

light' technique and is almost always visible to the public, being active from mid-morning to mid-afternoon. Its activity is at a maximum during the mid-afternoon when food is available.

A male arrived on 17 May 1967 in excellent condition. His weight was then 750 g (26 oz). Unfortunately, he was constantly harassed by the female and despite separation from the female and treatment he died on 10 August 1967. The cause of death was found to be aspiration of stomach contents, right lower lobe pneumonia, and multiple acute gastric ulcers.

In our experience this species appears to be solitary, for when two animals were placed together after a period of introduction they fought almost daily. Wounds were not inflicted with the mouth but with the fore and hind limbs. As a result large patches of hair were torn out and

superficial skin wounds were common. Most of this aggressive behaviour occurred between dusk and dawn, but sporadic fighting was observed during the day. The female was the aggressor in most instances. Despite this the species makes an excellent zoo display and should not prove to be too difficult to maintain in captivity, for its dietary requirements are simple and it requires a minimum of care to maintain.

#### PRODUCTS MENTIONED IN TEXT

**Mink Developer Chow** manufactured by Ralston Purina Company, Checkerboard Square, St Louis, Missouri, USA.

**Vi Penta Liquid Multiple Vitamins** manufactured by Roche Laboratories, Hoffman-La Roche Incorporated, Nutley, New Jersey, USA.

**VPC-Dynafos** manufactured by Vitamin Products Company, Peoria, Illinois, USA.

## Notes on primates in the Asiatic Primate Grotto at Miami Monkey Jungle

F. V. DU MOND

*General Manager, Goulds Monkey Jungle, Miami, Florida, USA*

The new Asiatic Primate Grotto at Miami Monkey Jungle is described on page 43 of this volume, and in this article I shall describe some of our experiences with the primates living in it.

Because Sabang, the adult male orang-utan *Pongo pygmaeus*, was a new animal to our collection and strange to the female, they were both kept in the den area for a ten day observation period before permitting them into the grotto area, where management would have been difficult if problems had developed.

The gibbon *Hylobates lar* group was a family consisting of the parents, and three offspring whose ages ranged from one to five years. This group exhibited some remarkable co-operative behaviour while being transferred to the new area and introduced to the orang-utans. While attempting to trap them in their previous quarters they were reluctant to enter the transfer cage, which was baited with food. When regular feedings were suspended, the father, whom we were planning to catch last, entered the transfer cage, retrieved the bait and took it to the others. Although

he did not actively give it to the other members of his family, he approached them and permitted them to take the food from his hand with no obvious avoidance or attempt to hold on to the food. When his hands were emptied, he returned to the transfer cage for another portion only to be relieved of the food again when he took it back to the family. After two days of this procedure we decided to trap him first.

When first in the outdoor enclosure all but the mother seemed afraid to approach the feeding stations for food. It was then she who retrieved food and passively fed the others in the group in the same manner as had the adult male. Although she would get several mouthfuls as she bipedally walked to the awaiting group with her hands loaded, she would not really eat until she had made three to five trips to the station and all had eaten. She had the additional burden of her one-year-old offspring clinging to her as she retrieved the food. When she finally got around to eating, the still clinging baby would attempt to get a bite of food and she would accommodatingly

stop eating, and permit the baby to eat several bites from her hand before resuming eating herself. This maternal feeding was very reminiscent of the frequently observed passive feeding of marmoset infants by the adults in the family group.

The mutual adaptation of these two species of adult and nearly adult animals which had had no known previous contact proceeded with surprising rapidity. The gibbons had the run of the grotto area for several days before the orang-utans were let out. Their first meeting was characterised by considerable alarm, fright, and near panic avoidance reactions on the part of the gibbons.

The orang-utans were fed at the lower deck to keep them out of the trees and then returned to their dens after one hour on the first day.

This procedure was followed for the next eight days, increasing the time a little each day. The gibbons were much less perturbed on the second and subsequent days. On the ninth day the orang-utans were given the entire day out and the gibbons displayed little more concern than to maintain a minimum spatial relationship with them.

During the introduction phase the female orang-utan, Suzie, and the three-year-old gibbon began making cautious approaches to each other, which later developed into play. During this period Suzie, on several observed occasions, took hold of the gibbon, and on one occasion stepped on her. These incidents elicited a distress call from the gibbon which in turn triggered the entire gibbon group into a loud whooping aggressive defence reaction characterised by several swooping passes at Suzie who rapidly retreated. This did not however stop the progression of the play association between the two, though it appeared to make Suzie a little more cautious in her play lunges at the gibbon. As they learned each other's play cues and responses, a definite rapport was established between them and they would play for 30 minutes at a time. Some grooming was observed and the gibbon gained so much confidence that she would permit Suzie to hold her in her hands.

On the 12th day this gibbon touched Sabang, who made no response. During the next three months her approaches to Sabang became more and more daring, to the point that she would jump on his back, pull his hair or kick him re-

peatedly in the face while swinging from a branch above. Sabang reacted minimally, either by brushing her away with his hand or by spitting at her. Once he stepped on her which resulted in a distress call and the loud whooping aggressive reaction was triggered in the gibbon group. The orang-utan merely walked away. Once during a particularly bold spell of teasing he reached out and grabbed her with his hand. After holding and looking at the struggling gibbon for several seconds, he released her unharmed. The loud whooping, diving defence reaction from the other members of the gibbon group may have been a factor in inducing him to release the gibbon.

After four months of association, the gibbons and orang-utans seem to be quite adapted to each other. Even though the other members of the group have no play interactions with the orang-utans, they appear completely at ease even when only half a metre from them.

A pair of langurs *Presbytis obscura* were recently introduced to the already established animals. At the first encounter, both orang-utans and gibbons aggressively rejected the male langur who was first from the den. After considerable chasing he returned to the den. The opening to the grotto area was kept open so that the langurs could enter the grotto area at will. After a week they were spending much of the time out. There were several confrontations between the adult male gibbon and male langur sometimes he held his ground, at others he retreated to the den. Agonistic responses diminished after a week of this contact. The orang-utans on the other hand, seemed to ignore these intrusions after the first encounter. However, on one occasion when the langurs held ground and advanced on the gibbons, they all clustered near Sabang, as if for protection, which is indicative of how well the gibbons have adapted to the orang-utans.

#### LETHARGY AND OBESITY IN THE ADULT MALE ORANG-UTAN

Sabang, whom we received in trade, was a huge specimen of the Bornean race and weighed 193 kg (425 lb) on arrival. He was very obese and appeared senile, though only 16 years of age. He would sit in a lump all day, avoiding all movement possible. When he did move, he walked very

stiffly and with apparent difficulty. After an initial exploratory and laboured climb into the tree network he made no further attempt to move off the floor. It is probable that a lifetime of habituation to flat surfaces where food was simply placed in front of him in overabundant quantities, and in which he had nothing to do but eat, had resulted in over-eating and subsequent obesity.

Since it is difficult to control selectively the food an individual takes in a community enclosure we attempted to reduce his appetite with dexadrene. Several dose levels were tried, but when his appetite was reduced he was no longer stimulated even to go to the feeding stations and so was even less active.

It is likely that in the wild a large vegetarian animal such as this would have to negotiate perhaps 1 km (0.5 mile) or more of jungle each day foraging for its daily ration. This would keep the animal in physical condition and provide a self-limiting control over hyperphagia, which would tend to favour an equilibrium between calory intake and energy output. With this hypothesis in mind he was fed four times a day and each time the food was placed in small portions at three widely separated stations in the tree network. Thus he had to exert himself to collect each small

portion of his daily ration. To help in this direction even more he was given one grain of thyroid extract daily, so that his appetite would be somewhat increased and the desired exercise encouraged. As a precaution against any nutritional deficiencies, the protein, vitamin and low calory green food requirements were given in the indoor dens. Thus he was forced to work for the more desired high calory foods such as bananas, apple and monkey chow. After three months the thyroid extract was discontinued and although he has not lost weight as rapidly as we had hoped, the forced simulated foraging activities have had a dramatic effect in improving this animal's physical condition and agility.

This project has demonstrated that several taxa of sympatric primates can be maintained together successfully, providing a greatly enriched environment for each other while presenting a more interesting exhibit for the public to see. We have also learnt that, by simulating the natural and apparently necessary feral activity of foraging, hyperphagia, obesity and lethargy can be controlled. These concepts were not, of course, original, they merely represent the application of some of the findings of investigators in the field.

## A brief note on a modified formula for hand-rearing infant baboons

*Papio* sp

D. H. BUSS,<sup>1</sup> W. R. VOSS<sup>2</sup> & A. H. NORA<sup>2</sup>

<sup>1</sup>Southwest Foundation for Research and Education, San Antonio, Texas, USA

<sup>2</sup>Baylor College of Medicine, Houston, Texas, USA

Numerous articles in the *International Zoo Yearbook* attest to the difficulty of rearing infant primates. The captive mother will frequently prevent her infant from nursing, or her diet may be inadequate for proper lactation; in either case, the infant must be hand-reared.

The composition of the milk formula used is important, especially if the infant is sickly. A modified formula for hand-rearing infant baboons has been described (Vice *et al.*, 1966), but we have

had greater success with a different modification based on a more complete analysis of baboon milk (Buss, 1968). The new formula consists of (by volume): 45 parts SMA/S-26 liquid, 40 parts water, and 1 part Mazola corn (maize) oil (see Table 1). The oil is easily dispersed, and well tolerated by the infants. Increasing the energy content in this way, rather than by using a more concentrated mixture, avoids the diarrhoea associated with a high lactose intake and gives a