Reintro Redeux

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Do we have the right tools in hand to contemplate a 'scientifically, biologically, socially and economically' viable reintroduction programme? As an international conservation community, yes. As an individual, or department or even a service ... maybe not. We need to know about small populations, threats, status, protection, animal behaviour, biology, veterinary science, monitoring, research, conservation, etc. for science. We need to know about human demography as well as culture, economics, communities, etc. for the social aspects of reintroduction. We need to know finance, sustainability, long-term plans, institutional backing, government support, etc. to define the economic aspects of a reintroduction project.

Reintroduction practitioners must consider many aspects of science, social factors and economics before setting off to reintroduce animals or plants to the wild. In our region there have been few instances of a proper planning of reintroduction. There have been many ad hoc release programmes, such as the release of surplus ungulates into forests, or convenient translocations of pesky monkeys. These are not reintroduction in any sense except "wrong reintroductions" – they are merely releases ... and "wrong releases" at that !

Reintroduction as a term is used too generously by organisations, agencies and individuals who need an "out" for wildlife problems. Releasing excess stock due to unplanned breeding or closure of zoos, head-starting crocodiles without managing habitats, or, rehabilitating injured animals or translocating problem animals are all acts of convenience with little if any adherence to basic tenets of reintroduction. **Reintroduction is a conservation tool to ease problems, not release problems!**

The articles published in this issue are examples of some release activities in India for the sake of documentation. As Editors and Chairs we salute the people who are courageous enough to report their releases in detail. This field is an evolving one and all experiences help us understand the complexity of reintroduction.

So, yes, the right tools are available to practice good reintroductions. The tools are the RSG guidelines which can be downloaded from the new RSG website www.iucnsscrsg.org. Once downloaded, however, the guidelines are not meant to be read and ignored but assiduously applied. Let every reintroduction practitioner assess his activity by comparing against the guidelines and try to use the guidelines more and better in future exercises.

Sanjay Molur & Sally Walker

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Rehabilitation of Indian Rock Python (*Python molurus*) in and around Kaziranga National Park, Assam, India

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Abstract
A brief note on the practice of python rehabilitation at the CWRC in Assam is presented. A total of 19 cases of python rescue is reported.

Keywords
Indian Rock Python, Kaziranga National Park, Rehabilitation

Rehabilitation is defined by the International Wildlife Rehabilitation Council (IWRC) as the treatment and temporary care of injured, sick, orphan, maimed wild animals and release of fit individuals back into the appropriate habitat. The Centre for Wildlife Rehabilitation and Conservation (CWRC), situated at Borjuri, near Kaziranga National Park, established with the efforts of the Assam Forest Department and The Wildlife Trust of India to cater to the needs of the displaced, orphan, sick, maimed and injured indigenous wildlife and release of healthy individuals back to appropriate habitats. The centre has been handling stranded and injured reptiles since inception, and successfully rehabilitated 91% (n=19) of them (Table 1). Out of the 19 cases handled at CWRC, 47.38% were trapped in villages as they preyed on livestock, while 86.42% of the cases admitted without apparent injury and 31.57% with injury while trapping and with dehydration requiring medical intervention. This article deals with the handling, treatment and captive husbandry of the "rescued" pythons at CWRC.

Initial examination

All the Python rescued were carefully screened for injury or behavioral abnormalities upon admittance. Efforts were made immediately to release them into a suitable habitat nearest to the place of rescue if the reptile did not have any injury or behavioural abnormalities.

Medical management of injured pythons

Among the rescued Pythons admitted 31.57% had lacerations of the skin and abdominal muscles. The following treatment protocol was followed:

1) Physical restraint and/or chemical immobilization with Ketamin HCl @ 25-30mg/kg body weight intra muscularly.

2) The lacerated wounds were cleaned with luke warm saline water (Normal saline 0.9%).

3) Wounds were derided and all the dead tissues were removed and curetted until there was no sign of bleeding.

4) Before closing the gap, topical antibiotics (Ampicillin) were applied liberally on the wounds.

5) The gaping of the wounds was closed by simple continuous sutures with chromic catgut 1/0 in the muscles and with B.B.Silk (6 metric) into the skin.

6) Parenteral antibiotics (Amoxycillin and Cloxacillin Injection, Inimox, Indian Immunological @ 10mg/kg body weight) administered depending upon the severity of the wounds from 3-7 days. Daily the sutures were examined and Neosporin Ointment (Neomycin and Bacitracin Zinc ointment) were applied into the suture line regularly until complete healing occurred.

7) In case of severe dehydration, the snake was immersed in luke warm saline water for up to 3 hours.

Captive husbandry

On arrival at the rescue center the snakes were carefully screened for assessing their health condition as well as injury, both external and internal. The snake was weighed on an electronic balance just after admission. If the snake showed its normal behaviour (antipredator behaviour, free locomotion) and also showed no signs of injury during moulting, then the snake was considered for immediate release, and was transferred to wooden release boxes (3 x 3 x 3ft) one side of which can be pulled up from above to facilitate release of the snake without handling.

However, if the snake was found injured it was housed in a rectangular wooden box of 6 x 3 x 3ft in dimension. Boxes were provided with 1ft^2 chain link mesh areas on either side for inspection and ventilation. Provision was kept for artificial heating by UV lamp from top if necessary. Some portion of the wire mesh was kept covered so that the floor received some shade. The floor of the enclosure was provided by newspaper and was changed everyday. Bunches of hay were provided in some cases and were changed at an interval of 2-3 days. Enrichment needs were taken care of by providing some rough textured surfaces like tree barks, base of bamboo clumps, which were sun dried before placing to enable moulting snakes to slough their skin. The snakes were supplied heat with the help of a UV lamp. During flood seasons when displaced and stranded python rescue cases increased manifold, some snakes were temporarily kept in a plastic bucket of 50l capacity with lid. The coverlid was removed and a plastic insect propelling net was put for ventilation and observation. Everyday the holding bucket was cleaned and disinfected with Chlorohexidine while the

Table 1. Rescue detail and final disposition of Indian Rock Python at CWRC (2002-2004)

	Date of rescue	Place of rescue	Reason of rescue	Condition on arrival	Age category	Sex	Final disposition
1	10-7-02	Panbari village	Swept by flood	No injury	J	U	Released same day in Panbari RF (PRF)
2	11-07-02	Panbari village	Swept by flood	No injury	J	U	Released same day in PRF.
3	12-07-02	Panbari village	Swept by flood	No injury		U	Released same day in PRF.
4	18-07-02	Geleki village	Prayed on livestock	No injury	A	M	Released in Kohora range of Kaziranga National Park (KNP)
5	20-07-02	Rongajan	Prayed on livestock	No injury	A	M	Released next day in Mihimukh, KNP.
6.	12-08-02	Bokhakhat town	Displaced	No injury	A	M	Released in Agaratoli, KNP
7	29-09-02	Diphuloo pathar	Displaced	Starved and dehydrated	A	F	Treated and released on 30-09-02 in PRF
8	02-11-02	Diphaloo pathar, Sonari gaon	Displaced	No injury	J	U	Released same day in PRF
9	21-00-03	Bokakhat	Displaced	Dehydration marked	A	M	Treared and released next day in PRF
10	13-05-03	Panbari Village	Displaced	No injury	A		Released same day in PRF
11	21-05-03	Diphloo pathar	Displaced	No injury	A	F	Released same day near Sohola beel, Agoratoli, KNP
12	04-07-03	Dipholoo pathar	Prayed on livestock	No injury	J	M	Released near bher-bheri camp, KNP
13	17-07-03	Dipholoo pathar	Prayed on livestock	No injury	A	M	Released same day in Khora, KNP
14	23-10-03	Borjuri, Bokakhat	Displaced	No injury	A	M	Released same day in PRF
15	23-12-03	Diffalu Pathar, Bokakhat	Prayed on livestock	Spear Injury	A	F	Released after treatment on 29-12-03 in PRF
16	30-5-04	Panbari Village	Prayed on livestock	Spear Injury	A	M	Released after treatment on 8-6-04 in PRF
17	13-06-04	Tamuli pathar, KNP	Prayed on livestock	Severe Spear Injury	A	M	Died on 4-7-04 due to septicemia.
18	29-7-04	Panbari Village	Prayed on livestock	No injury	A	M	Relesed on 30-7-04 in PRF
19	30-7-04	Panbari village	Prayed on livestock	Lacerated wound over skin, muscle	A	M	Treated and released on 8-8-04 in PRF

M - Male; F - Female; U - Unknown; A - Adult; J - Juvenile; PRF - Panbari Reserve Forest; KNP - Kaziranga National Park

reptile was handled for examination.

Injury treated python were initially force fed by protein soups administered by 15ml disposable syringe attached to a rubber pipe (infant feeding tube) one end of which was inserted into oesophagus of the snake and then slowly discharging the content of the syringe (Fig. 1). One Python, which was treated for spear injury, had consumed dressed chicken. However, the next time it cosumed live food. Live chicken, guinea pigs and rats were provided as general food.

Release procedure

1. Veterinary screening before release: All the reptiles were medically examined prior to release for signs of any diseases, especially those spending more than 72 hours in captivity.

Faecal samples of the pythons prior to release were examined by floatation and sedimentation methods, and deworming was considered with broad-spectrum anthelmintics (Albendazole @10mg/kg body weight) in case of heavy infestation. For ectoparasites, topical herbal sprays (Topicure, Indian Herbs) were used.

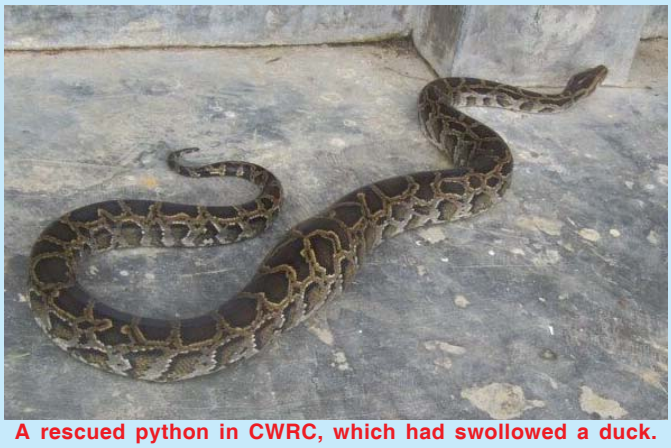
2. Selection of release site: A number of areas were selected in and around the Kaziranga National Park. The criteria for selection of sites being the following:

- Close to the place of rescue
- Type and quality of forest
- Distance from human habitation
- Availabity of prey base
- Availability of preferred microhabitats.
- Pre-existing population of the same species.

3. Marking of snakes selected for release: Though advanced methods of individual marking exist like microchipping, due to different constraints, especially financial, a cheap and easy method had to be selected. Thus, the method followed was that of clipping of subcaudal scales in a unique pattern for each individual (Blanchard & Finster, 1933). The head and neck portion of each marked individual were also photographed so that they could be later identified using characteristic head and neck patterns.

4. Time of release: Generally release operations were carried out at dusk mostly between 1700 and 2000hr, taking into account the biology of the snake and the need to maintain secrecy. However, release timing shows

Figure 1. The feeding method of a injured Cobra (*Naja kaouthia*) at CWRC, Kaziranga National Park.



A rescued python in CWRC, which had swollowed a duck.

deviation during flood season (June-August) when frequency of animal rescue increased manifold.

Release day preparation

1. Each individual to be released was carefully taken out of the enclosure and data on length and weight were gathered.

2. Verification of individual sex was done by gently inserting a blunt probe of appropriate size (Schaefer, 1934) into the cloaca to locate presence of hemipenis.

3. The snakes were then transferred to gunny bags and placed inside aerated wooden boxes for transportation by a rescue van.

4. Co-ordination was ensured between the forest staff at the various release sites so that the operation could be carried out smoothly.

Actual Release

1. The release operation was conducted during dusk, at prescribed spots selected previously.

2. The data on broad vegetation type, microhabitat and behaviour at the time of release were noted.

3. Post caudal scale clipping marks of the pythons to be released were shown to the local forest staff involved in the operation, to assist them in post release monitoring and individual identification in case of recapture.

Monitoring

Among all released python only one python (No. 15) which was treated for spear injury and subsequently released was again rescued for the same cause from Panbari village. However, the python was rescued uninjured the second time.

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Rehabilitation of a White Winged Duck (*Cairina scutulata*) at Dibru-Soikhowa National Park and Biosphere Reserve, Assam

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Abstract
Forest department personnel at Dibru-Soikhowa National Park, Assam, spotted a pair of White-winged Duck (*Cairina scutulata*) while on patrol. When the staff approached close one of the birds dropped to the ground trying to take flight. The forest staff restrained the bird physically, which apparently looked sick, took it to the mobile veterinary facility at Guijan Wildlife Range of the park for treatment and rehabilitation. The report puts into record of the rehabilitation process of the bird undertaken in captivity.

Keywords
Dibru Saikhowa, rehabilitation, White-winged Duck

Dibru-Soikhowa National Park is situated on the south bank of river Brahmaputra in the extreme east of Assam. Situated in the flood plains of Brahmaputra, Dibru-Soikhowa comprises of semi evergreen deciduous forests, littoral and swamp forests and patches of wet evergreen forest and hence is the safe haven for many extremely rare and endangered species of wildlife (Anon., 1998).

The White-winged Duck (*Cairina scutulata*) is a threatened species (IUCN) listed in Schedule I Part III under the Indian Wildlife (Protection) Act, 1972 (amended up to 2002). The species is facing threat of extinction due to destruction of its natural habitat in the state of Assam and Arunachal Pradesh (especially due to selective felling of old and mature trees), and expansion of agricultural land (Choudhury, 1998). Reclamation, siltation and pollution of wetlands inside forest, and hunting including collection of eggs and capture of live ducklings are other significant threats (Choudhury, 1998). Information collected from the patrolling forest staff reveal that sighting of the species is very rare for last three years at Dibru-Soikhowa National Park and existence of this species was doubted for the last few years. The rescue of this female bird along with sighting of the pair by the forest guards in Dibru Soikhowa National Park itself is considered an invaluable information for the park management.

Case history

As per report of the patrolling forest staff, on 10 December 2003, a pair of White-winged Duck was spotted roosting in a dead tree at Tongkrong area under Guijan Range of the park. The birds took flight when the patrol staff went close but the female dropped to the ground. The guards physically restrained it and found it to be very weak. They decided to shift the bird for treatment to the range office at Guijan where the mobile veterinary service unit of the Wildlife Trust of India was based.

Clinical Examination

The body weight of the bird was 1.75kg when received; wing span: 121cm, body length (beak to tail feathers): 79cm. On clinical examination there was marked dehydration accompanied by unthriftyness, prominent keel bone and soiled vent was noticed. Symptomatic treatment was initiated immediately with oral rehydration salts and supportive therapy. Stool sample was screened for endoparasites by both flotation and sedimentation method as described by Soulsby, and found to be negative for parasitic ova or larva.

Treatment

On 10 December 2005 the bird was gavage fed 100ml Electrosol (Benmed Laboratories Pvt. Ltd; Kolkata) @ 10% of the body weight orally with a sterile infant feeding tube of 09 size (Ramson Science and surgicals, Agra). It was followed by intra muscular injection of 0.3ml B complex vitamins (Polyvet injection, Intas Pharmaceuticals) in the breast muscle with an Insulin syringe (Ramson Science & Surgicals, Agra). The same treatment regimen was followed the next day. On 12 December as the condition did not improve, the bird was given 15mg Cephalexin powder, an oral broad spectrum antibiotic, @ 7.5mg/kg body weight (Lixen powder, Legend Pharmaceuticals) by mixing with 100ml Electrosol orally with a feeding tube and continued for next four days. Vitamin B complex injection was repeated on alternate days on the same dosage and route. The bird showed signs of recovery from 13 December and stool consistency appeared normal. The bird also acceted the natural food provided (algae, fish lings etc) in captivity.

Housing in captivity

The bird was kept at Guijan Wildlife Range Office premises under strict confined condition inside a room in a cardboard box for the first four days. Paddy straw and blanket were used as bedding material to avoid hypothermia and injury to the keel while in captivity.

Feeding in captivity

From 12 December 2005, it was offered algae collected from the park (species not confirmed) and fishlings (50g each) which the bird readily accepted and continued

Figure 1. White-winged Duck gulping fishling

for next two days. The food was offered in a stainless steel container.

Soft release

To assess the bird for recovery, on 15 December 2003 the bird was decided to transfer to a bigger enclosure inside the natural habitat where its activities could be recorded by visual examination from a distance. Therefore a suitable site was selected inside the Park near an antipoaching camp (Kolomi Camp) where a small natural water body was covered by fishing net from all the sides including the top to prevent the bird from escaping and a small dead branch was provided for perching. The bird showed its natural behaviour of feeding and grooming inside the enclosure (Fig. 1). The bird was kept under supervision of the forest personnel of the camp and its activities were monitored from a distance for the next two days. At night the bird was shifted inside the camp to avoid predation. The bird was provided 100g of fishlings every day; thrown from a distance into the water of the confined area in the morning and at noon. The bird readily took the fish.

Release

From 16 December morning the bird started taking small flights and flapping its wings. It was then decided finally to release the bird. On 17 morning the bird was recaptured and transported in a cardboard box to the released site. The bird was released to the wild at 1130hr on 17 December 2003 at Salibari area near Kolomy camp. The area comprises of a wetland with thick woodland surrounding and the species was sighted earlier by forest staff. The bird walked a while and then entered inside the bushes and finally with a low flight disappeared inside the woodland.

Post release monitoring

A red plastic ring was put in the left limb of the bird for identification and telephone number of the Forest Office was marked there with permanent marker. Visual monitoring was done in the area for the presence of the bird for the next ten days. No sign of the bird was found in the area.

Discussion

Correcting dehydration and stress management of wild captured birds is essential to increase chances of survival in captivity and to respond to treatment. From clinical symptoms it seems that the bird suffered from bacterial or mixed enteritis. Antibiotic Cephalexin is found to be effective and safe for gastrointestinal disorder of White-winged Duck. Intra muscular injection with B complex also produced prompt result and the injection site was found suitable.

Conclusion

Wildlife rehabilitation is a nascent science in India. Very often injured, orphan or sick animals are rescued by the forest department staff, but due to unavailability of adequate veterinary support and due to biological ignorance many of such attempts result in death of animals or birds. Although rehabilitation of individuals of a species hardly contribute to the conservation of the population, threatened species like the White-winged Duck, where only a few hundred individuals are left in the wild, definitely justifies human intervention in temporarily disadvantaged individuals. By these interventions valuable biological information can also be collected which are otherwise difficult to collect, which is of immense importance for the long-term survival of the species.

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Population of Mugger Crocodiles in Neyyar Wildlife Sanctuary, Kerala, India

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Abstract

The population of the released Mugger Crocodile was studied from May 2000 to December 2001 in Neyyar Wildlife Sanctuary, Kerala. The study was mainly based on observation methods. Twenty-one to 25 crocodiles were estimated in the Neyyar Reservoir during the month of May 2001. But only 10 to 16 crocodiles were estimated to be present in the Reservoir towards the end of the study. This is because, nine crocodiles were removed from the reservoir during the period.

Keywords

Kerala, Mugger Crocodile, Neyyar Wildlife Sanctuary, population

Mugger Crocodiles (*Crocodylus palustris*) were released into the Neyyar Wildlife Sanctuary as part of the Crocodile Conservation Project launched in the Kerala with the joint effort of the Government of India, U.N.D.P. and F.A.O. of the United Nations. Two captive-breeding centres were established in Kerala, one at Neyyar and another at Peruvannamuzhi during 1977 (Pillai, 1999). The purpose of the breeding centres was to breed the species in captivity and to release them into protected areas. From 1985 onwards, the crocodiles in Neyyar Wildlife Sanctuary have attacked local inhabitants along the banks of the reservoir many of whom were injured in the process. Further introduction of crocodiles in the reservoir was stopped after the initial release of 29 crocodiles in 1983. This led to increase in the captive population of crocodiles. This is causing severe management problems and the animals have no proper place for movement in the pens.

Only few studies have been conducted on the crocodiles of Kerala. Rosamma (1993) conducted an ecological study on the crocodiles of Neyyar reservoir where they report a population of 50 crocodiles. Similarly, Pillai (1999) also reported on the crocodiles of Kerala. A preliminary survey of crocodiles was carried out in Kabini river also (CSG, 1995). Jayson *et al.* (2006) reported the human-crocodile conflict in the Neyyar Reservoir. There has been no recent report regarding the status of crocodiles in Neyyar and the present study report the population status of crocodiles in the Neyyar reservoir.

Study Area

The Neyyar Wildlife Sanctuary, declared in 1958, is situated in the Thiruvanathapuram district in Kerala, India (Fig. 1). The area is 128km^2 and lies between 8^{0}17'-8^{0}53'N & 76^{0}40' -77^{0}17'E and is situated in the southern tip of the Western Ghats. The Neyyar dam was built on the Neyyar river in the early 1940s for the purpose of irrigation and the expanse of the reservoir is 8.45km^2. The entire area is rugged with undulating terrain with many rivers, streams and their tributaries in the sanctuary.

The major vegetation types in the sanctuary are west coast tropical evergreen, southern hilltop tropical evergreen, west coast semi evergreen and southern moist mixed deciduous forests. Typical trees in the evergreen forest are *Palaquium ellipticum, Calophyllum tomentosum*, *Hopea parviflora* and *Cullenia excelsa*. *Xylia xylocarpa*, *Grewia tiliaefolia*, *Lagerstroemia lanceolata* and *Schleichera oleosa* are the typical trees in the moist deciduous forest. Climate is tropical with heavy rainfall and high temperature and both southwest and northeast monsoons are prevalent. But maximum precipitation is obtained from the northeast monsoon during the month of September. Temperature varied from 16^{0}C to 35^{0}C and water level in the reservoir varied during different months. Except for the months of March to June, the water level was above 80m and lowest level of water was found during the month of May.

Methods

The study was conducted from May 2000 to December 2001. Population counts of Mugger Crocodiles were made in the whole reservoir by direct sighting and by indirect evidences by walking along the banks of the reservoir and from boats including all the rivers and creeks. Night counts were made using searchlights from a rowing boat and the light reflecting from the eyes of the crocodile helped to detect the animal. Crocodiles above 1.6m in size were categorised as adults and those between 1.2m and 1.6m as sub adults (Arumugam & Andrews, 1993). In each month, all the areas of the reservoir were visited and direct and indirect sighting of crocodiles were recorded. Indirect evidences were the presence of footprints, body and tail imprints on the bank of the reservoir. A total count census (night and daytime count) was done in the month of March 2001 with the help of the officials of Kerala Forest Department and volunteers. Twenty-nine Mugger Crocodiles were reintroduced into the reservoir in the year 1983 and crocodile attacks on livestock were reported from 1985 onwards.

Results and Discussion

Population assessment of Mugger Crocodiles: Surveying in rowing boats and walking through the banks were the most successful methods. The team spotted Mugger Crocodiles easily when they basked on the banks of the reservoir. Muggers were also spotted when they were swimming in the lake. By repeated sighting of a crocodile in a given area, it was possible to assign a territory to the identified individuals. In this way, the number of

Muggers in the reservoir could be estimated, apart from the complete census carried out in March 2001. The best months for censusing the crocodiles in Neyyar reservoir are April and May when the water level is the lowest and banks are exposed to the maximum. By selecting these months, the basking crocodiles can be detected easily.

Direct observations: An adult crocodile with 10 young ones was recorded in the month of May 2000. Most of the Muggers sighted in the reservoir were adults of more than 3m long. Only few instances of subadult crocodiles were recorded. Eggs of crocodiles were found in the sanctuary during the breeding seasons of 2000 and 2001. However, during 2002, no eggs were recorded from the area. Even though hatching and young ones were recorded in May 2000, no hatching and young ones were recorded in 2001 and 2002. Based on the sighting of crocodiles, the number of crocodiles in the sanctuary was estimated as 25 to 35 animals during January 2001.

The results indicated that sighting of Muggers was low in general. There was no significant difference in sighting of crocodiles between wet (June- December) and dry season (January-May) ($t = 0.80$; $P = 0.45$; $df = 8$). This was mainly because the number of crocodiles was low in the Neyyar reservoir. This was proved with a single visit to Parambikulam Wildlife Sanctuary, where six crocodiles were sighted within one and half hours of boat survey. Only eight hatchlings and one subadult crocodile were recorded from the Neyyar reservoir. Detailed sighting records of crocodiles in each month are given in Table 1.

Indirect evidences: Nine faecal samples of crocodiles were collected from the bank of the reservoir. This provided indirect evidence of crocodiles in certain areas and helped in the estimation of crocodile population in the reservoir. Main avian predator of young crocodiles at Neyyar reservoir was identified as Crested Serpent Eagle and Little Cormorant. Details of identified crocodiles are given in Tables 2 and 3.

In the released and established population of crocodiles, many juvenile crocodiles get entangled in fishing nets and are drowned in the reservoir. Local people destroy crocodile eggs whenever they are located in the sanctuary. Due to these reasons, recruitment to the population of crocodiles is low or almost nil at Neyyar.

After the two casualties in January 2001 and August 2001, nine large crocodiles were caught from the reservoir; four died due to various reasons. All these crocodiles except for one were more than 3m in length. Taking this into consideration it is estimated that only 10 to 16 crocodiles were left in the wild, when we consider the lower limits of the population estimated in the reservoir. Some crocodiles may have been poached when the two human causalities occurred during the period of study.

Census: Complete census of crocodiles in the reservoir was conducted from 18-20 March 2001 with the help of Kerala Forest Department and NGOs. In this census, 12 crocodiles were found in areas of the reservoir adjoining the human habitations and two animals in the interior areas. It is recommended to census the crocodile population in the Neyyar reservoir every year when the level of water is at its lowest, usually in the month of May. Continuous monitoring of crocodile population is necessary to avoid conflicts with human.

Table 1. Direct sighting of Mugger Crocodiles in the Neyyar reservoir during the months of May 2000 to December 2001

Month	Date	Area	Time	No. of crocodiles	Size
	08.05.00	Boat landing	0830	1	Large
	09.05.00	Kombai	0730	1	Large
May 00	09.05.00	Aruvipuram	0820	1	Large
	09.05.00	Kottamanpuram	0830	8	Hatchlings
	10.05.00	Kombai	1100	2	Large
Oct 00	26.10.00	Kanchimoodu	1000	1	Large
	27.10.00	Puravimalai	0900	1	Large
Nov 00	14.11.00	Boat landing	0800	1	Large
	15.11.00	Puravimalai	0930	1	Large
Dec 00	19.12.00	Mayam	0830	2	Large
	19.12.00	Boat landing	0900	1	Large
Jan 01	05.01.01	Boat landing	0800	2	Large
Feb 01	14.02.01	Mayam	1000	1	Large
Mar 01	21.03.01 to 23.03.01	Whole area Census	1400		Large
	18.05.01	Safari Park	1100	1	Large
May 01	18.05.01	Karumankulam	1200	1	Large
	16.06.01	Mayam	1030	1	Large
	17.05.01	Puravimalai	1100	1	Large
	25.06.01	Kottamanpuram	1200	1	Large
Jun 01	25.06.01	Puravimalai	1250	1	Large
	26.06.01	Puravimalai	0800	1	Large
	26.06.01	Narakkavu	1500	1	Large
July 01	24.07.01	Aruvipuram	1400	1	Large
Aug 01	10.08.01	Safari Park	1500	1	Large
	13.08.01	Puravimalai	1030	1	Large
	14.08.01	Mayam	1600	1	Sub-adult
	15.08.01	Anamugam	1100	1	Large
	16.08.01	Puttukallu	1000	1	Large
	20.08.01	Kumbichal Kadavu	0700	1	Large
Sep 01	20.09.01	Pantha	1000	1	Sub–adult
	20.09.01	Kottamanpuram	0900	1	Large
	23.09.09	Boat landing	0930	1	Large
	24.09.01	Kombai	1030	1	Large
Oct 01	09.10.01	Ulattimoodu (Mayam)	1030	1	Sub–adult
	18.10.01	Pantha	1100	1	Sub-Adult
Dec 01	15.12.01	Pantha	1030	1	Sub-adult
Dec 01	18.12.01	Pantha	1030	1	Sub-adult

Crocodiles are threatened by many human activities. Foremost and the most significant among these is the destruction or alteration of habitat. In the past, commercial overexploitation and indiscriminate killing have resulted in many species suffering drastic decline in numbers and reduction in distribution. Overexploitation combined with severe habitat loss has brought several species to the brink of extinction.

Crocodilians of all species depend wetland habitats. Different species have varying preferences and

Table 2. Number of Mugger Crocodiles estimated near the human settlement areas of Neyyar reservoir (May 2001)

S.No.	Area	No. of crocodiles
1.	Chembur	1 (Caught and died, 02.04.01)
2	Chembur	1 (Caught, 25.05.01)
3	Pantha	1 (Killed, 16.08.01)
4	Parathi	1 (Caught, 09.09.01
5.	Kombai	1 (Caught, 01.10.01)
6.	Mayam	1 (Caught and died, 02.10.01)
7	Lion Safari Park	1
8	Kappukad	1
9	Puravimalai	1
10.	Mayam	1
11.	Anamugam	1

Table 3. Number of Mugger Crocodiles estimated near the interior forest areas of Neyyar reservoir (May 2001)

S.No.	Area	No. of crocodiles
1.	Kottamanpuram	1 (Caught, 25.09.00)
2	Kottamanpuram	1 (Caught and died, 03.10.01)
3	Pazhinipara	1 (Caught, 01.10.01)
4	Aruvipuram	3
5	Kombai	1
6	Mullayar	1
7	Meenmutti	2

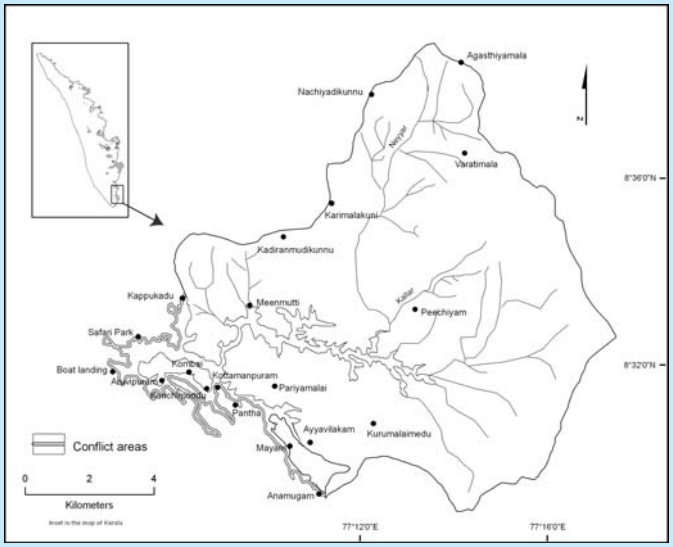

Figure 1. Neyyar Wildlife Sanctuary showing human-crocodile conflict areas

requirements, the crocodilians have adapted to most available tropical and subtropical wetland types (marshes, mangroves, rivers, lakes, lagoons, etc.). Because crocodiles are quite large animals and as they grow from hatchling to adult, they require habitat that is both large and diverse. Rural people are often intolerant of large and potentially dangerous crocodiles and deliberate destruction of both nests and adults has been widely reported from the Andamans, China, Bangladesh, Madagascar and Neyyar. Conservation of crocodilian population is therefore highly dependent upon providing incentives to maintain crocodiles and their habitats in a relatively undisturbed state, and a willingness to accept management practices that allow crocodiles and humans to co-exist.

One cannot relate the human attacks to scarcity of food in the case of crocodiles. Crocodiles of a sufficiently large size usually attempt to prey on larger animals including humans in vulnerable locations independent of other food sources or lack thereof. It might be generally true that extremely well fed crocodiles with an abundance of natural prey might be less likely to prey on people, but this is not a certain rule. The relative size of prey, prey behaviour and particularly the apparent vulnerability of prey, all may be involved in a crocodile's 'decision' to attack. People, particularly of smaller stature (women and children), at the water's edge or in the water, distracted by other activities (washing, fishing), following predictable daily patterns of movement and becoming complacent about crocodiles are likely to be attacked sooner or later. Crocodiles are careful, opportunistic and patient (Perren Ross, pers. comm.).

The best solution is to change people's behaviour so that they are unlikely to encounter crocodiles in the crocodile's habitat. The provision of enclosures within which people can access the water's edge in safety to wash, collect water etc. is a simple and feasible solution. This is not feasible at Neyyar due to the long distance of 26km and undulating water table and the steepness of banks. It is also possible to manipulate the size distribution of the crocodiles, removing some of the larger and more dangerous individuals to other locations (Ross, 1998). Walsh and Whitehead (1993) also suggested capturing problematic crocodiles for relocation as a management strategy in Australia. Another strategy to manage the crocodile populations is to treat them as a resource (Brazaitis, 1983) and utilise them.

Due to social commitments, it is practically not possible to relocate people from the fringes of the Neyyar reservoir to other areas. Except for a few recent encroachers on the bank of the reservoir, majority of the people have been staying there even before the crocodiles were released into the reservoir. From our studies, it is clear that even if the local population is provided with drinking water they will continue to utilise the reservoir for bathing, fishing and washing of cattle. During summer, people from far away places also depend on the reservoir for drinking water and bathing. Taking bath in the reservoir has become an age-old practice, which the local people are not ready to give up. This happens all along the length of 26km of the reservoir where people reside.

As the local inhabitants dump waste food materials, including meat, in the reservoir, there is an added attraction for crocodiles to be near human habitations than the interior forests. As the herbivore population is low in density, crocodiles are always attracted towards the populated areas from where easy prey like dog, cow, goat and poultry and discarded waste food are easily available.

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Rescue and Rehabilitaion of Burmese Rock Pythons (*Python molurus vivittatus*) with Implications for Conservation of Urban Wildlife

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Abstract

Urban wildlife especially in expanding cities are losing ground to increasing human population, forest degradation and encroachment. Rescue and rehabilitation of wild animals such as Pythons is not only a challenge but also an issue that has greater implications for the future. This paper discusses one such exercise that was undertaken at the Assam state zoo that can be replicated in other areas.

Keywords

Assam, Burmese Rock Python, IUCN guidelines, marking, release, rescue, site selection.

Zoos, especially in northeastern India face the immense challenge of rescuing a large number of strayed or injured wild animals. Areas such as Guwahati in Assam have rapidly urbanized only in the last one decade and forested tracts still remain within the city limits. The city of Guwahati, lies on the banks of the river Brahmaputra in western Assam and falls under the civil district of Kamrup, which has a total area of 4345km^2 and a population of around 26 lakhs (2001 census). This makes it one of the most densely populated districts in Assam with a density of over 581 persons per km^2. The city also cradles within itself seven reserve forests (Garbhanga, Sarania, Fatashil, Gotanagar, Kalapahar, Hengrabari RFs), one wildlife sanctuary (Amchang) and numerous wetlands or beels that serve as important watersheds and also for providing habitat to a rich amalgamation of flora and fauna.

Assam State Zoo (ASZ), established in the year 1957, is a large zoo located in the heart of the Guwahati city. It is unique not only for its list of zoo captives that include 87 species of rare and endangered fauna but also for its botanical gardens that house more than 600 species of indigenous and exotic species of plants. The zoo within its walled boundaries has a natural setting with undulating terrain, natural water bodies, lush greenery and a number of free-ranging and released animals, thus making it one of the finest centers for *ex situ* conservation in Northeast India.

Besides the day to day upkeep and fulfilling the various objectives laid down by Central Zoo Authority such as captive breeding of endangered species and environment education, the ASZ also performs the role for temporarily housing and treating rescued animals procured from various places in Assam. Such animals could be rescued (e.g. stray leopards and pythons), abandoned (e.g. elephant calves in a herd), injured (e.g. adjutant storks in a road accident) or captured (e.g. soft shell turtles being sold in the market for meat) or donated (e.g. exotic birds kept as pets). Very often, it is the zoo staff along with the veterinarians who undertake rescue operations and although the ASZ is not a designated rescue center, the animal is temporarily kept and treated due to ethical and logistical reasons.

This paper discuses the details of a successful operation of rescue and release of 19 wild caught pythons that was recently undertaken at the ASZ.

Rescue of Burmese Rock Pythons: The Burmese Rock Python (*Python molurus bivitattus*), as listed under Schedule I (Part II) of the Wildlife (Protection) Act, 1972 is a common snake found in Assam. It inhabits the moist deciduous and semi-evergreen forests and is also tolerant to scrub near human habitations to some extent. It has been observed that every year during summer, Pythons emerge out of their dwellings in forests near the water bodies and thus come into conflict with humans. Since in general, snakes are considered poisonous and dangerous the people panic and try to harm or chase them away. The rescue team of Guwahati Zoo is then compelled to take the python and keep it within the zoo premises.

The zoo is not a rescue center and according to Central Zoo authority and IUCN guidelines the animals rescued must be either

a) released back into the same place from where captured OR

b) released back into a place nearest to the place from captured OR

c) released back into a place similar to its original habitat and climatic conditions.

In case of the pythons it was observed that it was almost impossible to rehabilitate them in the locations from where they were rescued (Table 1) because of high density of human habitation and hence the first criteria of the guideline was not achieved. Attempt was therefore made to release them back to the place nearest to the place captured and also in places similar to its original habitat.

Methodology

The rescued pythons, after treatment were housed in the enclosure along with the others. Several of them had already been successfully released in the zoo forest, however it was observed that the zoo area of 175ha could only support a certain number of these species and hence this practice was abandoned. The numbers rose to more

Table 1. Details about the rescued pythons at the zoo

S.no.	Date of Rescue	Area from	Remarks
1	11-02-04	Near Dipar Beel	Found in healthy condition
2	28-02-04	Sualkuchi	Found in healthy condition
3	09-03-04	Maligaon	Found in healthy condition
4	22-03-04	Panbazar	Found in healthy condition
5	28-03-04	Panjabari	Found in healthy condition
6	30-04-04	Kalapahar	Found in healthy condition
7	19-05-04	Jagiroad	Found in healthy condition
8	31-05-04	Mailigaon	Found in healthy condition
9	14-06-04	Panikhaiti	Found in healthy condition
10	25-06-04	Near Rani Reserve forest	Found in healthy condition
11	03-07-04	Panbazar	Found in healthy condition
12	11-07-04	Garchuk	Found in healthy condition
13	13-07-04	Garchuk	Found in healthy condition
14	15-07-04	Bharali	Found in healthy condition
15	20-07-04	Dispur	Found in healthy condition
16	27-07-04	Sonapur	Found in healthy condition
17	28-07-04	Beltola Chariali	Found in healthy condition
18	07-08-04	Lakhipur Range	Found in healthy condition
19	12-09-04	Bharalumukh	Found in healthy condition
20	10-03-05	Bhanlumukh	Found in healthy condition
21	11-04-05	Morigaon	Found in healthy condition
22	2.06.05	Kachari	Found in healthy condition

than 25 in June 2005 while the new enclosure being constructed could only house a maximum of four pythons. The pythons were provided a weekly diet of 500g of meat and live chicken and were quite healthy. Only the space constraint made it imperative that some were released. A systematic release plan was thus planned the steps for which are as follows:

1. Selection and marking of pythons: A total of number of pythons were found fit for release after physical examination by the veterinarians. Each individual was marked by clipping two scales in the subcaudal region (Blanchard & Finster, 1933). The scales clipped were in succession for e.g. in case of the first python to be marked, the second left and right scale from the cloaca were clipped, while incase of the second python it was the third left and right scales and so on. This way each individual could be uniquely marked and would be useful in providing information in case it was recaptured. The length and body weight were taken. Scale patterns on the head are also said to be unique and photographs for the same were also taken as records.

2. Selection of release site: A number of reserve forests near Guwahati were selected. The criteria for selection was mainly the type and quality of forest, distance from human habitation and logistical support. It was also decided that not more than three pythons would be released at the same location, thereby maximizing their chances of survival. In total 10 sites were selected for the release of 19 pythons.

3. Releasing day preparations: Coordination was ensured between the forest staff at the various release sites and the zoo staff. The time of release was planned in the late evening, as the pythons are most active then. Secrecy was maintained so that the local public residing in the nearby villagers do not become aware of a 'snake' amidst them. The pythons were transported in gunny bags to the release site.

Table 2. Details of released pythons in and around Guwahati city

Python ID	Sex	Length (m)	Weight (kg)	Location	Habitat type
1	F	2.9	7	Lokhara	Moist mixed forest, near small rivulet
2	M	3.1	6.5	Lakhara	Moist mixed forest, near grassy cliff
3	F	2.85	9	Amchang	Dry scrub with small waterbody
4	M	4	14	Amchang	Dry scrub with small waterbody
5	M	2.73	10	Amchang	Moist mixed deciduous forest
6	M	2	3	Apricola	Bamboo patch
7	M	2.94	7	Apricola	Moist mixed forest
8	F	2.81	8	Matapahar	Scrub forest with rocky outcrop
9	F	2.97	8	Matapahar	Scrub forest with rocky outcrop
10	M	2.3	7	Morokdola	Bamboo patch
11	M	2.9	6	Laokhowa	Grassland
12	F	2.75	11	Laokhowa	Grassland near waterbody
13	M	3	11	Laokhowa	Grassland near waterbody
14	M	1.85	4	Panikhaiti	Near brahmaputra river
15	M	1.70	6	Panikhaiti	Moist mixed deciduous forest with small rivulet
16	F	2.30	10	Panilhaiti	Moist mixed deciduous forest with small rivulet
17	M	2.15	8	Bashishtha	Plantation forest
18	F	3.0	13	Bashishtha	Moist mixed deciduous forest
19	M	1.85	10	Dipar beel	Moist mixed deciduous forest near waterbody

4. Release: Once the selected forest was reached, the local staff was asked to take the release team near a stream or beel near rocks, as this was best-suited habitat for pythons. A single python was released at a specific location and the time and type of vegetation was recorded.

Results

Nineteen pythons were released successfully. One was found unfit for release while two died during the operation, possibly due to handling stress. It was observed that pythons released near a water body had the maximum chances to escape and survival. The snakes took to water almost immediately after they were removed from their bags. It was observed only during the operation that pythons were expert swimmers. Grassland and rocky habitats near a waterbody were found to be the ideal habitats for release. Due to shortage of time the prey base in the given habitats could not be ascertained, however the fact that there were no reports of recapture of strayed pythons indicates that they had suitably adapted themselves to their new homes.

Conclusion

Rescue and rehabilitation operations have been carried out for many large mammals (Jayawardane, 2005), birds (Choudhury *et al.*, 2005) and some reptiles (Choudhury & Rao, 2005). Most of these follow species and site-specific methods. However, such operations in reptiles, especially snakes largely remain undocumented

and untried particularly in India.

Unlike mammals, reptiles do not get easily imprinted and do not require large tracts to survive. They are also less prone to zoonotic diseases and therefore best suited to replenish a stock in the wild. Cities like Guwahati receive a large number of rescued animals every year. More than 89 number of animals of 41 different species were rescued in the year 2004-05 alone. This indicates that inspite of all the biotic pressures there is a plethora of wildlife still struggling to survive in these urban forests.

Habitat fragmentation and degradation are one of the main causes, however, the task becomes even more difficult because very little is known regarding population sizes and behaviours of most of these wild animals. Research work conducted on leopards in places like Mumbai indicate that habitat degradation, territorial behaviour of the animal combined with proliferation in breeding had resulted in several of the subadults coming into conflict with humans.

While the environmentalists vouch for a green cover in our urban areas to negate the effects of pollution, the quality of these forests especially for the wildlife that dwells in these forests needs to be looked at. Collection of fuelwood and fodder, mining and blasting, grazing and hunting are some of the issues that need to be curbed around a city while protecting its wildlife. Similarly city planners can show a little sensitivity by preventing encroachments and squatters, monoculture plantations and use of forests as dumping grounds for waste and refuse. The citizens can play their role in creating awareness and by coming together to fight against the use of non-degradables such as plastics and also for the use of any wild animal for meat or in the pet trade.

The Burmese Rock Pythons perhaps have a better chance to survive but the other wildlife fight a losing battle in our cities. The issue needs immediate attention for protection and conservation of such wildlife.

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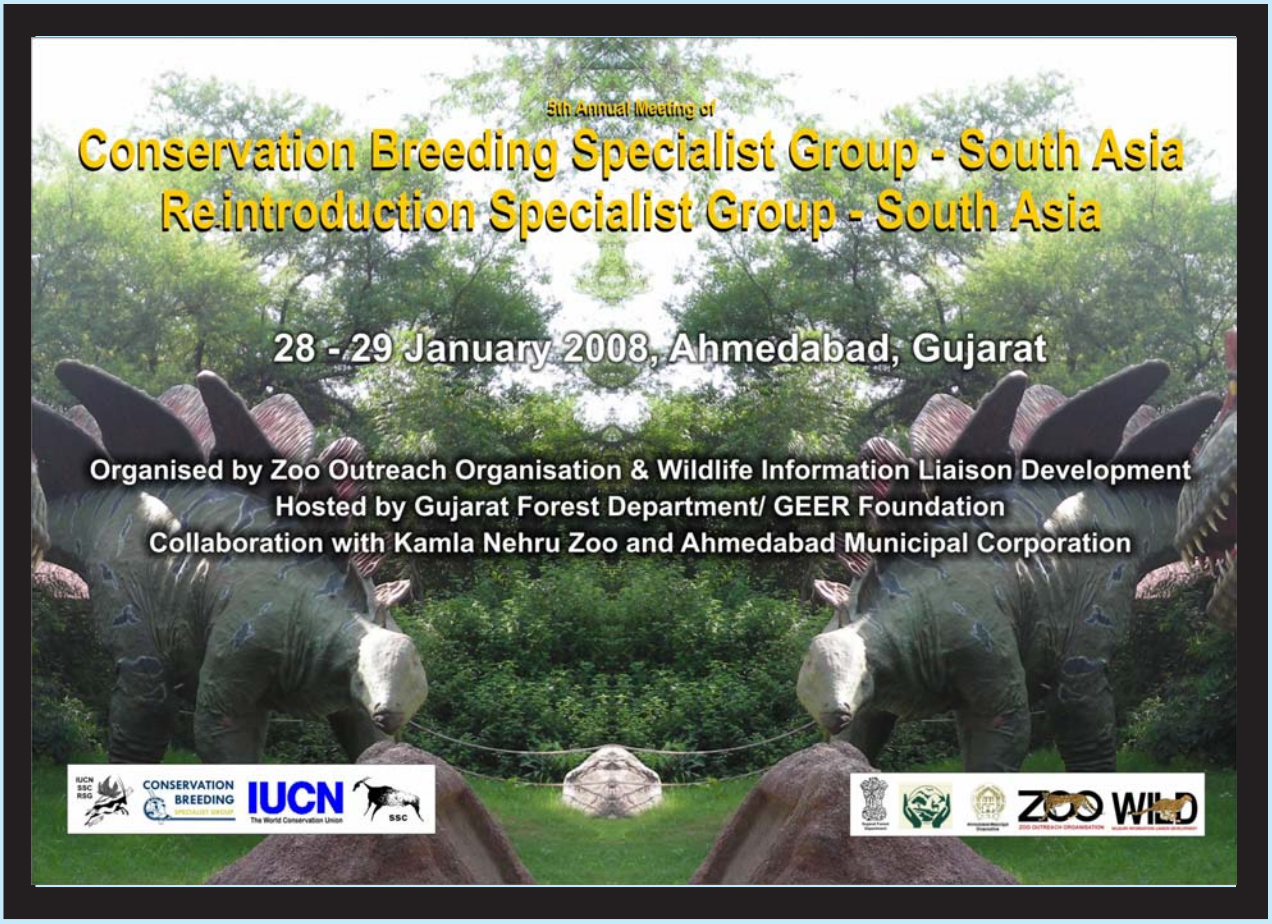

The Business of Monkey Control

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The problem of out of control monkeys is common throughout India. The Rhesus Macaques of Delhi are perhaps the most notorious newspaper regulars when they are accused of causing the death of the Deputy Mayor, caught prowling through the chambers of Parliament, and ripping up records and computers in the Supreme Court. They are not mere destroyers of crops and property; they transmit serious diseases to man - like tuberculosis and rabies. Although there are flashpoints of conflict all over the country there is no national policy on how to tackle them. Since all species of monkeys are protected by the Wildlife Protection Act, the onus is on the Ministry of Forests and Environment (MoEF) to do something about it.

The touted causes of the problem are increasing population of the animals and loss of forest cover. Habitat loss means the animals have no access to safe shelter and food, and therefore have little chance of survival. However, if the monkey population is increasing, it indicates that habitat loss doesn't affect them in the same manner as it affects tigers. We have to acknowledge that these animals have adapted to living off humans, because in the name of religion, humans willfully feed the monkeys. At 4 O'clock every evening cartloads of bananas and sweets are fed to the hordes of rhesus macaques that congregate on the roadside near the Ridge in Delhi. In temples across the country, people feed all kinds of food to langurs and macaques alike. In monkey language, the person who feeds the monkeys is effectively saying, "I am submissive to you". When other people do not feed these monkeys, they are seen as upstarts who need to be taught a lesson. So monkeys threaten by baring their teeth, snatching, scratching and we have "monkey menace" on the headlines of newspapers.

In a draft action plan the MoEF advocates translocation of troops and sterilization of male monkeys. For years we were under the impression that wild animals will know how to take care of themselves when released in the wild. But we know differently now - studies carried out in recent years have highlighted a range of problems such translocated animals face. Young monkeys are taught which species of fruits, flowers and insects to eat by their parents and other troop members much as a young leopard cub is taught to hunt by its mother. City born and bred simians are like fish out of water in the jungle. How do monkeys that are used to marriage halls and temples spontaneously know the varieties of edible forest fruits? How would monkeys used to dodging dogs and humans know about pythons and leopards? I wasn't surprised when a monkey trapper employed by the Chennai Wildlife Warden's Office narrated an anecdote of monkeys who traveled at least 14km home. They would rather risk coming back to abuses and stone throwing than slowly starving to death in the forest.

Although the authorities are aware that translocation merely relocates the problem to another area and doesn't really address the issue of the monkey menace, they continue to move large number of animals from urban areas to forest areas, from one rural area to another, from one state to another randomly and arbitrarily. For decades the Delhi Municipal Corporation has been moving hundreds of monkeys out of the city. In one instance in 2004, about 500 monkeys (comprising several family troops) were trapped in Delhi and released in Pilibhut and Kuno National Park. Today no one knows what became of these monkeys; enquiries reveal that local authorities had no idea that any monkeys were released in these areas under their jurisdiction. Recently they dumped monkeys caught in Delhi into Asola Batti Sanctuary and now the residents there are complaining of the monkey problem thereby translocating the news from page three to page five.

Most translocated monkeys don't survive: Dr. Wolfgang Dittus, a primatologist of the Smithsonian Primate Biology Program, who has studied macaques for the last 30 years says bluntly, "Translocation of monkeys or any wildlife to a National Park or wildlife refuge is a clear death sentence for the displaced - it is a political solution, not a biological one. It's a coward's way of killing the monkeys." Despite researchers worldwide rejecting translocation as a method of solving animal conflict problems, translocation remains the main strategy underpinning the government's action plan. If we were truly concerned about the safety and welfare of these monkeys, we would come up with realistic alternatives that aren't so cruel.

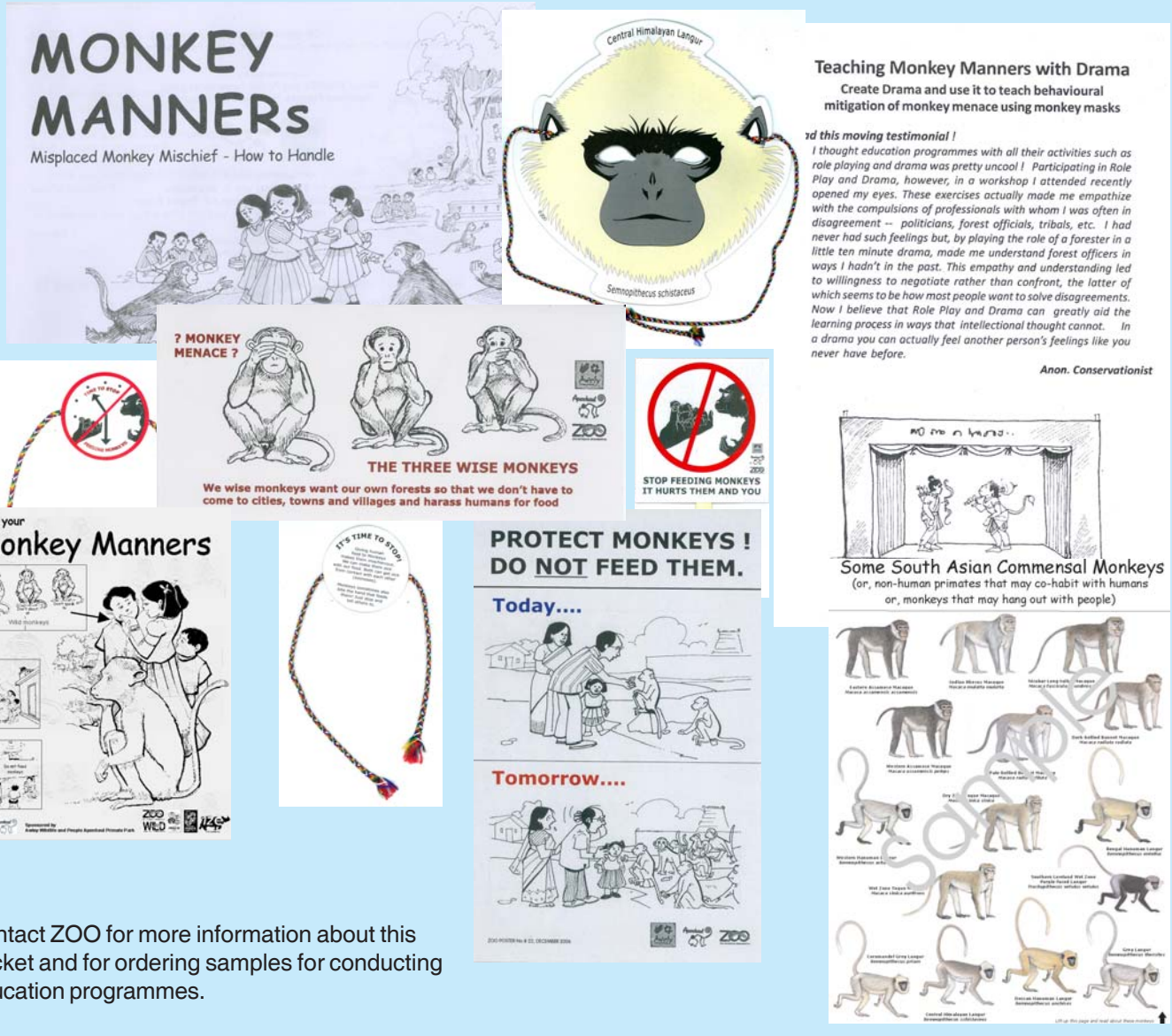
The MoEF also proposes systematic sterilization of male monkeys. There are fewer males than females in a monkey troop and it might make superficial economic sense to target males. But the catch is this: it takes just one intact male to impregnate every single female in the troop. Further, neutering male monkeys is not going to make them any less aggressive towards humans because they want food from us, not sexual favours. Dr. Dittus sums it up by saying that the only way we can control the monkey population explosion is by targeting the females of the troop for sterilization. A word of caution, however, sterilization does not prevent monkeys from continuing to

grab food from humans. It is merely a population control measure whose effects will only be seen when the current adult population dies out.

Other actions to take include a ban on feeding of monkeys. Dr. Mewa Singh, a primatologist at the University of Mysore, further advocates the use of monkey-proof garbage bins so there is no other food available for wandering freeloaders. While citizens can help combat the problem this way, it is ultimately up to the authorities to come up with a realistic action plan that does not merely shunt the problem around and is humane to the animals. The plan also needs to address what is to be done with monkeys that are used to handouts from people. In Shimla when the ban on feeding was enforced overnight, there was an increase in the number of monkey attacks. The plan should also address the implications of such recommendations.

This is a man-animal conflict involving animals protected by a wildlife law (and from religious sentiment), not an animal welfare issue that can be treated on par with stray dogs and cattle. There are no shortcut solutions to the problem and unless monkey biology and behaviour is taken into account, no solution is going to work. That's why primatologists have to be involved in this exercise and not just animal welfare organizations and municipality officials.

Some helpful hints on how to manage / deal with monkey problems through innovative education



Contact ZOO for more information about this packet and for ordering samples for conducting education programmes.

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