Strategy for enriching the environment of captive *Ursids*

Brij Kishor Gupta, Sant Prakash and A. K. Sinha*

Ursids in the wild spend considerable time and energy in finding and processing food, and defending their territories as compared to captive animals. It has become necessary to provide alternative methods of stimulating natural behaviour to meet both the mental and physical well-being of the captive animals. The present strategy for enriching the environment for captive Ursids provides enrichment practices for exhibit, dietary and social enrichment and their safety consideration. The enrichment practices promote behaviour of animals by providing animals with enriched environment. It is observed that improving animal well-being by increasing exercise, satisfying behavioural needs and optimizing the level of stimulation of the animal housed at the captive facility, reduces the abnormal behaviour patterns and stimulates natural behaviour.

Keywords: Animal welfare, bears, captive animals, environmental enrichment.

THE use of wild animals for the purpose of amusement either on the streets or in circuses, is an age old practice which persists in many parts of the world. It is in fact a sad story of agonized suffering by the animal. Although the Government of India, through the Ministry of Social Justice and Empowerment, vide its Notification dated 14 October 1998 and Wild Life (Protection) Act, 1972 has considerably curbed and controlled such activities, animals still suffer in the hands of the so called 'kalandars' or 'madaris'. The animals most exploited are monkeys and bears. There is an urgent need for captive management strategy for these animals after they are rescued and placed either in life-time care facilities, rescue centres or zoos. In captivity, bear management remains a challenge. Bears in most zoos are popular with zoo-visitors. Today increasing public awareness regarding animal welfare is being addressed or resolved through the provision of and interpretation of enrichment. Conservation of wild populations of bears in their natural habitats and the importance of well-adjusted animals for reproductive success, are messages that can stimulate public appreciation for them.

About *Ursids*

The Ursidae or bear family comprises animals that normally inhabit large home ranges and have great strength proportionate to body size. The family Ursidae consists of eight species of bear, viz. spectacled, sun, sloth bear, giant panda, black, brown, polar and Asiatic bear, most of which are closely related, the evolutionary exceptions being the spectacled bear and giant panda. Table 1 provides the distribution of four species of bears found in India. The captive bear population in India as on 31 March 2006 is shown in Table 2. They are generally omnivorous, good climbers, possess an exceptional sense of smell and have a slow reproductive rate. They have long maternal dependency and cubs are born in a poorly developed state.

What is environmental enrichment

According to Sheperdson[1–4], environmental enrichment is a concept which describes how the environment of captive animals can be changed for the benefit of the inhabitants. 'Behavioural opportunities that may arise or increase as a result of environmental enrichment can be appropriately described as behavioural enrichment'[2].

Environmental enrichment (sometimes called 'behavioural enrichment') is a term that is often misunderstood. According to the *Oxford English Dictionary*, there are two definitions that relate to this discussion and answer the questions: en-rich-ment (noun): the act or process of increasing intellectual or spiritual resources; enrich (verb): the act of making something better (richer) by the addition or increase of some desirable quality or ingredient.

Managing behaviour among wild animals is not easy and predictable. Individual responses can vary due to physiological states, age and animal experiences. Managing captive conditions is the primary tool when we want to

Brij Kishor Gupta is in the Central Zoo Authority (Ministry of Environment & Forests, Govt of India), Annexe VI, Bikaner House, Shahjahan Road, New Delhi 110 011, India; Sant Prakash and A. K. Sinha are in the Department of Zoology, Faculty of Science, Dayalbagh Educational Institute (Deemed University), Dayalbagh, Agra 282 005, India.
*For correspondence. (e-mail: brijkishor68@yahoo.com)

Table 1. The species of *Ursids* found in India and their distribution in the wild

Species	Distribution
Brown bear (*Ursus arctos isabellinus*)	Jammu and Kashmir, Himachal Pradesh, Uttarakhand
Asiatic black bear (*Ursus thibetanus*)	Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Northern West Bengal, Sikkim, Arunachal Pradesh, Meghalaya, Manipur, Nagaland, Mizoram and Tripura
Sloth bear (*Melursus ursinus*)	Uttarakhand, Uttar Pradesh, Rajasthan, Gujarat, Madhya Pradesh, Chhattisgarh, Bihar, Jharkhand, West Bengal, Assam, Arunachal Pradesh, Maharashtra, Orissa, Andhra Pradesh, Tamil Nadu, Kerala and Karnataka
Malayan sun bear (*Helarctos malayanus*)	Arunachal Pradesh, Manipur, Nagaland and Mizoram

Table 2. Status of *Ursids* in Indian zoos, rescue and rehabilitation centres and lifetime care facilities as on 31 March 2006

Species	Male	Female	Unknown	Total
Brown bear	1	1	0	2
European brown bear	1	0	0	1
Himalayan black bear	106	112	48	266
Sloth bear	86	90	74	250
Malayan sun bear	1	1	0	2

Source: Central Zoo Authority, New Delhi.

obtain a behavioural response. This must be carefully planned to achieve specific goals, and to predict and to avoid the possibility of negative effects. Thus it is necessary to know and understand the natural behaviour and biology of the species.

Managing the environment of the animals can increase their activity time, and also the amount of time the animals spend performing behaviours that they usually display in the wild.

Ideal enrichment programme

It is helpful to increase the intensity of the stimulating enrichment gradually, avoiding over stimulation of the individual, because if a captive animal loses the ability to cope with adverse stimuli, severe behavioural, physiological and emotional consequences may occur[5].

The stimuli must also be varied. According to Norton *et al.*[6], every reasonable step should be taken to introduce potentially stressful stimuli that might be encountered by a wild animal in the daily regimen of captive life, even if this means introducing stimuli that evoke predator-avoidance behaviour. In areas where surpluses or less-than-threatened species are kept, especially those being prepared for release into the wild, the actual introduction of live predators could add jarring authenticity[6]. However, behavioural enrichment techniques can be designed for many species of captive wildlife to stimulate protective responses and reduce the impact of captive stress without endangering the welfare of the animal.

A successful enrichment programme provides a balance between risk factors associated with enrichment and maintaining species-appropriate behaviours, and also promotes the physical and psychological well-being of captive bears. Incorporation of enrichment as part of the keepers' daily husbandry routines can help ensure the health of the animals, and therefore the educational value of the exhibit and thus create a positive perception among the zoo-visitors.

It is generally recognized that naturalistic, functional behaviours can be promoted in confined animals by increasing the physical complexity of their environments with species-appropriate furnishings, and by adopting methods of feeding that encourage complex behaviours. The natural habitat where an animal lives is made up of a rich mix of diverse stimuli. Organism must respond appropriately in order to survive and reproduce. Assertion that an organism maintains relationships with the living and non-living components of its environment, implies that it must change in response to environmental changes[7]. Captive environment may drastically affect animal behaviour[8]. Many captive animals of different species may show abnormal behaviours, which are uncommon or even absent in natural populations. In most cases, enclosures do not offer animals sufficient stimuli to occupy most of their activity times. Therefore, captive conditions must be developed which approximate the natural state, to achieve the species natural level of fitness.

Wechsler[9], a pioneer in the field of animal behaviour research, introduced the concept of enrichment while observing stereotypic behaviours in polar bears and designing stimulating enrichment features. These items furnished physical and behavioural stimulation in an otherwise limited environment. Hediger[10] stressed the importance of housing social animals in groups and also suggested that animals be housed in exhibits that encourage natural behaviours. Since then, numerous other researchers have recognized and documented this need for sensory stimulation in captive animals[1,2,11,12]. In addition, before the term enrichment was even coined, keepers in American and European zoos provided zoo animals with a variety of items in their exhibits to stimulate activity. In our country, zoo managers

have also realized the potential of using enrichment in animal enclosures for the welfare of these animals and few have started using it.

Overall, environmental enrichment describes the efforts made to alleviate the incidence of boredom in captive animals and reduce undesirable behaviours.

Environmental enrichment users

For zoos, rescue and rehabilitation centres, and life-time care facilities in the country, environmental enrichment could prove useful to improve animal welfare. Also, it may inculcate appropriate behaviours in animals intended to be released back to the wild, stimulating different natural behaviours such as foraging, orientation, avoidance of predators and development of social relationships.

Enriching the exhibit and off exhibit areas

In general, *Ursids* are relatively large and destructive animals requiring appropriately sized enclosure artefacts. Depending on the naturalistic state of the exhibit, it may be beneficial to install the suitable structures to provide attachment points and support. Particularly, in the context of sloth bears, which are strong diggers, the enclosure mesh must be of heavy gauge and embedded deep in the ground to prevent the bears from escaping.

Today, several facilities in the world also provide considerable artificial enrichment in holding areas, while maintaining naturalistic public-viewing exhibits. Although the type of enrichment may differ, it must be stressed that all bear areas should contain an appropriate and sufficient enrichment choice. For example, shelter, sun, shade, cooled, low and elevated areas or water features provide options that allow animals to regulate their own activity levels, temperature and visibility to the public.

However, while the animals are on exhibit, built-in visual barriers should be provided as a retreat for them from the public or cage-mates. These can include rock structures, uneven terrain, tree plantings and logs. Dens can provide escape from the elements, as well as natural cubbing areas or shelter.

Live trees and bushes can provide visual barriers as well as shade and climbing opportunities. Some trees need collars, power fencing or other barriers to prevent damage from clawing, scratching and rubbing of the bears on the trunks. Trees in proximity to exhibit barriers may provide escape opportunities and should be trimmed to ensure that the bears cannot walk or jump out of the enclosure or use fallen limbs to facilitate escape. Similarly, strong animals may be able to knock down or rearrange furniture against perimeter fencing, which can lead to escape from the enclosure.

Various substrates should be provided considering the needs of the species. Mulch, sand, gravel, soil, grass, leaves and hay can encourage natural exploratory behaviours. Ingestion is not normally a problem with these items; however, animals should be monitored when first offered access to new substrates. A variety of substrates can provide the bears with options for foraging and digging, as well as nest-building.

Water features are desirable for all bear species and often encourage species-typical behaviour. Shallow pools and streams provide a source of drinking water that can be stocked in artificial pools. Figure 1 *a–h* show the unenriched and enriched enclosures of sloth and Himalayan bears at various zoological parks and lifetime care facilities in the country.

Enrichment ideas for stimulating natural behaviour in captive environment

The enclosure should be kept as natural as possible, which relates to the scenario in the wild to stimulate natural behaviour. An artificial pond of water must be provided for the bears as they enjoy being in the water especially during summer. Adequate screening should be provided between adjacent enclosures to safeguard the bears getting unduly excited/stressed by other bears housed in those enclosures.

Animal behaviour in the enclosures should be closely monitored while they are placed in an enriched environment. Bears showing excessive stereotype behaviour and under stress should be kept separately and treated. Mechanical feeders may be used, if they are well-designed and have been tested.

Exhibit enrichment

(i) Climbing structures: trees, wooden poles, ropes, logs, rocks (Figure 2 shows the use of wooden logs as exhibit enrichment); (ii) Weather considerations: rain cover, shade structure, sunny spots, wind breaks; (iii) Substrate for lying, sleeping or nest-building: grass, hay, straw, leaves; (iv) Substrate for digging: grass, soil, sand, mulch, rotting logs; (v) Visual barriers: log piles, trees, rocks, caves, dens; (vi) Variety of feeding sites; (vii) Water features: pools, moats, sprinklers, misters; (viii) Mechanical devices to deliver random food items; (ix) Options for hanging items; (x) Area of safe access for veterinarian examinations; (xi) Safe shift area to allow keeper access for daytime enrichment additions or feeding; (xii) Vehicle access for large exhibit renovations or furniture replacement.

Dietary enrichment

(i) Browse for eating, destroying and displaying; (ii) Live animal feeding (insects, invertebrates); (iii) Variety and

Figure 1 ***a–h.*** ***a***, Un-enriched enclosure of Sloth bear at Jaipur Zoo, Jaipur; ***b***, Enriched enclosure of Sloth bear at Thiruvananthapuram Zoo containing soil mounds; ***c***, Un-enriched enclosure of Himalayan black bear at Pt. G.B. Pant Zoo, Nainital; ***d***, Enriched enclosure of Himalayan black bear containing area of sand, vegetation and a pool at Nehru Zoological Park, Hyderabad; ***e***, Un-enriched enclosure of Sloth bear at National Zoological Park, Delhi; ***f***, Enriched enclosure of Sloth bear containing climbing structures at Bear Rescue Facility, Agra; ***g***, Menagerie type enclosure of Sloth bear at P. S. Udyan Zoo, Sangli; ***h***, Naturalistic enclosure of Sloth bear at M. C. Zoological Park, Chhatbir. [Photos by Brij Kishor Gupta.]

randomization of feeding times; (iv) Increased number of feedings; (v) Mix of whole vs processed or chopped foods; (vi) Edible local plant material in the exhibit; (vii) Strong or bitter tasting food (leaves of neem *Azadirachta indica*); (viii) Cereal, popcorn, seeds or nuts for foraging; (ix) Treat foods: honey, hard-boiled eggs, sugarcane, honey-filled sticks; (x) Termite mounds; (xi) Suction feeders.

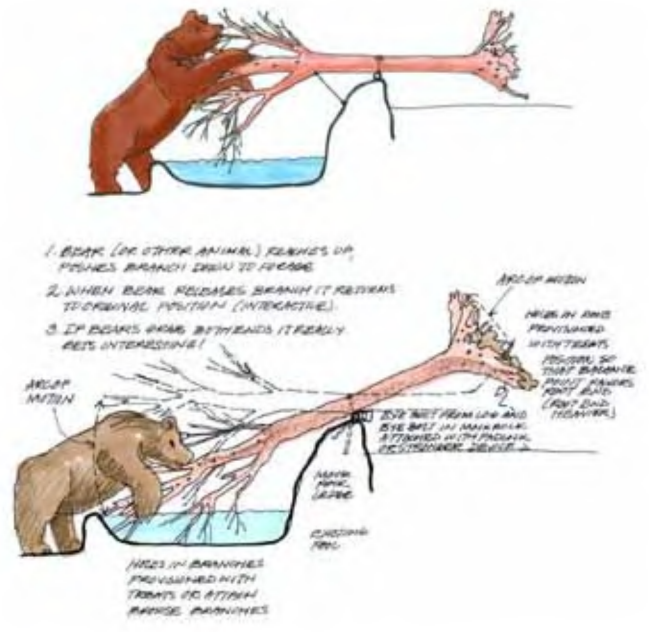

Figure 2. Use of wooden logs as enrichment tool for the *Ursids*. (Illustrations by Jon C. Coe.)

Social enrichment

(i) Social opportunities: species-appropriate social groups; (ii) Socialization for husbandry and management behaviours.

Novel enrichment

(i) Recycled items: cardboard boxes; (ii) Wooden logs; (iii) Soil mounds; (iv) Auditory enrichment: music, natural sounds, recorded vocalizations of same or other species; (v) Olfactory enrichment: herbs, condiments, perfumes, items marked by other species.

Safety considerations

While using any of the aforesaid enrichment options in the animal enclosure, the following safety considerations should be kept in mind and accordingly due precaution should be taken.

- Animals could get entangled in ropes and hanging apparatus or extremities may be caught.
- Animals may fall while trying to reach an enrichment placed high in the enclosure.
- Water features must provide a suitable escape area for the species.
- Dietary enrichment can lead to tooth decay, obesity, allergic reactions, impaction, diarrhoea, choking or aggression from cage-mates.
- Items or pieces of them, may be toxic or hazardous if ingested.
- Objects, if broken, can produce sharp edges that can injure animals.
- Social or mixed species exhibits can lead to injury or death due to aggression or harassment by cage-mates.
- Plants or parts of plants may be toxic to animals. Prior to offering animals, the leaves should be checked for toxic elements.
- Enrichment might cause excessive stress to animals.
- Safe keeper access for providing enrichment requires a secure shift area.
- Dietary enrichment may result in the animal not eating important nutritional components of its regular diet.
- Parasites may be transmitted through enrichment items if not properly cleaned and disinfected.
- Safety should be a primary consideration when introducing new enrichment. Input from supervisory and veterinary staff is important and animals should always be closely monitored when new items are offered.
- Horticulturists/botanists should be consulted regarding browse or plant toxicity. Leaves offered to animals should be checked for prior pesticide application.
- As individual animal responses to the same enrichment can be different, careful observation and documentation is necessary.
- A written assessment of each enrichment event is desirable. This provides a permanent record that can be valuable in reducing future problems, such as the potential for ingestion, entanglement or aggression from or toward cage-mates.
- In addition, documentation and evaluation of enrichment can lead to additional applications for medication delivery and other methods for improving animal management. One animal may wrestle with an item for extended periods, while another might destroy it immediately and leave it, and yet another might try to ingest it. Documentation of individual differences will allow keepers to tailor enrichment to maximize benefits.

Nowadays, most of the bears at zoos, rescue and rehabilitation centres and life-time care facilities have had previous encounters with human beings, as most of them are got from 'madaris'/'kalandars' who have trained them for public amusement. Some of these animals have been in association with other domestic animals, like dogs, domestic fowls and sometimes monkeys and hence re-establishing them to their natural behaviours is a difficult task. Each behaviour forms a link in a nexus of events. Therefore under controlled conditions, changing the external stimuli could be difficult. Therefore, it is essential to manipulate and enrich the captive environment in ways which do not reward unwanted learned behaviours, such as begging and over-dependence on humans and to reward species-appropriate wild behaviours. Environmental enrichment can be a useful tool to train animals that are intended to be released as well as those in captivity for long-

term exhibition, public education or to be bred as part of a planned breeding programme.

If the animals maintain natural behaviours in captivity they will be valuable for different programmes, such as education, research and even conservation or planned breeding. Also the animals will be fit for release back to the wild, under the guidelines of the IUCN Re-introductions Specialist Group and Guidelines for the Placement of Confiscated Animals[13].

The suggested environmental enrichment ideas could be implemented by the zoos, rescue and rehabilitation centres and life-time care facilities, which is essential for animal well-being. Also today captive facilities are answerable to the public and animal welfare activists as well.

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