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ARTIFICIAL INCUBATION OF REPTILE EGGS

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Photo: Brian Barnett.

Internal view of the author's highly successful incubator, showing containers with eggs. The thermostat is mounted to the right. The lowest point of the heating globes is out of view of the photo and 30 cm from the top of the egg container.

FOREWORD

An earlier paper was published as 'Artificial Incubation of Snake Eggs' in *Monitor* in 1981 (Vol.1 No.2 31-39). Several requests have been made for a rerun or better still, an updated version. The same incubator referred to in that article is being used, which was constructed and first used in 1976.

Twenty three years on has seen only very minor changes in my technique and my policy is to keep it simple, follow proven methods exactly and don't interfere.

As well as incubating my own eggs, in the past, other peoples were also incubated in my incubator. It would be impossible to estimate the thousands of eggs that have been successfully incubated in 'old faithful' with a minimum of effort and an extremely high success rate.

INTRODUCTION

Over the early years (1960's - 70's) I had tried many methods of artificial incubation of reptile eggs and although many of these did work to some degree, I was looking for perfection. In the past I had incubated eggs in a wide range of incubators, hatching containers, substrates etc.

Eggs having been incubated in heated rooms, in snake cages, on top of cages (floor heat to eggs) and under light bulbs.

Egg containers varied from margarine and plastic ice-cream containers to plastic bags and glass jars. Substrates ranged from sand, peatmoss, sphagnum moss and paper towels. In some cases eggs were completely buried in the substrate and at other times only half-buried or even placed on top of the substrate.

Although a combination of many of the above materials and methods are still used by others, and often quite successfully, my article will not include alternative methods but simply relate the system that I have used for several decades now, with complete satisfaction.

I sometimes laugh to myself when told of better methods, better incubators etc. Quotes like " we have this super dooper double insulated, triple thermostated, high tech humidity controlled incubator." Sure some of these will work but are generally unnecessary.

Eggs are created to successfully hatch, in most cases, and I have found it is generally the 'human element' that develops the failure rate.

INCUBATOR CONSTRUCTION

The incubator was constructed from 19mm particle board and measures 1.2m in length x 56cm high x 51cm in width. The size was calculated to accommodate the number of a particular size of container that was to be used. As the incubator was fixed to a wall, the door was hinged to the front (from the top) for easy access. The box was not ventilated in any way. As my incubator has always been kept in a room that did not suffer from extreme variations in temperature, it has not been necessary to insulate it. However, as others circumstances may change from time to time, it would not hurt to insulate the entire box, either inside or outside with styrofoam sheets.

HEATING

Incandescent light globes are used for heating and are fitted to the ceiling of the incubator. Originally one globe was above each container to apply an even spread of heat. The incubator holds 11 containers. In recent years I have reduced this to one globe over every second container, using only 5 globes. One end not having any globe directly over, has containers that I may wish to have 1-2 degrees C. lower in temperature. 15watt, normal size, incandescent globes are used and the distance between the globe and top of the egg container is approx. 30cm.

The low wattage and distance are to ensure that there is no sudden or intense application of heat. Choose the lowest wattage possible that will work up to the temperature you require in your own circumstances, but make sure that it can reach this temperature under adverse conditions. I can get away with the lower wattage because the room in which the incubator is

kept never goes under 20 deg. C.

The lower wattage choice is also a safety measure to avoid any quick rise in temperature, pass the safety margin, should a thermostat become jammed, etc.

The globes are controlled by a room thermostat, IMIT TA2, which is mounted on one of the inside walls. It is placed in a position where it is not directly affected by the heat of the globes when they switch on and in a position at container height is suitable but as detailed later on is not crucial.

A pilot light is fitted to the outside wall of the incubator and connected through the thermostat to indicate when the heating is on or off. This is simply a safety check without having to regularly open the incubator.

SITE FOR INCUBATOR

The incubator should be kept in an area where it will not be unduly affected by extremes of natural weather conditions. A cooler area where the lights are required to work more often is preferred to a warmer area where temperature control may be difficult to maintain during our warmer seasons. Avoid placing the incubator on top of other heated reptile cages, if they are heated from the roof of the cage with high wattage globes etc, as the temperature emitted from the lower cage may be higher than the safety margin required for incubation.

EGG CONTAINERS.

The containers that I use are known as bread containers, originally made to hold a loaf of bread. This will give you some indication of their size and shape. The bases are coloured plastic and the removable tops are clear plastic which makes observation quite simple without having to remove the lid and regularly spray the eggs from loss of humidity. The containers are sealed and not ventilated in any way. I believe these containers are no longer available but there are many similar choices available these days.

SUBSTRATE.

The only substrate I use is Vermiculite which is a sterile absorbent mineral. There are generally three grades available; fine, medium, large. For what reason I am still not aware of, the fine grade has resulted in some bad hatch rates. The medium I used for several years without problems apart from purchasing batches that I believe had some fine grade mixed in with it. For quality reasons mainly, I use only large grade Vermiculite.

TEMPERATURE PRE-SET AND CHECK.

It is advisable to pre-set the desired temperature in the incubator before the eggs are placed in the containers. The temperature shown on the thermostat may vary to that in the actual egg containers. I select one of the central egg containers as a permanent temperature guide for accuracy. In this container I used to fix a maximum/minimum thermometer to provide me with accurate daily readings. With the modern digital thermometers available these days I have the probe of the thermometer in the container and the body of the thermometer placed on the outside wall of the incubator for easy checking of current as well as maximum and minimum readings.

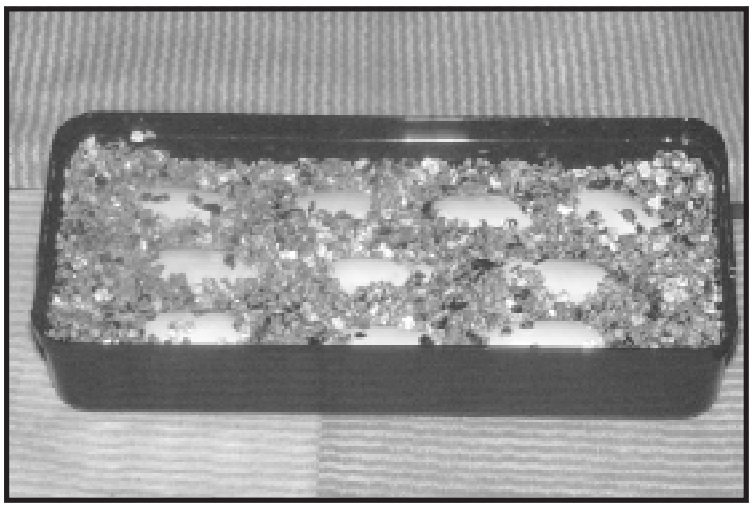

Photo: Brian Barnett.

Collett's Snake (*Pseudechis colletti*) eggs, freshly laid and placed in a container of vermiculite. For this photo the clear upper lid of the container has been removed.

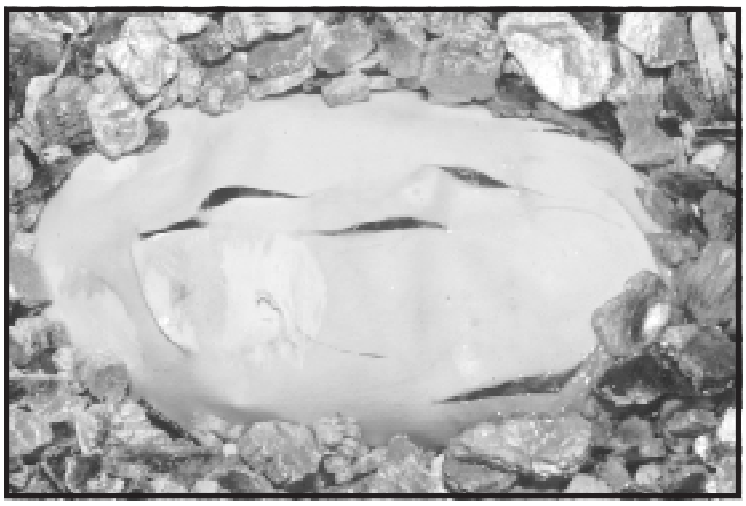

Photo: Brian Barnett.

Collett's Snake (*Pseudechis colletti*) egg, showing egg tooth marks which are made just prior to the emergence of the young snake.

The thermostat is adjusted above the desired temperature and when the temperature in the container, as indicated on the digital reading of the thermometer, reaches the desired level the thermostat is turned down until it just clicks off and the lights cut out. The reading of the thermostat is of no interest, the reading in the container is all that counts. Check this over the next 24 hours and adjust if necessary.

HUMIDITY.

Relative humidity is kept high during incubation and I use a quantity of Vermiculite which would amount to a depth of approx. 25mm in the egg container. Water is added to the dry Vermiculite in a measured ratio of 1:1, 150gm Vermiculite to 150gm or 150ml water. This will result in almost 100% humidity. If the container lid is not regularly removed, very little additional water, if any, needs to be added during the period of incubation. If

any eggs do start to 'cave in' during the early stages of incubation, a fine spray of water over the eggs and medium should be applied. Repeat this every couple of days, in moderation until the eggs return to their normal full shape. During the last weeks of incubation, if the eggs have not swollen considerably, they will naturally 'cave in' to a certain degree before hatching - I do not apply any additional moisture when this occurs. Condensation may appear on the inside of the egg containers, this is not a worry and the amount will be influenced by the outside temperature. The warmer the outside temperature, the less condensation visible. With my incubator, the coolest part of the egg container is that at the front. The condensation tends to flow in this direction and makes the Vermiculite at this end more moist than at the other which can result in larger swollen eggs at the front and drier smaller eggs at the rear. I simply rotate my containers around, front to back and back to front, once per week which evens out this flow of condensation.

INCUBATION TEMPERATURE.

My incubator, or more precisely these days, my control container (the one with the probe thermometer) is set at a maximum temperature of 32 deg. C. When this temperature is reached, the thermostat cuts out and brings the power back in again when the temperature falls to 29.5 deg. C. I can maintain 3 or 4 containers at a slightly cooler temperature i.e. those at one end without the globes directly above them. This has been a very successful range for me in incubating a wide range of reptile eggs.

I have never incubated above this temperature (32 deg. C.) but on occasions, such as power supply strikes, the temperature has fallen below the desired minimum (as low as 24 deg. C.) for short periods of time without any damage to the eggs.

One point of interest in regards to incubation temperatures was an experience with a clutch of Sand Goanna *Varanus gouldii* eggs (Barnett 1979). The eggs were laid by a monitor in the care of a friend of mine. We decided to incubate half of the eggs each and the ones incubated by myself using the aforementioned method and temperatures hatched in 169 - 172 days. The other eggs were being incubated at a lower temperature, unfortunately not recorded, but estimated at 24 - 25 deg. C. Only one of the three eggs survived and were not necessarily lost through lack of heating. After 10 weeks of incubation at this lower temperature, the remaining egg was given to me to place in my incubator. This egg hatched in 208 days which was 39 days longer than the ones that I incubated for the full period at 29.5 - 32 deg. C.

REMOVAL OF EGGS FROM CAGE:

I remove the eggs from the cage where they are being laid as soon as possible. Normally the eggs adhere to each other and form a clutch. Fortunately I have been present whilst most of my eggs were being laid and this has made the task much easier. In the case where the eggs have already adhered to each other it is not essential to separate them unless you need to weigh and measure them, need to fit them in a specific container or it is just your choice for incubation.

Within the first 12 hours or so it is not too difficult to separate the eggs. Select the eggs that are easiest to separate, that is, those on the outside of the clutch and those with the least amount of surface area adhered to the other eggs. The key word is 'gently'. If it looks like any of the eggs may be broken, maybe split the clump into several smaller clumps and incubate in this manner.

The majority of eggs are quite soft as they are laid by the female and I prefer to leave them to dry out and 'harden' for approx. 30 minutes before placing them in the hatching containers. This is done in a reasonably warm area. In most cases, if you are going to weigh and measure the eggs, it would take you this amount of time anyway.

I then discard any obviously infertile eggs. Size is really no good indication of this as fertile eggs from the same clutch may vary greatly in size and/or weight. Any that are extremely soft, do not 'harden up' or have the 'non-white' appearance (normally yellow/brown) are discarded. These days I have a candler lamp which illuminates the interior of the egg but generally only confirms what I already know.

It is advisable to keep records (not memory records - they don't work) of clutch sizes, egg measurements, weights, incubation periods etc.

EGGS TO HATCHING CONTAINERS

With the hatching containers prepared with the substrate and moisture, the eggs are now ready to be placed in the containers. I make a shallow seat in the substrate by pressing down with a finger or removing a small amount of substrate from where the individual egg is to be placed. This is to ensure that the eggs remain stable and retain their position through incubation. Eggs, if handled or removed, should not be turned but kept in the same position throughout incubation. The embryo develops very close to the top of the egg in the early stages and movement of this position may result in the loss of the developing animal. The incubator containers are not overcrowded and the eggs are placed so that they are not touching each other although I do not have any specific reason for doing this, it is more out of habit.

The same amount of medium and water is placed in each hatching container whether it be for a clutch of Children's Pythons eggs weighing a total of 200gms or for 3 Black-headed Python eggs weighing a total of 500gms.

RUPTURED EGGS

I have rarely experienced this and all occasions were in the early days when experimentation was part of the chore. This always occurred from over watering or initially a bad incubation media ratio. No doubt some eggs would have been lost from this but some survived looking maybe 50 - 60% larger when they were laid.

There comes a point when the pressure becomes too great and the egg simply dies or a weak point in the shell, possibly created when pulling eggs apart, allows some of the content to weep out. In this case I have removed problem eggs into a dry substrate until the massive expansion has subsided. With modern knowledge this should not deteriorate this far. I prefer to have my eggs looking as they were laid or possibly only very slightly larger. If you can see this problem occurring shake any excess moisture from the container lid. Weigh one of the eggs to give an accurate account of whether it is subsiding.

Photo: Brian Barnett.

Three Black-headed Python (*Aspidites melanocephalus*) eggs placed in a container with pre-mixed vermiculite and water at a ratio of 150 gms to 150 gms by weight. The three eggs weighed just on 500 gms in total.

My most notable ruptured egg was that of a Childrens Python egg that split right open and deflated 31 days into incubation with an estimated 24 days to go. Looking at the little pink occupant one would not give it much of a chance of survival. I decided to try and save this egg and experimented with a 'humidicrib' (Barnett 1980). The egg was tied at each corner and suspended in an elevated position in a container in the hatching container. It was treated more or less as a normal egg from that time on and 'hatched' 24 days later. Its whole progress could be witnessed and photographed in the fully opened egg.

Photo: Brian Barnett.

Carpet Snake (*Morelia spilota*) eggs just prior to hatching. Note how they tend to become indented at this stage.

HATCHING

When the time for hatching arrives, the young reptiles make cuts in the egg shell with their egg tooth. They may not emerge from the egg immediately and in some cases remain with their head out, or emerging in and out, for several days. The snake will emerge when all or most of its egg food has been absorbed. Do not make a practice of removing reptiles from eggs simply because of impatience. On the odd occasion where it seemed that a problem was existent a reptile has been removed from an egg its umbilical cord tied and cut, antiseptic to the cut area and placed in a sterile container for several days. Some of these died as there was obviously other complications but also some survived.

Once the first of the clutch has broken through its egg, I sometimes make a slit in each of the other eggs in the clutch. This is generally done for some of the more uncommon or valuable species. Usually I attempt to leave most of them alone. If I slit an egg I rip it rather than cut it. By grabbing the top between the thumb and index finger of both hands I find it pretty simple to create a small rip that exposes the contents without doing any damage to the blood vessels etc.

GENERAL

Incubation periods vary from species to species and those I have incubated ranged from around 8 weeks up to 30 weeks. Periods within a certain species may vary and minor variance in incubation temperatures can produce some interesting ranges. When working with a certain species consult a known authority and discuss

techniques with them, it makes sense to get it right this year and not have to wait another twelve months. You will no doubt meet or hear about some local experts on incubation. A second opinion never hurts as many of the so-called experts may have not much more knowledge than yourself. Everyone knows how to do it better and some how come up with these new techniques, devices and equipment that are going to change the herpetological world. They, and their equipment, are usually short lived.

After sharing my experiences with you, on incubation, I hasten to add that when my incubator is full, I put any additional eggs in the hatching containers in a snake cage, after the snake has been removed. They'll hatch there anyway.

ACKNOWLEDGMENTS

Raymond Hoser and Peter Comber discussed parts of earlier material published by myself and offered valuable suggestions on the updating of it.

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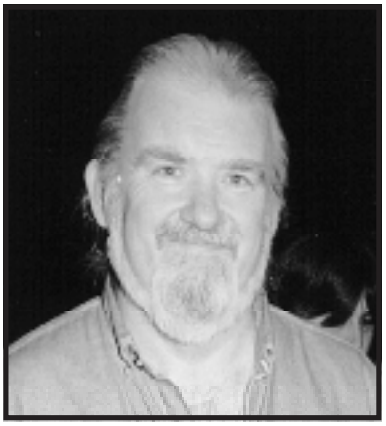
BRIAN BARNETT has been involved in herpetology for nearly 50 years. A recognised authority, he's successfully bred many reptiles including some species for the first time recorded in herpetology.



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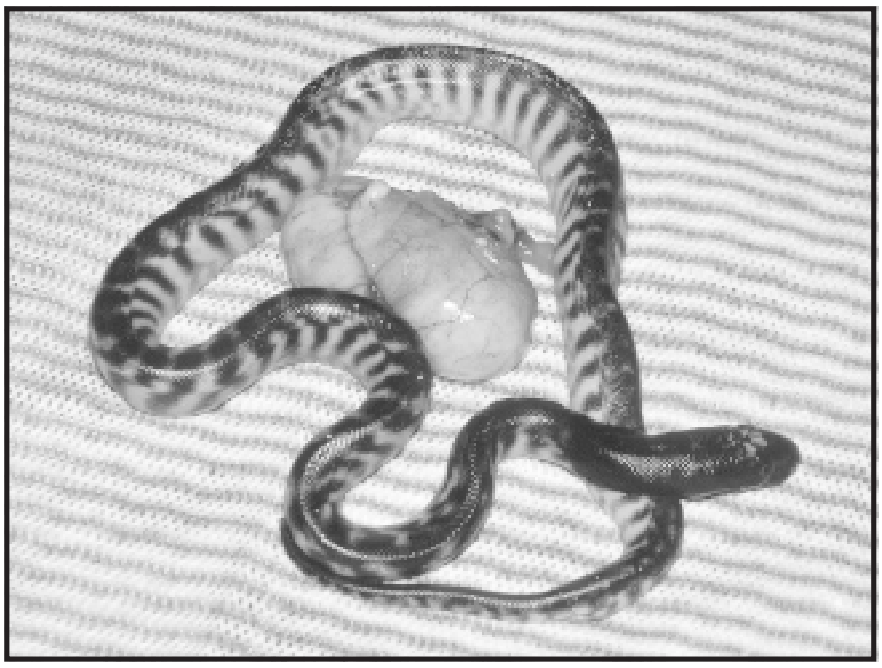

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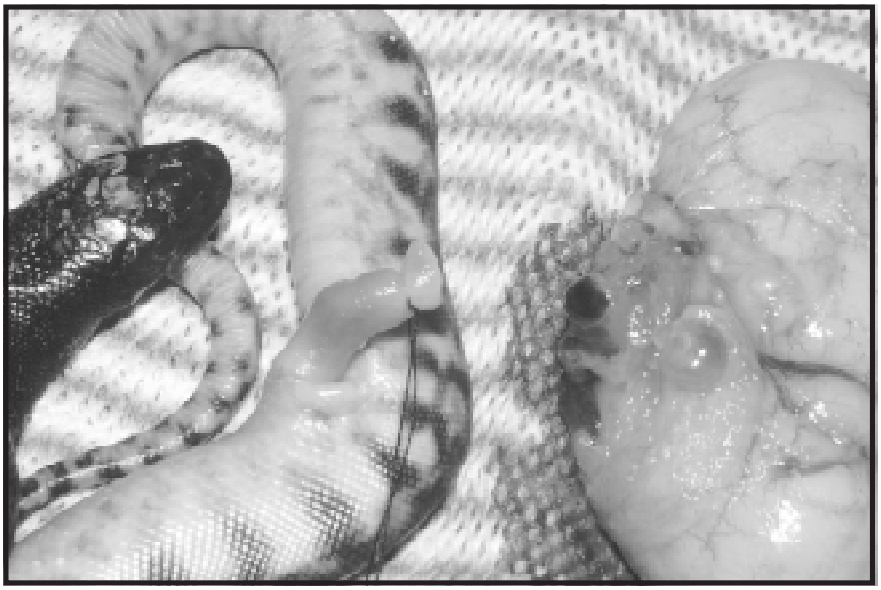

Photo: Brian Barnett.

The three photos above show a Black-headed Python (*Aspidites melanocephalus*) hatchling. It was manually removed from it's egg after the rest of the clutch had hatched without incident and it was apparent that this one was having some difficulty. The photos show how the umbilical cord was tied off and a liberal amount of betadine (liquid) was applied before the cord was cut, releasing the snake from it's obstruction. The young snake weighed 52 gm while the average for the remainder of the clutch was 91 gm. The remaining egg that was not ingested weighed 23 gm.