

BREEDING OF THE AMERICAN ALLIGATOR (*ALLIGATOR MISSISSIPPIENSIS*) IN THE SOUTHERN HEMISPHERE

A.E. ERIKSEN

Cango Crocodile Ranch & Cheetahland
P.O. Box 559 Oudtshoorn 6620 Republic of South Africa

This account covers the successful breeding of the American Alligator (*Alligator mississippiensis*) and is the result of three former attempts. The most recent attempt was detailed in an earlier article (Eriksen 1987a).

HISTORY

The Alligator breeding population of the Ranch consists of two pairs – the first pair, (hereafter referred to as "Pair A"), consists of a 2.95m male, approximately 22 yrs old, and a 2.2m female approximately 20 yrs old. The second pair, (hereafter referred to as "Pair B"), consists of a 2.9m male, age unknown and a 2m female approximately 16 yrs old.

Pair A and the female from Pair B were imported from America by the Ranch, while the male from Pair B is on breeding loan from another Zoological institution. Pair A have been together for approximately 6 years and Pair B for 2 years.

ENCLOSURES

The enclosures for both pairs are virtually identical and are situated adjacent to one another. The dimensions are as follows:- the pens are 10 metres x 10 metres in diameter, the pool being of irregular shape, with a surface area of 45 square metres. The average depth is 1.5m. The pool is of concrete construction and is drained twice a week. Emphasis in the enclosures is to create as natural an environment as possible. At the rear of the enclosure is a small room, which is kept heated in winter; this has a river-sand base, but is not used by the alligators for nest building purposes. The water in the enclosure is not heated.

OUTDSHOORN TEMPERATURE RANGES

	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	YEAR	
°C														
1987	MEANMAX	32	30	27	23	20	19	21	23	26	28	30	32	26
	MEANMIN	15	14	11	7	3	3	5	7	10	12	14	15	10
	RAIN mm	13	26	21	21	11	19	16	22	21	31	21	10	232 (total)
1988	MEANMAX	38	35	27	27	18	22	25	25	28	31	33	34	28
	MEANMIN	19	17	11	8	5	3	6	8	10	12	13	16	11
	RAIN mm	0	19	22	15	16	3	9	18	1	4	20	0	126 (total)

The water temperatures in summer average 25°C and winter 12°C.

DIET

The diet of the alligator originally consisted entirely of ostrich meat, (readily available in our area), however it was felt that this possibly contained too much calcium, as an ostrich head contains up to 50% bone. It was therefore decided to change the diet to donkey meat, with carcass meal and a vitamin mixture added.

The average feed rates are: 3kgs per animal per week during the summer months, i.e. October through to March. The alligators are not fed during the winter months.

BREEDING – 1987/88

The reproduction attempts of Pair A up until and including 1987 were discussed in my previous article. However, as stated in that paper, success was limited (1 hatchling born in 1987 subsequently died). To summarise, breeding of Pair A began in 1985 with a total of 45 eggs laid on the 14th January 1986. Of these eggs, one was broken and the remaining 44 were placed in an incubator containing no substrate. Five eggs were measured and weighed. These ranged in length from 72.5mm to 69mm, with a diameter of 40.5mm to 39.5mm – the weights averaging 67.5g to 61.9g. Of these eggs, 19 appeared fertile, however banding continued for only 14 days and then ceased. In 1987, 49 eggs were laid – 3 were badly damaged and 2 were cracked. A total of 46 eggs were placed in the incubator, once again, with no substrate. Of these, 28 appeared fertile and had begun banding.

After 58 days, on the 26th March, only 5 fertile eggs remained and on day 65 (2nd April), one hatchling broke through the eggshell. As the shell was very tough, the hatchling struggled to free itself requiring assistance after 20 + hours (detailed in previous article). The hatchling appeared to have a problem with its balance and subsequently died 2 months later through drowning, having had to be force fed until this time. At birth the length of the hatchling was 233mm with a weight of 35g.

By day 70, the remaining 4 eggs were opened revealing fully developed dead embryos. The average measurement of the eggs was 71mm long by 39.5mm in diameter, and weight average was 66g.

In 1987 Pair A produced no eggs, however from the 23rd of July 1987 heavy bellowing was heard from both pens, sometimes lasting up to 15 minutes and usually started by the males. This was observed on 18 different days up until the 9th November 1987. Bellowing occurred mostly in the early morning between 7am and 8am, and in the afternoons between 4 and 5pm.

Pair B, which had been introduced to each other and the new enclosure on the 1st July 1987, produced eggs which were discovered on the 22nd January 1988. On the 8th January 1988 the female started moving the nesting material around and showed signs of aggression, snapping and hissing on approach. However, she made no attempt to attack. On the 17th, she displayed extreme aggression, chasing and lunging at everyone that entered the enclosure. On the 18th she was chased off the nest and a thorough check was made of the nest; however, no eggs were sighted. This was unusual, as her behaviour indicated a lay. Periodical checking of the nest continued until the 22nd January 1988 when it was decided to do a complete check of the whole area. At 9am, 12 eggs were discovered buried under about 5cm of ground, at the back of the nest. No banding had occurred and the eggs proved to be infertile. (It would seem probable that they had been laid on the 17th). Nine of the eggs were completely broken. The average dimensions of the 3 remaining eggs were as follows:- length 70mm, diameter 40mm and weight 63g.

BREEDING 1988/89

In 1988, both pairs produced eggs with pair B producing first.

Vegetation was placed in both pens at the end of October, consisting of a mixture of cut grass (Kikuyu) and leaves of a wild bamboo found in the area. The nests were watered down approximately once a week, to aid in decomposition and to provide moisture. During this period, heavy bellowing was heard from both enclosures. Towards the end of November copulation was twice observed in Pen A, both times occurring at approximately 8am. On the 30th December 1988 at 8am, Female B was observed using her back legs to scrape the nesting material into a mound. This continued for approximately one hour before she re-entered the water. On the 31st December at 8.30am, I entered Pen B. The female lunged off the nest with her mouth open. She was then chased off the nest and the nest was opened. One egg was found near the surface of the nest, with a further 16 found in the centre. One of the eggs had a soft leathery shell and 4 others were cracked. All 17 eggs were placed in a styrafoam box. Holes were punched in the base, with a 5 cm deep layer of dampened vermiculite, placed at the bottom (vermiculite was dampened until a drop of water was produced

when squeezed). This was followed by a 2cm layer of nesting material. The eggs were then placed one layer deep, on top of the vegetation, which was then covered with another layer of dampened vermiculite.

The styrafoam box was then placed in the incubator which was set at 29°C and a humidity of 94%. A temperature probe was placed in the vermiculite and registered 30°C. This temperature rose in the following week to 32°C, then dropped to 31.5°C where it remained for the incubation period. On the 30th January, the eggs were removed from the incubator, as 7 eggs were infertile and the remaining 10 had ceased banding at approximately day 14. The embryos appeared to have reached stage 12 (Ferguson, 1985).

Egg measurements were on average:- Length 69.2mm, diameter 42.3mm and weight 66g. On the 31st January 1989, one month after Female B's initial lay, one egg was found in the water of her pen, and on the 4th January 1989, 3 more eggs were found in the water. They were placed in the incubator, however, none of them showed any signs of banding and were removed after one week. We therefore had no success with Pair B for the 1988/89 breeding season.

The eggs in Pen A were laid on the 16th January 1989. (Prior to this date, no copulation or nesting behaviour was observed). For 2 weeks prior to this, the female spent most of her time in the water, however on the morning of the 16th, she was observed on the nest and at 7.30am we entered the enclosure. The female showed no real signs of aggression, even when approached to within 1 metre. This was completely contrary to her previous protective nesting behaviour, however it was decided to go ahead and check the nest. As soon as wooden barriers were placed against her, she attacked and did not want to leave the nest. The eggs were discovered scattered around the inside of the nest, which contained a lot of sand - obviously scraped up by the female. Most of the eggs were found approximately 1cm from the top of the nest and a lot of them were crushed. A further eight eggs were found approximately 30cm below these eggs and only 1 of these was cracked. The rest were found in clusters scattered around the nest. Some eggs, which were covered in yolk from those that had broken, were first washed in warm water and then rubbed in nesting material, before being placed in the polystyrene container. The minimum and maximum temperatures on the 15th January 1989 were: Min 17°C, Max 35°C, and on the 16th January 1989 the morning temperature was 21°C. Nest temperature measured 27°C. As a point of interest, for one week prior to the 16th January 1989, the female refused to eat. The container and incubator were prepared in exactly the same manner as for Pair B.

On the 22nd March 1989, at 8am, 65 days from date of laying, (the exact no. of days occurring for Pair A's previous successful hatching), pipping was heard coming from the box. However, as it was very weak it was decided to leave the eggs until stronger pipping could be heard. On the 23rd, at 2.30pm, the nest was opened and by this time, 3 hatchlings had already broken through the shells. By 5.30pm, 5 hatchlings had fully emerged - these were washed in warm water and transferred to the hothouse. By 3pm on the 24th March 1989 a total of 10 hatchlings had emerged. Of the remaining eggs, 1 hatchling was found dead in the egg, however it appeared to be under-developed. The remainder were infertile. At birth, the hatchlings measured on average:- Length 24cm, weight 40g. 10 healthy hatchlings were produced by Pair B for the 1988/89 breeding season.

HATCHLINGS

For eleven days the hatchlings refused food completely, however, on day 12, one began to eat and this was followed by the rest. The method of feeding was to roll the food mix into a small ball then drop it near the hatchling. This movement seemed to stimulate feeding. Once the hatchlings were eating well, the food was placed around the sides of the pool for the hatchlings to eat in their own time.

They are at present kept in an enclosure, within the hothouse, measuring approximately 5 square metres. The enclosure contains a 2.25 square metre pool with a 40 cm concrete apron bordering it. The pool has a gentle gradient, sloping down to a maximum depth of approximately 16cms. Floor, air and water temperatures are kept constant at 32°C.

HATCHLINGS' FOOD

The food mix for the hatchlings consists of 60% meat, 20% fish, 20% liver, with a vitamin mix added at a rate of .1%. The vitamin mix is based on the "Alligators Premix" (Joanen and McNease, 1981) and consists of the following:

SPECIFICATIONS	PER 1 LB
Vitamin A	1,800,000.00 USP u
Vitamin D3	200,000.00 IC u
Vitamin E	5,000.00 iu
Riboflavin	1,000.00 mg
d-Pantothenic Acid	2,760.00 mg
Niacin	4.50 gm
Choline Chloride	86.43 gm
Vitamin B12	1.35 mg
Folic Acid	90.00 mg
Biotin	20.00 mg
Pyridoxene Hydrochloride	1,000.00 mg
Menadione Sodium Bisulfite	4,283.00 mg
Thiamine mononitrate	1,000.00 mg
Inositol	5,000.00 mg
Para-Amino Benzoic Acid	5,000.00 mg
Ascorbic Acid	45,000.00 mg
Ethoxyquin	5.00 gm

The growth rate as at 31 May 1989, was as follows:

Average length: 37cm

Average weight: 128g

CONCLUSION

Having finally succeeded in breeding Alligators, it would seem from our previous experiences that Alligator eggs do not hatch as successfully when no medium is used. When using a medium, it is my belief that nesting material, or some other form of biotic material, should be used around the eggs. This would seem to promote degradation of the egg shell as stated by Ferguson (1985). A high humidity (i.e. 94 to 98%) is also essential to prevent air spaces and regression of the yolk. Diet of the female alligator is an important consideration and too much calcium in the diet may create too thick an eggshell, thus making gaseous exchange and degradation of the shell more difficult. This is possibly borne out by our successful hatching for the 1988/89 breeding season, as the female was fed a diet of donkey meat with a small amount of calcium added. In previous years she had been fed a diet of ostrich offal, containing nearly 50% calcium.

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