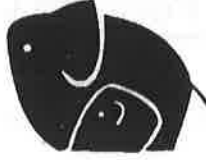


**Executive Director**

**SRI CHAMARAJENDRA ZOOLOGICAL GARDENS  
MYSORE - 570 010**



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No.MZA/ 371 /2009-10

Date: 4/7/2009

Encl: copy 7

To,

The Member Secretary,  
Central Zoo Authority,  
Bikaner House, Annexe-VI  
Shahjahan Road,  
New-Delhi - 110 011



Sir,

Sub: Sanction of research project to develop standard protocol for  
Maintaining live food project for captive animals

Ref: 1 This office letter No.MZA/384/2008-09 dated 19/3/2009  
2 Your letter F No.93/2005-CZA (Vol-I) (M) dated 8/4/2009  
3 My D.O. Letter No.MZA/150/2009-10 dated 7-8/5/2009

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Please refer my letter on the subject.

As per the discussion had with you during my last visit to New-Delhi during May 2009, I am submitting herewith the Research proposal for developing protocol of live food in Mysore Zoo for your kind perusal and for granting sanction of the Technical Committee of Central Zoo Authority, at the earliest. Since Mysore zoo is producing live food to captive animals on ad-hoc basis, which is causing problem for maintenance, there is a need for addressing this issue permanently.

I request you therefore to sanction a sum of Rs.2.00 lakh for implementing the required research project to develop protocol for maintenance of live food in Mysore zoo as well as other zoos.

Yours faithfully,

*W Singh*  
Executive Director

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## PROPOSAL FOR LIVE FOOD TO CAPTIVE ANIMALS

Mysore zoo is home to over 157 species of animals, which include 52 species of mammals, 82 species of birds, 21 species of reptiles and 2 species of amphibians, with varied dietary habits. The primary aim of the zoo is to provide exemplary care to its captive animals that have been living away from their natural habitat since many generations. It becomes the responsibility of the zoo to provide animals naturalistic conditions which will facilitate the animals to exercise their natural instincts and thus lighten the stress of being held in confinement.

I have made a humble attempt through following explanations to justify our demand of small time grant for live feed project in Mysore zoo; simultaneously answering the all queries raised by your kind self in reference 2.

### NECESSITY OF THE PROGRAMME AT THE MYSORE ZOO AND THE NEED FOR LIVE FOOD TO CAPTIVE ANIMALS

A significant portion of the diet of certain animals like primates, birds, amphibians etc. consist of insects. In the wild, such animals spend a significant amount of time searching for the prey and then feeding upon them. This act of foraging serves to increase their activity and at the same time adds to their diet certain nutrients that are otherwise lacking in the other components of their diet. In captive conditions, all these opportunities are absent and hence the animals experience a sense of lacking of natural stimuli. This absence reduces their interest in feeding and at the same time offering of ready food hinders their natural behavioural repertoires. Animals are adapted to specific dietary habits in the wild and any variation in their diet would affect these animals at the physical and as well as at the psychological levels. Hence, while housing animals that are insectivorous in habit requires that their diet is supplemented with insects. If not, other means include supplementing their diet with the nutrients that are otherwise derived from insects. The latter option is unable to be realized because of following constraints.

diet their survival rate is considerably increased. Having insects ready in hand would help in the proper management of such endangered species.

Recently, Mysore zoo had organized a workshop on the *in-situ* and *ex-situ* conservation of amphibians in collaboration with the Central Zoo Authority. Mysore zoo being one of the organizers and a participant requires that initiatives are taken for the *ex-situ* conservation of certain selected amphibian species. Amphibians being insectivorous, having insect cultures would help to provide the required diet for the amphibians for sustained periods.

Lack of proteins in the diet has a direct effect on the fertility of animals and is also known to influence abnormal behaviors like coprophagy and others. Feeding of wild caught crickets to marmosets on regular basis has reduced the display of such behaviors significantly. And it has also been observed that feeding termites and earthworms to pheasants has resulted in increased fertility rates (Table 1 and Table 2). The supplementation of the diet with termites and earthworms has resulted in the better survivability of the chicks and reduced neonatal death. A consolidated chart for the years 2008 and 2009 describes the hatching percentage and percentage survivability of the chicks before and after the supplementation of diet with insects (Table 1a and Table 2a).

In an effort to save the pheasant and fowl eggs from being eaten away by rats, the eggs are being collected from the enclosures on daily basis and incubated using an automated incubator. And following hatching and sufficient development of the chicks, they are released to the enclosure. There has been a considerable change in the growth and development patterns of the chicks after the incorporation of the live feed in their diet.

- As it is arduous to supplement the nutrients that the insects contain in exact proportions. Hence it would be more suitable to include live insects in the diet of such animals.
- There are two primary ways in which live insects to be fed to zoo animals can be acquired
  - a. Wild caught insects.
  - b. Culturing insects under controlled conditions and then harvesting them periodically.

The former way of procuring insects from wild, presents us with many problems like:

- Difficulty in trapping live insects
  - Knowledge of entomology essential to rule out the possibility of poisonous insects being caught and fed to animals
  - Availability of insects in all seasons
  - Availability of desired quantity on a regular basis.
- 
- Our previous experimentation with the culture of wild caught insects have been unsuccessful as wild varieties lack the abilities to sustain higher degrees of climatic variations and it is hence difficult to maintain them in cultures. For this reason, variants that are stable in cultures have to be procured, and can then be maintained in cultures for prolonged periods of time

Mysore zoo has well-equipped hospital and an orphaned and rescued animal rehabilitation centre attached. This centre often receives rescued and orphaned animals from the wild either through forest department or general public. The staffs of the rehabilitation centre face difficulties when animals turn out to be insectivorous (drongo, myna and other small animals like slender Loris, scaly ant-eater and others), and at times they even succumb due to the variations in the dietary habits. It has been noticed that when such rescued animals are given insect diet instead of artificial

DETAILS OF INCUBATION AND HATCHING-2008

TABLE 1.

NAME OF THE BIRD	NUMBER OF EGGS COLLECTED FOR INCUBATION			TOTAL
	FERTILE	UNFERTILIZE	D	
1. Satyr Trogon	1	0	1	
2. British Jungle Fowl	10	2	12	
3. Lady Amherst Pheasant	0	71	71	
4. Golden Pheasant	0	2	2	
5. Green Pheasant	0	8	8	
6. Yellow Golden Pheasant	20	10	30	
7. Burmese Peafowl	0	3	3	
8. White Peafowl	0	48	48	
9. Khalf Pheasant	0	8	8	
10. Green Peafowl	20	5	25	
TOTAL	51	157*	208	

FERTILITY RATE: 25%

TABLE 1(a):

Name of the bird	Number of eggs collected for incubation	Fertile eggs	Unfertilized eggs	Hatching	% Hatching	Still Birth	Death during infancy	Number of chicks survived	% Survivability of the chicks
ST	1	1	0	0	0	1	0	0	0
YG	30	20	10	9	45%	11	2	7	78%
GP	25	20	5	10	50%	10	2	8	80%
BJF	12	10	2	4	40%	6	0	4	100%

ABBREVIATION KEY: YG: Yellow Golden Pheasant; ST: Satyr Trogon; GP: Green Peafowl; BJF: British Jungle Fowl.

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DETAILS OF INCUBATION AND HATCHING: UP TO APRIL, 2009  
TABLE 2:

NAME OF THE BIRD	NUMBER OF EGGS COLLECTED FOR INCUBATION		
	FERTILE	UNFERTILIZE	TOTAL
	D		
1. Satyr Trogon	0	5	5
2. Red Jungle Fowl	44	10	54
3. Grey Jungle Fowl	4	3	7
4. Silver Pheasant	20	24	44
5. Lady Amherst Pheasant	4	5	9
6. Green Pheasant	0	15	15
7. Golden Pheasant	1	5	6
8. Green peafowl	1	0	1
9. Yellow Golden Pheasant	0	1	1
<b>TOTAL</b>	<b>74</b>	<b>68</b>	<b>142</b>

FERTILITY RATE: 52%

TABLE 2(a):

	Name of the bird	Number of eggs collected for incubation	Fertile eggs	Unfertilized eggs	Hatching	% Hatching	Still Birth	Death during infancy	Number of chicks survived	% Survivability of the chicks
Following the use of generator - April, 2009	GP	1	1	0	1	100%	0	0	1	100%
	RJF	54	44	10	44	100%	0	4	40	91%
	GJF	7	4	3	4	100%	0	0	4	100%
	SP	44	20	24	20	100%	0	2	18	90%
	LA	9	4	5	4	100%	0	0	4	100%
	GoP	6	1	5	1	100%	0	0	1	100%

ABBREVIATION KEY: GP: Green Peafowl; RJF: Red Jungle Fowl; GJF: Grey Jungle Fowl; SP: Silver Pheasant; LA: Lady Amherst Pheasant; GoP: Golden Pheasant.

Procuring live food for reptiles is a difficult task and snakes being strictly carnivorous, it is difficult to obtain live food on regular basis. Until now rats and rabbits to feed the snakes, were being purchased and this turned out to be uneconomical and difficult because of irregular supply. The culture of rats and mice would serve this purpose as this serves as a continuous source of food for snakes, birds of prey like owls, Shikra, tawny eagle that are being housed at the Mysore zoo.

#### ANIMALS THAT ARE TO BE FED WITH LIVE ANIMALS

Some of the animals that are presently being housed at the Mysore zoo and their dietary habits have been listed below.

ANIMAL	DIETARY HABITS
1. Pheasants (9 species)	Seeds, berries, INSECTS, worms, grass and fruit.
2. Fowls (5 species)	INSECTS (termites, ants, locusts), plant parts, flower petals, seed heads, arthropods, reptiles, and amphibians.
3. Chimpanzee	Mainly fruit, but also leaves, buds, flowers, bark, resin, honey, INSECTS; occasionally mammals.
4. Lion-tailed macaque	fruits, leaves, buds, INSECTS, small vertebrates and invertebrates
5. Nilgiri and Hanuman Langurs	Leaves, flowers, buds, seeds, bark, stems, INSECTS
6. Hamadryas baboon	Grasses, rhizomes, roots, tubers, shoots, fruits, leaves, flowers, and invertebrates
7. Brown lemur	Fruits, young leaves, and flowers invertebrates like cicadas, millipedes etc.
8. Marmosets	Exudativore, insectivore
9. Snakes	Small animals including lizards, other snakes, small mammals, birds, eggs, fish, INSECTS

Supplementing the diet of the above listed animals with insects would serve to mimic natural conditions to a certain degree and also adds to their diet the required amounts of protein and other nutrients.

### RESPONSE OF ZOO ANIMALS TO LIVE FOOD

Our ground work indicated that live feed programme is nowhere being implemented in Indian zoos and providing a comprehensive account regarding the response of zoo animals towards live food is not possible as our communication with foreign zoos did not provide us sufficient information regarding the same. However, our experience of feeding wild caught insects and literature studies suggest that live food serves to:

1. Increase activity among zoo animals by allowing them to search for food, process it and then feed on them.
2. Acts as a dietary supplement, adding to their diet sufficient proteins and other vital nutrients in a fresh state.
3. Contributes to the overall growth and the well-being (physical and psychological) of the animals.
4. Relief from a monotonous diet, thus providing varieties and also arouses the animals' interest in feeding.