku/W	Ni/N				√	√	√									3
Ku/W	Jd/W				√	√	√				√				√	5
Ku/W	Ki/W, Rh/W				√	√	√					√		√		5
Ku/W	Jg/W, Bh/W				√	√	√					√		√		6
Ks/W, Jy/N. Rk/N	Ni/N				√	√	√			√						4
Ks/W, Jy/N. Rk/N	Jd/W				√	√	√			√						4
Ks/W, Jy/N. Rk/N	Jg/W, Bh/W				√	√	√					√		√		5
Ss/N	Ni/N				√	√	√									3
Ss/N	Jd/W				√	√	√				√					4
Ss/N	Ki/W, Rh/W				√	√	√					√		√		5
Ss/N	Jg/W, Bh/W				√	√	√					√		√		5

KEY: N Normal Coloured Tiger, W White tiger, Pr Pradeep, Si Sikha, RII Rani II, D Deepak, Su Subhra, GI Ganga I, Sn Sangram, Jn Janhabi, Db Debabrata, Ja Jamuna, Pi Pinaki, Aw Aswini, Bi Bisakha, Bs Biswamitra, As Anusuya, Re Rebati, Li Lilita, Pr Priyanka, Ku Kusum, Jy Jyoti, Rk Rakhee, Ss Sushma, Ni Nishant, Jd Jagdish, Ki Kishan, Rh Roshan, Jg Jagat, Bh Bhagat. Males or females born to same parents are placed in one cell since they have same genealogies. Males and females born to same parents are not paired. Inbreeding coefficients of ancestors are given along with their names.

However, number of common ancestors itself is not a reliable estimate of inbreeding. As obvious from the formula stated above, inbreeding is not only a function of the number of common ancestors, but also of the position of the common ancestor in the pedigree and of the inbreeding coefficient of the common ancestor. This means that in the pedigree, greater the number of individuals lying in the path leading from one (potential) parent, through the common ancestor to the other (potential) parent, the lesser the inbreeding coefficient. So if a pair is closely related to the common ancestor, for e.g. a common parent or grandparent, their kinship is greater than if they were remotely related to the common ancestor. Secondly, if the common ancestor is already inbred, it adds to the inbreeding coefficient of its descendants. White coloured tigress Subhra, who is one of the founders was from the Rewa lineage and already highly inbred. This greatly increased the inbreeding of its descendants. To sum up, inbreeding is a measure of the following factors:

- Greater the number of common ancestors, greater the kinship of the pair. Greater the number of paths connecting a common ancestor to the pair, greater the kinship.
- For two pairs having the same number of common ancestors (but different individuals as ancestors), greater the inbreeding coefficients of the common ancestors, greater the kinship of the pair sharing that set of ancestors.
- For two pairs having the same common ancestor, the pair that is more closely related to the ancestor has a greater kinship than the pair that is remotely related to the ancestor.

While choosing a pair for breeding, it was remembered that normal coloured tigers could be paired with normal or white tigers. White tigers should not be mated with white tigers. This way, the gene for white colour is preserved while not promoting homozygosity. Also to preserve maximum genetic diversity, it is important to breed as many adults in the breeding age as possible. On the basis of the above analysis, it is suggested that steps be taken to breed the following pairs:

♀	♂
Anusuya	Kishan
Anusuya	Bhagat
Rebati	Jagat
Priyanka	Roshan
Jyoti	Jagdish
Sushma	Nishant

By good judgment, other pairs can also be tried in case a problem is encountered in the breeding of above mentioned pairs. Normal coloured tigress Anusuya has comparatively lower values of kinship with all the males. It is observed in the pedigree (Figure 1) that she is related to wild-caught normal coloured tigress Rani (one of the founders) in three ways – two paths lead through her son Robin and one leads through her son Anand. All the other tigers are related to Rani only through Ganga, daughter of Deepak and Rani. So to preserve the genes of Rani in the population, it is important to breed Anusuya with different males. Normal coloured tigress Rebati has the same kinship values as the two sisters, white coloured Lilita and normal coloured Priyanka. It is because they have similar genealogies (see Figure 1). White coloured brothers Jagat and Bhagat are at present housed at the White Tiger Safari in Nandankanan. It is suggested that white males Rishi and Sitesh be put on safari duty while Jagat and Bhagat are brought into the enclosures for breeding. Such planned breeding must go hand in hand with good husbandry practices such as proper medical management and hand-rearing of cubs in case of emergency so as to minimize mortality.

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GLOBAL WARMING - ROLE OF GREEN FUELS TO PACIFY THE FURY

M. Brahmam

ABSTRACT

Global warming is associated with enhanced concentrations of carbon dioxide (CO2), methane (CH_4), chloro-fluoro carbons, and other radioactive gases. Increasing abundance of these gases affect the radiation balance at the earth's surface. Ozone depletion in the stratosphere caused a significant increase in ultra violet radiation reaching earth's surface. It is feared that the earth is going to experience diminishing supply of water suitable for human use, change in photosynthesis, respiration, transpiration, trace gas exchange on the land and in the oceans which in turn affect the carbon budget, patterns of evaporation, precipitation, soil erosion etc. Remarkable decline is expected in the health of vegetation due to long term changes in the chemistry of atmosphere, precipitation, run off and ground water reserves. In short, life is going to be miserable because of global warming.

Key words : Global warming, guenhouse gules, radiation balance, emissions, carbon sinks, pollutants, biofuels, renewable energy.

INTRODUCTION

The unprecedented super-accelerated rate of global warming happening today is due to the amount of greenhouse gases being spewed into the atmosphere. Global warming is a complex issue that involves many different environmental factors. If we look at the ins and outs of global climate change, carbon dioxide (CO_2) and methane (CH_4) appear to have been playing pivotal roles (Thomson and Cicerone, 1986). Increasing abundance of these gases affect the radiation balance at the earth's surface (Mitchell, 1989). The most notorious greenhouse gas is carbon dioxide (CO_2). Because CO_2 comprises more than 75% of all greenhouse gases, it has become the biggest single contributing factor to global warming. Aeroplanes, shipping, various manufacturing industries dotted all over the globe are the other main sources of greenhouse gas pollutants (Mathews, 2007).

HARBINGERS OF GLOBAL WARMING

Earth's surface is made up of thousands of different habitats and ecosystems, all with unique characteristics. The coal, oil, and natural gas that drive the industrial world's economy contain carbon inhaled by plants hundreds of millions of years ago. Carbon now is returning to the atmosphere through exhaust pipes, smoke stacks etc. and joining emissions from forest burned to clear land in developing and under developed countries. Carbon dioxide is foremost in an array of gases from human activity that increase the atmosphere's ability to trap heat i.e. methane from cattle, rice fields, landfills etc. and the chloro-fluoro carbons from refrigerators and air conditioners (Aldy *et al*., 2003). Melting glaciers, earlier drying of springs, and a steady rise in global average temperature are just some of its harbingers.

SOME FACTS

The world is a big jar. Every year billions of tons of carbon pass between land and the atmosphere through the respiration of the living things. A similar traffic in carbon, between marine plants and animals, takes place within the waters of the ocean. And nearly a hundred billion tons of carbon diffuses back and forth between ocean and atmosphere. Fire and respiration use oxygen and give off carbon dioxide. The photo-synthesis takes up the carbon dioxide, converts it into plant tissue, and give off oxygen as a by-product. It has been estimated that we dump roughly 8 billion metric tons of carbon into the atmosphere every year i.e. 5.9 billions from fossil fuels, 1.4 billions from deforestation and the rest from other sources. But less than half of that i.e. 2.9 billion metric tons remains in the atmosphere to warm the planet. Where does the missing carbon go ? It's a really major mystery. Forests, grasslands, waters of the oceans etc. act as carbon sinks. If the carbon sinks stop absorbing some of our excess carbon dioxide we might face drastic changes too difficult to avoid. Some scientists and engineers believe that by understanding natural carbon sinks, we may be able to enhance them to check the threat (Baranzini *et al*., 2000).

WHAT DOES GLOBAL WARMING BRING?

It brings scorching summers, fiercer storms, altered rainfall patterns, shifting species, etc. and it is predicted that coral reefs might vanish, deserts might spread, currents that ferry heat from the tropics to northern regions might change its course- all resulting in warming the globe. Some fear that the British isles and the scandinavian countries would be under heavy fatal chill. Pieter Tans, one of the scientists of National Oceanic and Atmospheric

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Administration (NOAA) laboratory, Colorado, calculates that carbon dioxide piles up in the northern hemisphere, which has most of the world's cars and industries. Both the waters of the ocean and the plants on land steal carbon dioxide from the atmosphere. Because plants give off oxygen when they absorb carbon dioxide, a plant sink would lead to a corresponding oxygen increase. But when carbon dioxide dissolves in the ocean, no oxygen is added to the atmosphere. Plants prefer gas that contains carbon 12, a lighter form of the carbon atom but rejects gas containing carbon 13. On the contrary, the ocean does not discriminate. Passing clouds can dampen photo synthesis, spoiling the trees' appetite for carbon. In winter, when leaves fall and decay, more carbon dioxide, a by-product of plant respiration and decomposition seeps back out of the forest and into the atmosphere. Fires can speed up the melting. In the summer a fire can race thousands of kilometres. Plants need carbon dioxide to grow, and scientists have found that in laboratory chambers well-nourished plants bathed in high-carbon dioxide air show a surge of growth. So out in the real world, it seemed, plants would grow faster and faster as carbon dioxide builts up in the atmosphere, stashing more carbon in their stems, trunks, and roots and helping to slow the atmospheric build up. Such a growth boost could, turn mature tropical forests into carbon dioxide sponges. Carbon dioxide dissolves easily in cold water, and the marine-plants quickly use up the dissolved carbon dioxide. Carbon dioxide is less soluble in warmer water. Dissolved carbon dioxide can easily slip back into the atmosphere unless it is taken up by a marine plant or combines with a 'buffer' molecule of carbonate. But the ocean's supply of carbonate is limited and is replenished slowly as it is washed into the ocean by rivers that erode carbonate-containing rocks such as limestone.

REPERCUSSIONS

With no new help from nature in sight, perhaps it is time for us to think about creating our own carbon sinks. Scientists have dreamed up plenty of possibilities, major being creating new forests. This approach has already taken root on a grand scale in China, where the government has planted tens of millions of acres since the 1970s. Reality has not been quite so elegant. Experiments have shown that a dash of iron sulphate triggers ocean's surface waters to bloom with patches of algae miles together. A rise in carbon dioxide concentration in the atmosphere will acidify the ocean's surface waters (Adamson and Sagar, 2002).The rapid rise in greenhouse gases is a problem because it changes the climate faster than the adoption rate of living things. There has been a regular shift in earth's temperature back and forth in the past but the difference between average global temperatures of today and during those of ice ages is only about 5 degrees Celsius, and these swings happen slowly, over hundreds of thousands of years. Now, with concentrations of greenhouse gases rising, earth's ice sheets of Greenland and Antarctica have started melting (Ryan et al., 2006). The extra water could potentially raise sea levels significantly. As the mercury rises, the sea level also rises and the weather can become more extreme. This means more storms, more rain followed by longer and drier droughts that ultimately pose problems both for plants and animals including man.

CAUSES OF GLOBAL WARMING

The following is the list of a few causes of global warming. With all the facts laid out, one can make a better decision about what global warming is and how it might affect.

Power Plants

One of the largest contributors to global warming is thermal power plants. It is estimated that approximately 40 % of CO_2 emissions come from this source that use natural gas, coal and oil. Coal is the biggest contributor.

Transport sector

Cars, trucks, buses, scooters, motorcycles etc. emit carbon into the air. There are approximately 3 billion vehicles that emit millions of tons of pollutants into the air. Diesel, the standard fuel for heavy vehicles is less clean than gasoline.

Air traffic

Air travel has become indispensable in today's society. Ten percent of green house gas emissions come from aeroplanes, helicopters, supersonics etc. They release directly into the air.

Dwellings

Houses contribute greatly for pollution. Since, they have longer lifespan (50-100 years) and inhabitants burn oil, coal, wood etc. their contribution is significant. In most houses, coal is burnt because it is the cheapest and most abundant resource.

Methane emission

Methane is nearly 60 times stronger than CO_2 as a greenhouse gas. Rapid release of methane heats the earth faster Methane stored in Oceans gets released when the temperature rises and pressure reduces. Since methane also finds in ice, it gets released on melting. If the earth reaches a particular temperature, it would be impossible to bring back and prevent associated maladies.

REMEDIAL MEASURES

i) The world's aim is to reduce global carbon emissions by 70 % at least by 2050 and this takes our focus to bio-

fuels. Recycling of carbon revenues to promote renewable energy sources in developing countries especially Brazil, India and China should be given priority. Developing countries should take adequate steps to preserve rainforests as carbon sinks (Bruvoll and Larsen, 2004).

ii) Too many greenhouse gases in the earth's atmosphere will increase the greenhouse effect. The most dangerous aspect of the climatic change is the effects of ice/snow. As the earth warms up, the levels of ice and snow decrease. NASA scientists while studying the temperatures of the world opine that the year 2005 was the warmest. It is ascertained that even if we stop emitting heat-trapping gases immediately, the climate would not stabilize for many decades because the gases we have already released into the atmosphere will stay there for years or even centuries (Kim Phat et al., 2004).

iii) The number of cars in operation around the world will double by the year 2030. The United States is responsible for 25% of the world's CO_2 emissions which equates to 7 billion tons of CO_2 emissions in one year. The amount of CO_2 released into the atmosphere in the next 30 years is expected to double or triple. Deforestation is another main producer of carbon dioxide. The causes of deforestation are logging for lumber, pulpwood, and fuel wood. Also contributing to deforestation is clearing new land for farming and pastures used for cattle. Forests and wooded areas are natural carbon sinks. Trees absorb carbon dioxide and release oxygen through a process called photosynthesis. This process occurs naturally but gets slowed down as we cut and burn trees. As the abundance of trees declines, less carbon dioxide can be recycled. As we burn them down, carbon is released into the air and the carbon bonds with oxygen to form carbon dioxide, adding to the greenhouse effect (Glenday, 2006).

iv) The rate of global warming and sea level rising will be higher than previous predictions at the prevailing conditions. A one metre sea-level rise would affect 6 million people in Egypt, 12-15 % of agricultural land submerging and 13 million people perishing in Bangladesh. Additionally, 16 % of national rice production will be lost and 72 million people will get affected in China. In all, tens of thousands of hectares of agricultural land will be lost (1 hectare=2.47 acres). This is based on new information released by the Intergovernmental Panel on Climate Change (IPCC). IPCC is made up of about 2,000 scientists who advise United Nations and revise estimates of current forecasts in sea levels by conducting studies on the west Antarctic ice sheet. Small, low-lying island states and countries with big coastal populations such as the Marshall islands and Bangladesh could see catastrophic damage from the rise.

v) Around the world, ice sheets and glaciers are melting at a rate unprecedented since record-keeping began (Cooper,1998). Changes in the area and volume of the two polar ice sheets in Antarctica and Greenland are intricately linked to changes in global climate and could result in sea-level changes that would severely affect the densely populated coastal regions. According to the NASA scientists, glaciers along the south eastern coast of Greenland are thinning by more than 3 feet a year possibly because of global warming. Researchers compared aerial surveys of the Greenland ice sheet taken in 1993 and 1994 with a similar survey taken last year. Their data indicated that parts of the ice sheet near the ocean thinned at a rate of more than 3 feet (1 meter) per year

vi) All of the scientific data and understanding now point to the critical situation we face: to slow future change we must start taking action soon. At the same time, because of our past and ongoing activities we must start to live with the likely consequences - more extreme weather, rising sea levels, changing precipitation patterns, ecological and agricultural dislocations, the spread of human disease and declining economic health around the world. In the end, failure to solve the global warming problem is not an option (Newell, 2002).

vii) Application of new alternative energies and agriculture technologies are the needs of the hour to combat the global warming *(*Berndes *et al.,* 2003*)*. The first is an alternative type perpetual electric device that will replace gasoline or diesel engines for transportation. With better transmissions and with more aerodynamic designs, and stronger yet lighter material for chassis will allow a totally non-fuel burning automobile. More than 80 % of Asia's and Africa's electricity is produced from outdated, coal-burning power plants that dump pollutants and heat-trapping gases into our atmosphere. In fact, power plants are the single largest source of CO_2 (Socolow *et al*., 2004). Replacing the present power grid systems by perpetual electric units will not only reduce the pollution but also restrict the wastage of the natural resources (Haas *et al*., 2004). Protecting threatened forests will help halt global warming which can also save us money, increase food productivity and create new business and agriculture opportunities. Using the force of water without creating dams will utilize turbine generated energy that will be modified for many agriculture uses in order to complete systems for providing large magnitude crop yields (Pizer, 2002).

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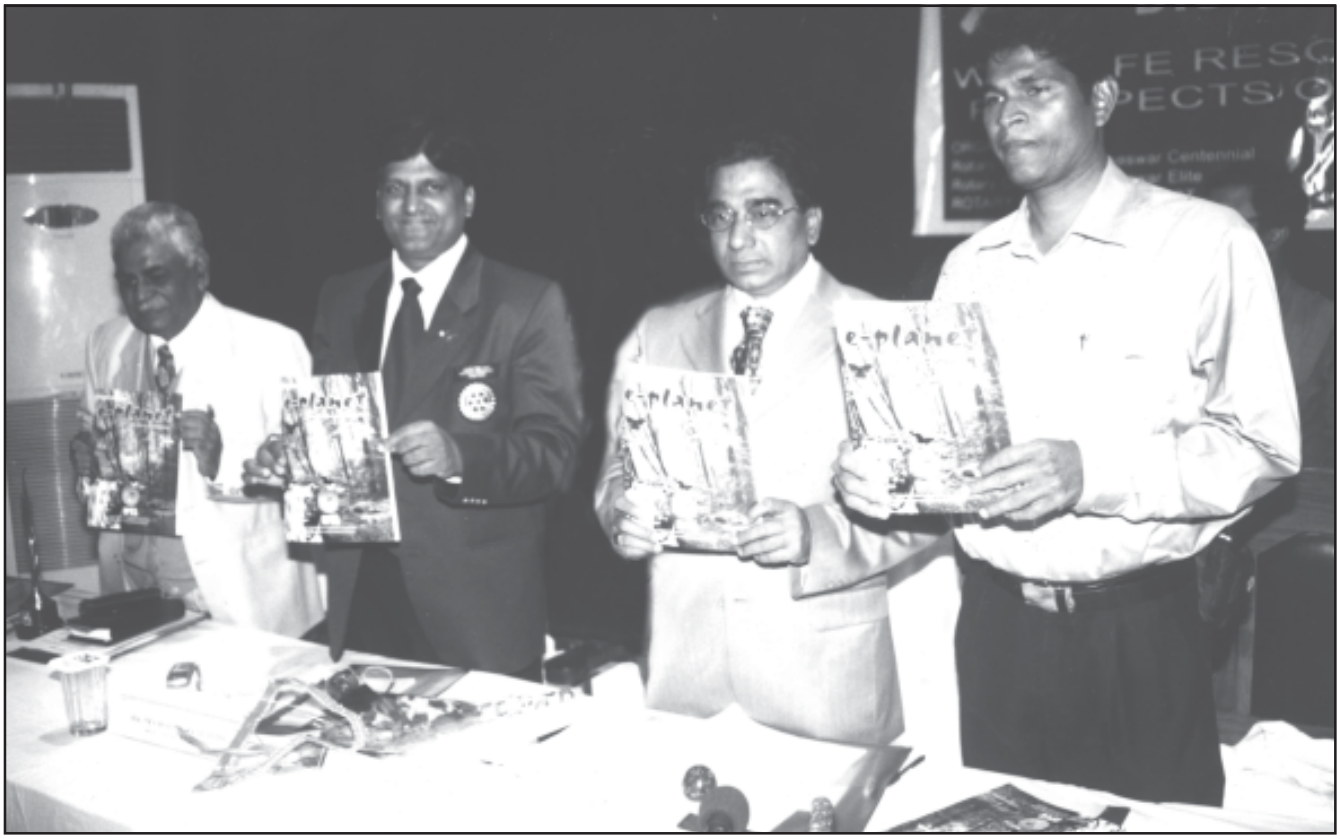

RELEASE OF JOURNAL E-PLANET AT
STATE LEVEL SEMINAR ON 'WILD LIFE RESOURSES OF ORISSA: PROSPECTS OF CONSERVATION' BY

Dated 27 January 2007:

A state level Seminar on 'Wildlife Resources of Orissa: Prospects of Conservation' was successfully conducted by Rotary Club of Bhubaneswar Centennial & Elite in collaboration with OPES, Bhubaneswar at Jayadev Bhavan, Bhubaneswar on 27th January 2007.

In the inaugural session, Chairman of the Organising Committee Rtn. Ashok Kumar Mahapatra in his welcome address talked on significance of the preserving and conserving the wildlife resources of Orissa. Convenor & Organising Secretary Rtn. Dr. Ranjit Samantray in his talk expressed grave concern on declining habitat and different wild animal species of Orissa and justified the need of inviting such a seminar. Governor Rtn. Promod Rath, Chief Guest of the occasion addressed on the urgent need for restoring the degraded ecosystems of Orissa. Chief Speaker Shri Atanu Sabyasachi, Hon'ble MLA, Patakura advised the organizing committee to put forth recommendations made from this seminar at right forum of the Government which would in turn facilitate drawing contingent plan for future preservation and conservation of our wild live & ecosystem. Mr. Saroj Jumar patnaik, formor Addl. PCCF (WL) and Chairman WWF (Orissa Chapter) & Zoo Expert in his keynote address presented an over view of status of wild lives of Orissa in respect to different National Parks, Sanctuaries and other Protected Areas.

On this occasion the special issue of the one and only Environment & Wildlife Journal of the State *'e-planet'* published, printed and edited by Dr. Samantray was released by Rotary Dist. Governor Rtn. Promod Rath.

For commendable services towards wildlife conservation dedicated persons like Mr. Saroj ku. Patnaik, Dr. L.N. Acharjyo, Prof. Dr. S.K.Ray, Mr. Suresh Ch. Mohanty, dr. Ajit kumar Patnaik, Shri. Suresh kumar Mishra were presented with Lifetime Achievement Award by Rotary Dist. Governor. Eminent Veterinary expert Dr. S.K. Ray, conducted the Technical Sessions, where Dr. L.A.K. Singh, dr. Sudhakar Kar, Dr. V.P. Upadhaya from Deptt. Of Forests & Environment, Gol, Dr. Sarat Palita, Nayagarh College, Mr. Sisir Pradhan, ecological Society of Orissa, Michel Peter, WWF India. Arun ku Mishra from Nandankanan Zoo Mr. Abhijit Sasmal from GEIS (Bio-tech) Bangalore presented their Reserch Papers on specific areas of Wild Flora & fauna and suggested measures for their conservations. On the said occasion many persons were also awarded by Rotary International for their formidable services towards preserving and conserving wildlives of Orissa. In the valedictory function, the chief guest Rtn. D.N.Padhi, IAS, Hon'ble Chief Information Commissioner, Orissa emphasize on his involvement with different wildlife organization and impressed the august gathering to bring all important informations to the Government for better conservation and preservation of natural resources. Dr. J.K. Panigrahi, Secretary of Orissa Environment Society presented vote of thanks. Amidst the gathering, prominent persons like Past Dist. Rotary Governor Rtn. Govind Senapati, IPS, former Chairman Goa Port Trust Mr. P.K. Mohanty, many Rotarians & inner Wheel Club members, technocrats, environmentalists, scientist, research fellows, wildlife experts of the state participated in the question answer sessions and made this event a grand success.

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NEW SPECIES OF LIMBLESS LIZARD OF *SEPSOPHIS* SPECIES DISCOVERED FROM KHANDADHAR HILLS OF BONAI, SUNDARGARH, ORISSA

P. Mahapatra and S. K. Dutta

Recently, during a field trip to Khandadhar Hills of Bonai Forest division of Sundargarh district, Orissa, led by Professor S. K. Dutta and research team of Vasundhara, a new species of limbless skink was encountered below a rock boulder on the top of the mountain. The reptile resembles a snake and can only be distinguished when looked closely. It is shiny brown in colour with black bands on the sides and dark dots on the dorsal part. It has rudimentary bud like fore limb (visible only under magnification) and no hind limb. It is a very fast burrower and immediately enters inside soil. The reptile is classified under Family *Scincidae* of genus *Sepsophis*. With the finding of the species, the genus *Sepsophis* is rediscovered after 137 years. During 1870 the then Col. Beddome discovered *Sepsophis punctatus* from Golconda, Andhra Pradesh and after that there was no record of the species any where in India. This limbless skink shows some typical characters, which differentiate it from *S. punctatus*. We found only one animal from the field and it is clear from the scale count and colouration that it is another species of the genus *Sepsophis* claims Prof. S. K. Dutta of North Orissa University, Baripada, Orissa. The animal lives in loose soil, found near hill stream covered with thick canopy and is fossorial in habit.

There is another species of limbless skink *(Barkudia insularis)* of the same family found in Chilka and Nadankanan Wildlife Sanctuary in Orissa. *Barkudia* distribution is confined to the coastal region, where as *Sepsophis* is found far away from the shore line. There are two other families of limbless lizards found in India namely *Anguidae* and *Diabamidae* found in North East India and Andaman Nicober Islands respectively.

Professor Dutta and his team including research scholars of various institutions like North Orissa University, Utkal University and Regional Research Laboratory, Orissa are engaged in biodiversity documentation of the state in collaboration with Vasundhara. A policy analysis and action research group based at Bhubaneswar.

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MY REAL LIFE EXPERIENCE WITH AN OCTOPUS

S. Baux

I was going to make an underwater video shoot with all my diver friends for the 15th August - the Indian independence day celebration. We were busy wih our preparations. An underwater song was being shot, which was written, composed, sung, picturised, edited and directed by me. I was busy giving directions for the song, when at that moment an octopus came from nowhere and sat on Akmal's back, though he tried to remove it yet it stuck to him. Akmal came out of water and at that moment the octopus left him. Oh ! he heaved a sigh of relief !!

Fig. 1 : The octopus being tackled by a diver freind

After a while, when I was busy shooting with my underwater scooter the octopus sat on the scooter with a very firm grip. I tried to ward it off but its grip was firm. At that moment it ejected ink to off guard us. It sat on the underwater scooter as if it was ready to drive it. We tried our best to take it off the vehicle but instead it changed its position and sat in front gear.

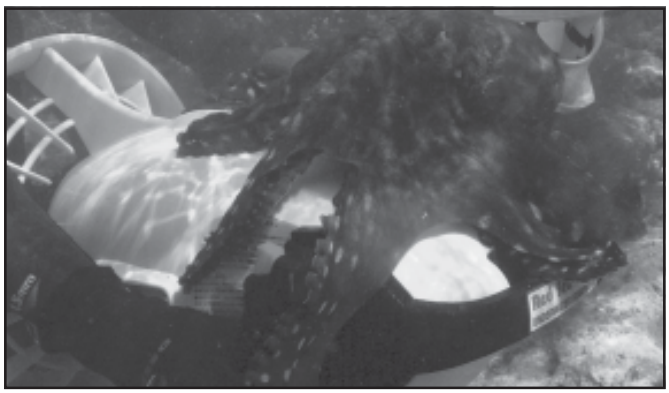

Fig. 2 : Octopus with farm grip on the under water scooter

Ayub and Akmal came to the surface of water and tried to remove it forcefully but it held the vehicle firmly and we were afraid that its tentacles would get stuck in the fan of the scooter. Octopus are really very smart creatures, they may seem to be useless but they have brains too. They can reduce and enlarge their sizes, camouflage themselves quite well and strong enough to kill enemies bigger then their sizes.

Fig. 3 : The team trying to remove the octopus forcefully

Recently I went through an exciting video of an octopus killing a shark ! Can you believe it ! But it's true, so I would advise my diver friends not to underestimate any creature. Our octopus admirer had no desire to leave us I took it out of water but it was still firm on the scooter, then slowly I submerged it inside water to prevent it from dying (which you can see in the above picture). Finally Akmal could freed its tentacles from the scooter. I directed Akmal to release it in deep sea. Akmal smoothly went down to drop this unexpected passenger in the deep succesfully.

Fig. 4 : Submerssion of the scooter to prevent the octopus from dying

The moment Akmal reached 22 ft below Octopus left the scooter in peace and went off leaving behind a jet of ink. We had gone for a peaceful underwater shoot but instead we were shooting with the octopus and in this venture we lost about an hour. It was really my life time experience which I will always remember with a smile !!

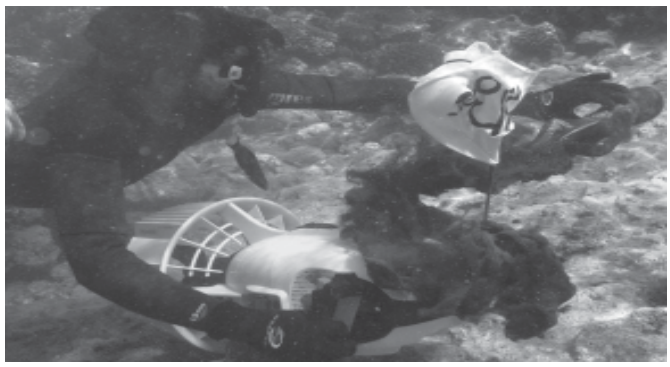

Fig. 5 :Octopus left the scooter in deep sea in deep sea

International diver, Cuttack, Orissa, India. Tel. + 91 9861356484

ENVIRONMENT OF SOUTHERN ORISSA

S. K. Rout

Fig.1 : Sun set at water reservoier, Sunabeda, Orissa

Fig. 2 : Scenic beauty of Deomali hills

Fig. 3 : Religious meet of tribals amidst bamboo thickets of Koraput.

Fig. 4 : Sillohetu Beauty and grandeur of Koraput, Orissa

Fig. 5 : Economical crop at higher altitude on way to Deomali, Koraput

Fig. 6 : Maa Kanta-Baunsuni temple at Damonjodi, Koraput

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QUIZ

A. K. Mishr

QUESTION

1. Which is the fastest flying bird in the world ?
2. Which animal has the largest eyes in the animal kingdom ?
3. Which is the world's smallest known monkey ?
4. Which is the heaviest insect in the world ?
5. Which is the longest-living animal recorded ?
6. Which bird makes the largest nest ?
7. Which is the largest reptile in the world ?
8. Which is the longest venomous snake in the world ?
9. Which is the shortest snake in the world ?
11. Which mammal has the longest gestation period ?
12. Which living bird has the largest wingspan measurement ?
13. Which is the world's smallest butterfly ?
14. Which is the largest bird of prey in the world ?
15. Which is the fastest moving land snake in the world ?
16. Which has the thickest skin of any living animal ?
17. Which is the largest lizard in the world ?
18. Which is the longest lived insect ?
19. Which is the smallest member of the cat family ?
20. Which is the poisonous fish in the world ?
21. Which is the largest land crab in the world ?
22. How many dik-diks are killed to make a pair of gloves
23. The excrement of seabirds is used as commercial fertilizer. What is it called ?
24. What animal does the toy Teddy Bear represent ?
25. Which animal's hide was copied as camouflage for jungle warfare uniforms in World War II ?
27. Which animal's extract is used by the Javanese to flavour tobacco ?
28. From which animal does pashmina wool come from ?
29. What is a fox's tail called ?
30. What does the word Termite mean ?
31. What is a female Ass called ?
32. What does the word Reptile mean ?
33. Which animal's home is called a Drey ?
34. What does the word Dinosaur mean ?
35. What does the word Orangutan mean ?
36. Where does the word Civet come from ?
37. Which was India's first National Park ?
38. Where is the main rhinoceros sanctuary of India ?
39. In which country are hyenas eaten ?
40. Where did the Dodo live ?
41. Which animal is only found in the Little Rann of Kutch ?
42. Where in India is Hoolock's Gibbon found ?
43. Which country's government exterminated tigers as 'harmful to agricultural and pastoral progress' ?
44. Ornithophily
45. Head quarters of World Wildlife Fund
46. What is Crepuscular ?
47. Animals having summer sleep, what it is ?

ANSWER

1. The Alpine Spine- Tailed Swift
2. The Giant Squid
3. The Pygmy Marmoset
4. The African Goliath Beetle
5. The Galapagos Tortoise
6. The Bald Eagle
7. The Estuarine Crocodile
8. The King Cobra
9. The Thread Snake
11. The Asian Elephant
12. The Wandering Albatross
13. The Dwarf Blue
14. The Andean Condor
15. The Black Mamba
16. The Whale Shark
17. The Kamodo Dragon
18. The Queen Termite
19. The Rusty Spotted Cat
20. Japanese Pufferfish
21. The Coconut Crab
22. Two
23. Guano
24. Koala
25. The Leopard
27. The Civet
28 The Barbary Sheep
29. A Brush
30. End
31. Jenny
32. To creep
33. Squirrel
34. Terrible lizards
35. Man of the woods
36. It is Arabic for scent from the glands
37 Corbett National Park in Uttar Pradesh
38. Kaziranga, Assam
39. Egypt
40. Mauritius
41. The Asiatic Wild Ass
42. The mountain forests of Assam
43. China
44. Flower pollination by birds
44. The Great Barrier Reefs in Queensland
45. Gland, Switzerland
46 Twilight
47. Aestivation

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