The care and breeding of the Pygmy hippopotamus *Choeropsis liberiensis* in captivity

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GENERAL DESCRIPTION

The Pygmy hippopotamus *Choeropsis liberiensis* of West Africa is closely related to the Nile hippopotamus *Hippopotamus amphibius* but is the more primitive of the two living species. They were first discovered by Dr Samuel G. Morton in 1844, but were not actually seen outside Africa until 1873, when a young animal arrived at Dublin Zoo. Dr Hans Schonburgh captured five Pygmy hippos for the noted animal dealer, Carl Hagenbeck, in 1912 (Crandall, 1964).

Possibly because of their close resemblance and diminutive size these animals are often mistaken for baby Nile hippos by the uninformed. The average Pygmy hippo weighs about 272 kg (600 lb) and stands 84 cm (2 ft 8 in) at the shoulder. As nonsocial animals, they prefer living in solitary fashion in the rain forests of their habitats (Liberia, Niger, Sierra Leone and the Ivory Coast), and, being nocturnal mammals they prefer the tangled thickets of the rainforests, yet they do swim when the situation warrants it.

At the National Zoological Park the Pygmy hippopotamus has been designated a 'vanishing animal'. In their native countries they have been ruthlessly hunted for meat and sport and have never been given local protection. The future of the Pygmy hippopotamus almost certainly lies in the hands of zoos and breeding farms around the world.

HISTORY OF THE PYGMY HIPPOPOTAMUS AT THE NATIONAL ZOOLOGICAL PARK

In June 1927 the first Pygmy hippo, a male, arrived at the zoo. Two years later the introduction of a female initiated a breeding programme that continues at the present time. The addition of a second female (captured in the wild) added impetus to the breeding programme. The offspring of the first female (produced over a period of 24 years) totalled 16. Of these, only six lived to maturity. By the time the second female arrived our knowledge of care and breeding had improved to the point where six of her eight offspring were raised to maturity. The other two lived almost a year. Of the 24 calves born to this trio, eight were males and 16 were females. Of these, nine are still living in zoos around the world. When the male died in 1955 our initial breeding programme came to an end. Three years later the original female died and left the zoo with only the wild caught female acquired in 1940 and two of her female offspring, Susan and Millie.

Five years later the National Zoological Park was presented with a young male who reached sexual maturity in 1962. In December of that year, with the birth of his first calf, a new line of breeding was begun. Nineteen calves have been sired by this male; 12 are still living.

The average success was reduced considerably by one female who continually gave birth to deformed young. Three out of four of her calves were malformed. She was removed from the breeding programme. Of the 19 young in the latest line, 11 were males and eight were females.

Since 1931, 43 Pygmy hippos have been born at the National Zoological Park of which 21 are still living, four are at present at the zoo. The 1940 female, the 1962 male captured in Liberia, and a new female acquired in trade represent our present breeding stock. The 1940 female was mature when captured and at the age of 32+ she has ceased breeding and cannot be counted in our future plans. In the past few years a number of zoos and game farms have transferred females to the National Zoological Park for breeding purposes. Our male has successfully impregnated all of these females and this portion of our breeding plan will probably continue.

CARE OF THE PYGMY HIPPOPOTAMUS

Pygmy hippos are easily cared for as it is only necessary to house them in a heated building with access to a small water tank. The water must be

warmed in winter. Because of the defaecating habits of all hippos, it is necessary to hose their area many times daily. To ease this burden enclosures should be made of concrete with metal doors. A waste gutter at the rear of the enclosure carries away urine and faeces. Access to a water tank approximately $3 \times 4{\cdot}6 \times 1{\cdot}2$ m ($10 \times 15 \times 4$ ft) deep is desirable. The tank can be divided by a pipe fence so that one tank will serve two enclosures. A great deal of defaecating is done in the water so it will probably need to be changed twice daily. Pygmy hippos vary in their personal habits; some require more attention than others.

If conditions are very crowded some animals can be kept in the water during the daylight hours and others can use it during the night. Except during breeding, two animals should not be placed in the same tank or cage as they will almost invariably fight, causing great damage in a matter of seconds. Another major hazard is damage to tusks, which sometimes break off below the gum line causing pain to the animal. Prolonged contact with another aggressive animal results in both animals becoming highly nervous.

If a Pygmy hippo has access to an outside yard in favourable weather, it will enjoy a mudhole in which to wallow, but the animals should never be allowed to remain outside for long periods in the fall when the water and ground begin to chill. In general, Pygmy hippos are easily cared for, requiring only a large amount of attention to hosing their area and constant observation by their keeper.

DIET

The diet for healthy Pygmy hippos is very simple; a good grade of commercial horse chow or pellets and a small amount of alfalfa hay is all that is usually required. The quantity depends on the individual animal; an average hippo consumes 3·8 l (one gal) of commercial horse pellets and 1·36 kg (3 lb) of alfalfa hay daily. The keeper who is familiar with his charges can increase or decrease feed as the hippo's condition warrants. Trying to complicate this diet in a healthy animal is a waste of time and money, for hippos have been bred, raised, and maintained on it alone.

SHIPPING AND HANDLING

Handling Pygmy hippos manually is almost impossible; they are aggressive and dangerous. If it becomes necessary to examine or treat one, the best method is to use a handling crate which is just large enough to allow the hippo sufficient standing room. At each end it should have sliding doors which should be cut in half, so that the top portion can be removed to work through. The top crate must be hinged in case it is necessary to work from the top, and a number of openings cut into the sides will ensure proper ventilation if the animal is to be held in it for any length of time. Double skids of hardwood with metal runners built under the bottom of the crate will facilitate dragging it and strengthen the foundation; this is important if the crate is to be moved with a fork-lift.

When it becomes necessary to catch a Pygmy hippo, the crate is placed outside the shift door. A number of men then enter the cage, walking behind hand-held sheets of 18 mm ($\frac{3}{4}$ in) plywood and slowly move the animal toward the shift door. As the hippo becomes cornered, an assistant opens the shift door and, in most cases, the animal, seeking safety from the keepers and advancing plywood, will dart through it into the crate. The sliding doors are then dropped and the animal is ready for treatment or observation. In such a crate, the hippo can be examined from the front, rear, and top. It is also simple to feed, water, and clean the animal in it if necessary. If a hippo is to be shipped to another location, the same procedure can be followed and the animal moved into a shipping crate at the last moment.

BREEDING

The male hippo should always be kept in a separate cage, except when breeding. The use of a tank with a pipe partition down the centre will facilitate introductions. The animals are placed in the tank, one on each side of the pipe partition, in about 45 cm (18 in) of water. If the water is deeper, the female will not be able to breathe properly during mating. A keeper should be present at all times during the process. If possible, the partition should have a sliding gate at each end; this allows the hippos a flight pattern to 'go around in circles' so to speak and, in the event of fighting, enables the keeper to isolate one of the animals as it passes a gate. One animal will almost always run – normally the male. During this time the actions of the animals should be carefully observed by an experienced keeper. Signs of

compatability are deep and audible breathing of the female, rubbing noses, and standing quietly. Danger signs are a playful female, or one who stands and claps her jaws very rapidly. Occasionally a female will mount and ride a male. The male may pay no attention to her advances but tries to play. The female becomes frustrated and soon a fight will begin.

It seems from the records that the female hippo probably comes into heat every 28 to 30 days. Unfortunately, there is no precise way to tell if a female is in heat. Close observation and trying a pair together in a cage is the method we use.

When both the animals seem receptive, the male, after some playful actions, mounts the female, usually at an angle. The female tries to assist by changing her position. When mating does begin, there is very little movement, but the deep breathing of the female is noticeable. Copulation usually last five or six minutes, after which the male dismounts and tests the female by rubbing noses. Both animals then sleep for an hour or so before mating again.

Although habits vary with different individuals, some pairs mate five or six times in one day, others only once. Whatever happens, they should be separated at night and introduced in the morning for the next few days. If they mate two or three days in succession, the female can usually be considered to be pregnant. To be sure, however, the female should be placed next to the male in the separated cage a few days each month for two or three months. If she remains aggressive and shows no interest in the male, she has conceived. It should be noted that some females will mate a few months after they have conceived, and this plays havoc with expected birth dates and sometimes results in a surprise calf.

Pygmy hippos, being naturally round and fat, do not always look pregnant to the observer. In some cases there is a marked protrusion of the vulva, and the teats may swell. The teats never hang as in some pregnant animals but they redden and enlarge. In one of our females, the entire area around the vulva protruded to such an extent that the tail could not lie flat; it may be significant that this animal had a breach-birth.

During late pregnancy the female should not have access to the water tank at night when there is no one to observe her. Furthermore, when allowed in the tank during this time, the water level should be no more than 30 cm (12 in) deep. If signs of labour are noted while the female is in the tank, the keeper should empty it immediately and move the hippo into a clean, dry, bedded cage as soon as possible. This should have closely spaced bars to prevent the calf falling out. If the female's diet is well balanced, no change is necessary during pregnancy.

PARTURITION

On 14 January 1968, a swelling of the vulva was noted on the female Pygmy hippo Millie. As we knew when she had mated and she was under observation, she was allowed into the water tank for a swim, and then returned to her cage to ensure safety to the expected young. This particular hippo is by nature a very restless animal. Normally, the walls of her cage are covered with faeces each morning but during the final two or three days of pregnancy, she does not dirty the cage but defaecates only in the water. This has been the general rule for all our females. Although Millie showed definite signs of the approaching birth throughout 14 January she did not deliver until the next day. Detailed notes were kept by her keepers and a summary of the last 12 hours is as follows:

14 JANUARY

1830	Lies down with difficulty, gets up and defaecates, paces, lies down
1930	Gets up and defaecates
20–2100	Sleeps
2130	Gets up, paces, lies down awkwardly
2200	Gets up, paces, defaecates, feeds, defaecates, feeds, paces
2230	Feeds, paces, defaecates, feeds, defaecates, feeds
2359	Defaecates, lies down, gets up, lies down, gets up, lies down again

15 JANUARY

0030	Sleeps
0100	Gets up, defaecates, lies down again, continuously changes position
0130	Gets up, stands still, paces, sits, lies down, changes position, rolls to left side, gets up, defaecates against wall, paces, lies down on right side

0200 Gets up, defaecates, lies down again on right side, rolls over from side to side, gets up, sits, lies down, stands up, paces

0230 Stands, sits, lies down, gets up, paces, lies down, gets up

0300 Gets up, lies down, gets up, defaecates, paces, stands quietly, paces, lies down on right side, gets up, stands still, sits on rear, gets up, sits, gets up again

0400 Paces, lies down, gets up, walks to centre of cage and squats. First contraction takes place, paces again, lies down, gets up, twitches tail against bars

0430 Squats again with mouth open, lies down, gets up, twitches tail against bars, lies down, gets up, squats and strains, membrane visible, lies down

0500 Gets up and squats, strains, head raised with mouth open, paces, licks area where she strained, lies down, gets up, squats and strains, walking at the same time. Moisture on and around vulva, lies down, gets up

0530 Strains, sits down and strains, gets up, sits down again, sits up straining, wags tail, rubs vulva against wall, strains, strains very hard in a half standing-half sitting position, lies down, rolls to one side, vulva open and protruding. Still down, head on front legs, strains very hard again, gets up again and still strains, rubs vulva on wall, foot can be seen protruding

0600 Paces, foot back inside, rubs against wall again, stands with rear to wall, half sits and strains, foot visible at vulva again, up again, strains, foot showing at vulva again, up again, strains at wall, foot back inside, stands, paces, stands with head down, eats hay, paces in a circle, strains at wall, foot showing again, scoots around cage on rear, lies down, strains very hard, back to wall, strains, sits down, lies on side. Very still, eyes closed, gets up, feet sticking out, head down; eyes closed, crouching position, lies on side, tail wags, feet still out, back to crouching position, lies on side, tail wags, feet still out, back to crouching position, lies on side, feet showing more, scoots around cage with back bent and strains, paces, lies down, stands up, scoots around and strains, stands still, squats, back to wall, strains, lies down and strains, lies on side and strains very hard, feet can clearly be seen, strains hard, feet out to hock, scoots around cage with head up, mouth open, lies on side, rests, strains hard

0700 Feet back inside, back to wall, strains, feet can be seen again, rubs wall and strains, lies down, gets up, strains, feet showing more, rests

0730 Gets up, scoots around cage, strains, spurt of blood, gush of water, young is expelled. Calf is a male weighing 5·7 kg (12¾ lb)

Birth weights of the newborn calf may vary from 3·4 to 6·4 kg (7½–14 lb).

The measurements of a typical 6·4 kg (14 lb) calf were as follows:

	CM	IN
Ground to top of hip	25·4	10
Ground to shoulder	26·6	10½
Girth at shoulders	45·7	18
Circumference of forefoot	22·8	9
Circumference of neck	33·1	13
Length of ear	3·7	1½
Diameter of eye	1·2	½
Circumference of muzzle	22·8	9

Because female Pygmy hippos are receptive to a male for some months after conceiving, it has been difficult to determine the exact gestation period, which is usually reported as 201 to 210 days (Walker, 1964). Four matings and the resultant births from different females, however, have been recorded which cannot be contested. On these occasions, the gestation periods were 192–194, 192, 195 and 196 days.

CARE OF THE YOUNG

Soon after delivery the female is offered a full tank of water to swim in as this aids in passing the afterbirth. It also permits the keeper to weigh, examine, measure and sex the new calf. It is not usually too much trouble to separate them, as the mother has been out and away from water for some time and is usually anxious to return to it; she welcomes the chance to drink and swim. We never have the tank completely full when we begin this procedure, in case the baby slips through the door before we can close it. While the baby is being examined, it is placed in a shallow pan of warm water and given a bath. Normally he has his first bowel movement at this time. If he does not, gentle massage will be sufficient stimulant. The umbilical cord is cut short enough to ensure that the animal cannot step on it and the end is dipped in iodine.

For about two weeks the calf is separated from the female daily for its bath and weight check. The birth weight should be between 5·5 and 6·4 kg (12–14 lb) but smaller calves have been raised successfully. Daily gains normally average from 0·45–0·7 kg (1–1½ lb).

When nursing the calf, the female lies on her side and holds her leg in the air to provide head room. It is difficult to pinpoint actual nursing times, because the female often lies with her back to the observer, but we find that the young suckle about every two hours. The baby hippo is born with very small tusks – about 1·5 mm ($\frac{1}{16}$ in) in length – which grow very rapidly. The calf is usually mouthing hay at about one week of age, while its mother is eating.

It is of the utmost importance that the baby have a bowel movement at least once a day. If it does not defaecate while being bathed, or in the cage, it should be placed in the tank with its mother, as this will normally stimulate action. The water should be about 30 cm (1 ft) deep. If for some reason no defaecation is noted for one or two days, every effort should be made to induce it. Our most serious difficulties have involved constipation in the newborn calf and, in all cases of this type, a veterinarian is consulted.

WEANING

At weaning (at about three months of age) the calf's diet is very important. Particularly, it should not receive any dry foods that might cause constipation. We feed calf manna, bananas and milk which have been mixed in a blender to a milk shake consistency. Finely chopped vegetables, fruit, and greens are also given. Sweet feed and pellets can be fed in very small portions, but no attempt should be made to put the calf on these solids too quickly or all at once. A great deal of difference will be noted in individual animals as to the ability to adjust to weaning. Thus, a three-week old calf suffering from serious multiple puncture wounds inflicted by its mother was given the weaning diet and began to eat heartily the same day. In this particular instance, no sign of pining for the parent was noted, and daily weighings showed no loss of weight. On the other hand, some animals suffer from emotional stress during weaning, and refuse to eat for several days. During this time they suffer a rapid loss of weight, and extremely sore feet from continual pacing in the cage. The best remedy for foot trouble is a good muddy yard, and the pacing usually ceases as time passes.

It is very easy to feel concern for individual calves who are difficult to wean but we owe it to the animal to see that it becomes self-sufficient. In all cases, it takes only a few weeks for the young calf to adjust.

HAND-REARING

The female Pygmy hippopotamus, Epsilon, was born on 19 February 1964, in a somewhat premature state – weighing 3·3 kg (7¼ lb) – being only half the average birth weight. By the end of the third day with the mother, the young animal had lost 340 g (12 oz) and she was therefore removed on 21 February for hand-rearing. Initially, the young hippopotamus was fed a formula consisting of equal portions of evaporated milk and water. This mixture was placed in a bottle and attempts were made to induce the animal to nurse. These were not completely successful and only 57 g (2 oz) were taken. Routine bathing after each feeding attempt was instituted and was maintained throughout the hand-rearing. Bathing stimulates defaecation and urination and is essential for maintaining the skin in a healthy condition.

Since the young hippo attempted to suck the fingers of the handlers but refused to suck on a nipple, milk was poured into a pan and the fingers of the keeper were dipped into the milk and

placed in her mouth. In this way the animal was induced to take an additional 113 g (4 oz). Four hours later, the fingers of the keeper were again inserted in the mouth but the pan of milk was placed closer and closer to her muzzle and, by turning and tipping the pan, she was induced to drink from it. A further 113 g (4 oz) were taken.

Feeding at 4-hour intervals was continued throughout the night with an average intake of 113 g (4 oz) per feed. This schedule was maintained for the first two weeks and by the end of this time, she was taking 340 g (12 oz) at a feed. Weight gains were maintained at 113–170 g (4–6 oz) daily. By 29 February she weighed 4·2 kg (10 lb).

On 1 March the young hippo was constipated. An enema alleviated the condition and on 2 March, the milk formula was changed to 3 parts evaporated milk to 2 parts water and 1 lactinex granula. On 25 March feeds were given three times daily, at 0800, 1200 and 1600 hours. Intake at this time was 650 g (23 oz) in the morning; 227 g (8 oz) at noon; and 650 g (23 oz) in the afternoon.

On 26 March the animal weighed 9·7 kg (21 lb 6 oz), and on 27 March she was offered, in addition to her milk ration, pieces of bread soaked in milk. This diet was accepted and was maintained until 30 March when one cup of beet pulp was added to the ration. The animal now weighed 10·5 kg (23 lb) and swam in deep water in the tank.

Except for a severe cold which was treated during April, she continued to gain weight and was still maintained on a soft diet. It seems that Pygmy hippos should not be converted to hay and grain alone until they weigh at least 18 kg (40 lb). Grass and green food were added gradually to the soft mixture. The recommended diet until a weight of 18 kg (40 lb) is attained is as follows:

1 cup calf manna	1 banana
1 cup evaporated milk	1 apple
1 cup water	handful of greens

The ingredients should be mixed in a blender until they look like cooked oatmeal, and may be poured on the floor of the cage.

MOTHER	DATE OF MATING	BABY	DATE OF BIRTH	GESTATION PERIOD (days)
Millie	12–14 February	Pi	26 August	192–194
Susan	10 August	Epsilon	19 February	192
Matilda	25 June	Delta	7 January	195
Epsilon	23 May	Tau	6 December	196

Table 1. Gestation periods of four Pygmy hippopotamuses *Choeropsis liberiens* born at the National Zoological Park, Washington.

PRODUCT MENTIONED IN TEXT

Lactinex granula: manufactured by Hynxon, Wescott and Dunning Inc., Baltimore, Maryland 21201, USA.

Albers-Calf Manna: manufactured by Carnation Albers, 5045 Wilshire Boulevard, Los Angeles, California, USA.

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