

Captive breeding, egg incubation and rearing of the red-tailed ratsnake *Gonyosoma oxycephala*

ADAM RADOVANOVIC

Birmingham Nature Centre, Pershore Road, Edgbaston, B5 7RL, UK.

THE red-tailed ratsnake *Gonyosoma oxycephala* (Fig. 1) is one of the most impressive ratsnakes in the world. The species is widely distributed throughout tropical Southeast Asia, Indonesia and the Philippines (Staszko et al., 1994). It is an arboreal species that will, when threatened, inflate its body and strike (Whitaker & Captain, 2004). Captive bred animals are available but most are wild imports and are generally heavily parasitized (Mattison, 1998).

A pair of *G. oxycephala* was used in this breeding programme. The male was wild caught, measured 120 cm and weighed 500 g. The female was captive bred, measured 180 cm and weighed 800 g. The two snakes were housed individually and only introduced together when attempting to breed. The male was housed in a vivarium measuring 60 x 45 x 45 cm (L x W x H) with branches and a large basking area. The female was housed in a larger vivarium measuring 100 x 75 x 75 cm (L x W x H) with similar furnishings.

The ambient day temperatures were kept between 25 and 32°C with night time temperatures between 18 and 20°C. *G. oxycephala* is a tropical ratsnake and therefore the specimens were kept at 50-90% RH. The male was fed 4 or 5 mice per month whereas the female was fed 10 to 12.

Breeding Attempt 1 (2007-2008)

Between November and March the pair of *G. oxycephala* did not receive a temperature reduction. Instead, temperatures continued between 32-18°C. Both specimens were fed throughout this period with neither refusing meals. Toward the end of April 2008, the male was introduced to the female's enclosure. Within five minutes of introduction courtship behaviour was observed but no copulation was witnessed. Throughout June 2008 the female basked daily. Towards the end of

June four eggs were laid. These were transferred to an incubator. The eggs appeared infertile and were opened to reveal a large egg mass with no embryonic development.

Breeding Attempt 2 (2008-2009)

During November 2008 and February 2009, both specimens were cooled by gradually reducing the ambient temperature from 30 to 16°C over a five-day period. Both specimens ceased feeding during these months. The female gradually began to darken in colour during this period of temperature decline. Temperatures were gradually raised at the beginning of February from 16 to 30°C over a five-day period.

Both specimens were fed one week after temperatures returned to normal. During February 2009 the male was introduced to the female's enclosure for breeding. Courtship was observed immediately and copulation was observed within one hour. On one morning copulation was observed again after spraying the enclosure with warm water. In March 2009 the female appeared gravid and was moved to a smaller enclosure (as per 2007-2008 breeding attempt) ready for oviposition. During April four fertile eggs were laid in the hide box overnight among sphagnum moss. These appeared different to the eggs laid in 2008. They were pearly white in colour, full in appearance and larger (Fig. 2). The eggs were removed and transferred to an incubator.

Incubation of First Clutch

The eggs were incubated in a clear plastic container that fits within the incubator. Vermiculite mixed with water (ratio 2:1) was used as a substrate. A small depression in the vermiculite was made for the eggs to sit in. Eggs were only half buried using this method. A clump of damp sphagnum moss was

placed over the eggs to raise humidity to 100% RH. They were incubated at 30°C. The container lid was opened every two days to allow the eggs to freely exchange oxygen and carbon dioxide with atmospheric air (Deeming, 2004).

After 40 days of incubation two of the eggs began to discolour. The remaining two looked healthy. By day 54, all eggs had become discoloured and began to smell. All four eggs were opened up and revealed embryonic death. The embryos were dead and the interior of the egg was dry.

Sperm Retention in *Gonyosoma oxycephala*

In late June 2009 a second clutch of four fertile eggs was laid overnight in damp sphagnum moss. The female was found coiled around them (Fig. 3). As the female was isolated in March 2009 and was not introduced to the male after her previous clutch I suggest that sperm storage from the previous mating fertilised the eggs. The eggs were removed and artificially incubated.

Incubation of Second Clutch

The second clutch of eggs was incubated using the same method as the previous clutch, with the only difference being the use of sphagnum moss. Instead of smothering the eggs, damp sphagnum moss was placed around the eggs allowing greater access to air. After 36 days in incubation, one egg began to discolour and desiccate. After 87 days, the first hatchling began to hatch and was followed by a second on day 88 (Fig. 4). The hatchlings were transferred from the incubator to small rearing enclosures. The last hatchling emerged on day 89 but was still attached to the umbilicus that was secured to the egg. The specimen was left in the incubator for a further two days, still attached to the umbilicus. Intervention was required after two days and the umbilicus was tied off using cotton. After two days the hatchling was free and the remaining tissue began to atrophy and was shed away after the first slough.

Rearing of Hatchlings

All hatchlings weighed 21 g on emergence. They were housed in small plastic containers measuring 27 x 15 x 10 cm. Orchid bark mulch and sphagnum moss was used as a substrate to improve humidity.

Bamboo sticks were added to provide climbing opportunities. Hatchlings, however, were observed to be shy and spent most of their time buried under the sphagnum moss. They were only rarely observed climbing or perching.

Hatchlings sloughed 10-14 days after emerging from the egg. They were fed on pinkie mice, that were left in the enclosure with them overnight. All hatchlings reacted defensively when food was offered on tongs. One specimen did not feed after several attempts so a method of reflex feeding was adopted by utilising the snake's strike reflex (Ross & Marzec, 1990). All three hatchlings were feeding regularly within a month of hatching.

Conclusion

A two-month cooling period may be important for the production of fertile eggs. Precise incubation techniques may need refining in future breeding attempts and further research is necessary. The correct use of sphagnum moss may also be important when incubating *G. oxycephala* eggs. Smothering the eggs with damp moss likely killed the embryos in the early stages of development. It is possible that gaseous exchange was inhibited due to the moss covering the surface area of the eggs. When damp moss was placed around the eggs a 75% hatch rate was recorded. Temperature during incubation may also have a considerable effect on development of eggs. The egg incubation period is highly variable, from 80-180 days (Mattison, 1991).

To the best of my knowledge this is the first record of sperm retention in *G. oxycephala*. This process of reproduction has been described in snakes such as pythons and boas (Ross & Marzec, 1990) and a rattlesnake (Mattison, 1998). It has also been observed in *Pantherophis guttatus*, *Lampropeltis getulus californiae* and *Lampropeltis triangulum campbelli* (pers. obs.).

G. oxycephala is both a rewarding and challenging species to maintain in captivity. Future documenting of breeding attempts would be needed to determine whether sperm retention is a common reproductive mechanism, or maybe just a sporadic occurrence induced by environmental conditions.



Figure 1. Adult male *Gonyosoma oxycephala*.



Figure 2. Second clutch of eggs 2008-2009.



Figure 4. Egg clutch with hatchling 2009.



Figure 3. Adult female *Gonyosoma oxycephala* coiled on eggs.

ACKNOWLEDGEMENTS

A special thanks to Rowland Griffin for support during the preparation of the manuscript and to the staff and keepers at Birmingham Nature Centre for their excellent animal husbandry.

REFERENCES

Deeming, D.C. (2004). *Reptilian Incubation: Environment, Evolution and Behaviour*. Nottingham: Nottingham University Press.

Mattison, C. (1991). *A-Z of Snake-Keeping*. London: Merehurst.

Mattison, C. (1998). *The Encyclopedia of Snakes*. UK: Blandford.

Ross, R.A. & Marzec, G. (1990). *The Reproductive Husbandry of Pythons and Boas*. Stanford: Institute for Herpetological Research.

Staszko, R., Walls J.G. & Quinn, J.R. (1994). *Rat Snakes: A Hobbyist's Guide to Elaphe and Kin*. USA: T.F.H. Publications.

Whitaker, R. & Captain, A. (2004). *Snakes of India: The Field Guide*. India: Draco Books.



Figure 1. Close-up of adder consuming great tit fledgling.