In Press

THE SAME OLD SNAKES, FIFTEEN YEARS LATER

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INTRODUCTION

In early 1976 the National Zoo began to develop breeding groups of *Epicrates cenchria* (Brazilian Rainbow Boas), *Corallus canina* (Emerald Boas), and *Chondropython viridis* (Green Tree Pythons). We currently maintain some of the largest captive breeding populations of these snakes anywhere in the world. As of April 1992, we have produced a total of 710 offspring from these three species. This includes 19 litters of *E. cenchria* for 349 neonates, 10 litters of *C. canina* producing 101, and 24 *C. viridis* clutches resulting in 260 young. Third generation breedings are now common for all species. Our bloodlines are diverse including some founder stock and many captive lines.

Over the years our work has generated a tremendous amount of data and a number of publications (Walsh, 1976, 1977, 1978a, 1978b, 1979, 1983; in Pinney, 1981; with Van Mierop and Marcellini 1982; and with Davis 1983). Due to the limited time available for this presentation, I will focus on a few topics which I feel are critical to long term population management. The subjects I will cover are: 1. Physical conditioning and thermal cycling to induce breeding, 2. Care of gravid females and egg incubation, and 3. Husbandry practices for offspring.

Temperature cycles are the primary environmental cues which we control and manipulate to stimulate breeding behavior in all three species. We try to provide a six to nine month period of minimal day/night temperature fluctuations for what I call a pre-breeding/conditioning phase. During this time the animals are provided with a thermalgradient in the day ranging from 25°C to 34°C with a nightly low averaging 23°C. To induce breeding, the night time lows are allowed to drop below 16°C for four to 12 weeks. Daytime high temperatures remain about the same during this period. As long as the animals have the opportunity to warm themselves in the day, health problems are not experienced.

Courtship and breeding behaviors develop soon after cooling begins. Males usually go off feed when cooled, while females may eat regularly through ovulation. In the live bearing snakes, (*Epicrates* and *Corallus*), gravid females may infrequently accept small food items throughout gestation.

The cooling process we use to stimulate breeding may not alone be any more important to reproduction than the more stable temperatures of the pre-breeding/conditioning period. Both conditions seem equally important for long term successful propagation, with change acting as the trigger.

At the NZP we have produced young and/or eggs from all three Boids in every season of the year. In the case of *Chrondropython* we have experienced fertile eggs in every month except September. The ability to cycle animals to initiate breeding is of benefit with regards to maintenance of young. By choosing when to breed particular individuals of a given species, we can control when, and how many young are produced.

It is possible to breed females year after year in all three species. However, we currently choose to give females a year off between breedings. This seems particularly important with the live bearers which may go off regular feed for over six months while gravid. Our experience with breeding females annually shows a reduction in fecundity as well as wear and tear on the female. Prolapsed cloacas, reduced muscle tone, and pre-mature death may result in some breeders.

In *Chondropython* we have experimentally tried double clutching females in the same way some commercial breeders do with colubrids. To accomplish this first clutches were pulled for artificial incubation and females fed heavily while subjected to a condensed pre-breeding/conditioning cycle. In two instances females prolapsed soon after laying their second clutches, and in a third case a female lost all her teeth when allowed to brood the second clutch. Although both clutches from this latter female hatched producing normal young, it is suspected that the mother experienced

a form of calcium depletion. To this day, three years later, the now retired female doesn't have a tooth in her head.

CARE OF GRAVID FEMALES AND EGG INCUBATION

Thermalgradients are provided for gravid Boids at all times. Gravid snakes show physical and behavioral changes such as seeking heat, altered feeding patterns, personality change, and general posterior swelling. It is important not to confuse ovulation with signs of pregnancy. I associate the quick developing, localized mid-abdominal bloating appearance of females with ovulation. Obviously it is critical to maintain sexes together at this time, as well as continue with nightly cooling. Failure to distinguish between ovulation and conception may result in no young if males are removed and/or cooling cycles are interrupted prematurely.

In the late 1970's we set up two gravid *Corallus canina* in special brooding cages to monitor the position of the females in relation to four temperature zones. Results indicated the gravid snakes preferred warm temperatures averaging 31°C for most of the gestation period. However, over the last few weeks prior to parturition the females sought out cooler regions averaging 28°C.

More casual and recent observations of other gravid Emeralds, Chondros, and Brazilians show similar temperature preferences - all of which appear different from those of males and non-gravid females. Failure to provide and adequate thermal gradient for these gravid Boids, or too high or too low an ambient temperature

during the latter stages of pregnancy - may result in deformed and/or stillborn young.

It appears that *Chondropython* eggs go through a similar evolution with regard to thermal needs as do developing young in live bearing Emerald Tree Boas. During the early 1980's L.H.S. Van Mierop, in conjunction with the NZP, determined optimum Chondro egg incubation temperatures by monitoring brooding females on eggs (Van Mierop, et.al. 1982). During the first six weeks females maintained clutch temperatures around 31.5°C.(88°F) In the last week clutch temperatures were allowed to drop to an average of 29°C.(8- It appears that eggs which are kept too warm in the last few days result in full term dead fetus. This is a very common problem experienced by many *Chondropython* breeders, particularly with artificial incubation.

In our experience and discussions with other breeders, it is widely agreed that *Chondropython* eggs are difficult to hatch on a consistent basis. They produce relatively thin shelled eggs which do not take well to handling, extreme temperatures, or excessive moisture. In recent years at the NZP we have had excellent success hatching Chondro eggs by both maternal and artificial means. Regardless of the ultimate incubation method, I prefer to let females brood their eggs for several days to allow the clutch to "form up". During this time the delicate shells harden which enables the vascular system of the egg a stronger framework. This brief period of maternal incubation also allows slugs or bad eggs to solidify and become less of a threat to good eggs. I would also

stress the need for a virtually dry egg laying medium in nestboxes and for artificial incubation. The eggs require an atmosphere of high humidity, but succumb quickly to contact with a wet substrate.

HUSBANDRY PRACTICES FOR OFFSPRING

Among the three species, housing and husbandry needs of the neonates vary considerably.

Epicrates cenchria are by far the easiest babies to get started and maintain. They are the cornsnakes of the Boid world. Offspring do well when set up in large groups, and feed voraciously after firstsheds on anything resembling small mice.

Corallus canina babies may also be housed communally, however due to a more complicated feeding regimen it may be advisable to use individual cages. Because of the large size of newborn Emeralds and a very slow metabolism, we usually do not offer food until the young are three to four weeks old. Many Emeralds prefer live hoppers or small mice over pinks or dead food for first meals. Baby Emeralds are fed at the NZP on average of once every two weeks based on defecation cycles.

If Rainbow Boas are the cornsnakes of the Boid world - then *Chondropython* are like thoroughbred race horses. Chondro breeders generally have a love/hate relationship with their charges. Because of their high-strung nature and ability to inflict serious harm on one another I recommend setting up young Chondros individually. Problem feeders are more the rule than the

exception. One of our more successful tricks for stubborn eaters involves slitting open a fresh killed bird and placing dead pinks in the body cavity to be warmed and scented. With any clutch, four out of five problem feeders will readily accept pinks prepared in this fashion. We have never had a baby Chondro starve to death at the NZP, however holdouts of up to three months occasionally occur.

Most breeders are aware of a condition in captive raised *Chondropython* known as the "kinky tail syndrome". It is my opinion that this condition results from inappropriate husbandry of young delicate animals and not genetic flaws or bone disease as has been suggested. Since the mid-1980's the NZP has employed a policy of minimal physical contact with Chondros throughout their first year. Cages are setup to be worked without disturbing the animals. If specimens do have to be moved, they are encouraged on to a new perch with gentle prods, rather than being hooked off an old perch. The point is to avoid the animal anchoring it's prehensile tail and experiencing an unnatural "yank" causing stress to the vertebra. Finally, it is NZP policy not to probe *Chondropython* until they are at least a year old and more structurally able to withstand restraint. Since we initiated these "hands off" policies eight years ago we have not raised one animal which has developed the "kinky tail syndrome".

All three species are specialized in their habits, but all make hardy captives once needs are understood and met.

I hope that the shared breeding efforts, of both private and zoo sectors, will make it possible for future generations of Herp enthusiasts and zoogoers to appreciate animals in a captive setting, even if a natural environment no longer exists. What I am referring to is a preservation of life forms, not necessarily conservation. Preservation can play a role in conservation. By focusing on and bringing other's attention to specific life forms, we all may become more appreciative of the "Bigger Picture". As we learn more about a few life forms, we begin to ask more questions about the many.

My personal goals in working with a few species of snakes, which I do for no better reason than I like them, are few and simple. I hope that when I leave zoo work there will be more captive born snakes around than when I started. I hope that I will have a better understanding of these animals and a more comprehensive appreciation for the "Bigger Picture". Finally, I hope that my children and grandchildren might have the same opportunities to appreciate some of these animals as a result of my efforts.

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