

# A Non-scientific (Behavioral) Approach to Reptile Reproduction

Frank Retes

Tucson, Arizona

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This will be pretty much an open discussion. I'll start with what I think are the key elements in breeding snakes and lizards. One essential thing in reproduction is to work with sexual pairs, not just any male-female pair. Even long-time keepers have the problem of not having sexual pairs. Another thing is that, for some of the rarer animals, we don't know what the breeding size is, and what we need are adult-sized animals. When black-headed pythons were first being kept, 90% of the animals in captivity were sub-adults, but people had them on an adult schedule and were feeding them once a week or once every fourteen days and hoping they would reproduce. In fact as juveniles, they simply were not yet ready to reproduce and should have been fed more often.

Another thing is to have compatible pairs. Just because you have two black-headed pythons, a male and a female, does not mean that they are compatible. Individual reptiles may have different breeding rhythms in the wild. Some of these animals with large ranges cycle differently in different parts of their range. They'll react differently if you treat them with the same hibernation or photoperiod, even though they are both the same species. So you have to get a sexual pair that is compatible.

Now let's move on to "cycling." You have to let the animal know what season or time of the year it is. You can do this through "hibernation", through photoperiod, or through feeding schedules where you just feed them more heavily at one time of year. You can cut off their feeding first and later lead into what I call "conditioning," i.e., increased food intake. I found out that with fish, amphibians, and reptiles the key thing is to condition the females. They have to be well fed at the right times, and this has to do with getting them to cycle when you want them to. In fisheries they condition the animals, but they can't get them to cycle without using hormones. Hormones can also be used with amphibians, but we don't yet know how to do that successfully with reptiles. So we coordinate the timing of the conditioning with the cycling of the animal. You can have problems with southern and northern hemisphere animals: you have your weather and cycles here and their weather and cycles there, and how do you get them to breed here? That gets to be fun.

**Q: How do you "condition" your female snakes?**

A: Mainly by feeding them heavily in the fall and after hibernation. Colubrids for example form their ova in the wintertime when they're in hibernation, and in the spring the ova develop and ripen. If you put the snakes into hibernation in the winter and drop their temperatures and then bring them back up, just feed the females heavily when they start feeding. If you don't do this, the ova don't ripen. One of the things I do is feed them a lot of food items more often. When you feed them on a schedule of once a week or once every ten days, it's very hard to get a female to produce a lot of young or sometimes even to produce young at all. In the wild they feed every day if they can.

**Q: Why would there be a problem with southern hemisphere animals if in the southern hemisphere they breed on increasing**

**day length or whatever; wouldn't they do the same thing here?**

A: Yes and no. When I first started breeding southern hemisphere pythons, I hibernated them in our winter and brought them out in our spring, thinking they would breed in our spring and have young that would hatch or be born live during our summer. It worked with the first few pythons I did that with. If you cycle them strongly enough, it can work. But somehow they have the ability to know what's happening in their world outside. A lot of the problems that people have had with pythons catching colds while hibernating is a result of hibernating them too strongly at temperatures that are too cold. For some animals like carpet pythons and black-headed pythons, you can drop their temperature and do all the things that you're supposed to do to them, and the males may still cycle at a different time than the females. I've never had that problem with colubrids, where the male will try to breed at one time of the year, and the female is cycling and producing ova at another time of the year. So there are problems where these animals fall victim to our summer and winter periods when these differ from the animal's origin. Of course, in Tucson it is so hot that we have special problems keeping them cool.

**Q: Do you see a difference in first, second and third generation captive bred animals adjusting?**

A: Yes, and that goes back to having compatible animals. Once you get captive hatched animals, you can successfully raise them, and most are very easy to breed. But getting compatible animals is the key thing. I always assume that my animals were designed to grow to adult size and then breed. Sometimes when they're sick, they can prove you wrong, and that's when Dr. Jarchow has to be called in to fix them up.

**Q: What are the optimum temperatures when you're cycling these snakes; how far do you drop them, say, for a strong cycle?**

A: I've taken Dumeril's boas down as low as 40° or 45°F. and had no problems. In fact they were breeding at 45°. One of the things you need to do with pythons is take their cage temperatures down low, but always give them a place where they can get warmth if they need it. The Dumeril's didn't go to the heat pad till it got below 40°. Most pythons, if you drop the temperatures, will start copulating within two weeks. They breed when they're in hibernation. Actually it's probably not really "hibernation," but when you drop their temperatures, that's when they cycle. Most boas are the same except for Rosy boas, which I think are a little more colubrid-like in their behavior.

**Q: Aren't those temperatures much lower than those encountered in the wild?**

A: Some of the animals do face these extremes, but not all of them. *Chondropython* (green tree python) is found both at low elevations with very warm temperatures, and in higher, cooler environments. So the same type of snake can experience various temperatures, and that's why you have different breeding conditions and rhythms for the same type of snake. That's why you have to try different things. If you haven't bred a particular animal, and don't have friends that have, you start with photoperiod, then hibernation, and then changing rhythms, and trying various other things.

Failure is only a method of learning, and there is no such thing as real failure unless you give up trying. If you can't breed an animal the first year or the second year, or the fifth year, all of you still can learn from your mistakes. One of my best friends, Ernie Wagner, never experiences failure. If he wants to breed something it might take him eight years, but if you talk to him, he'll always say, "They're on the way." And they are! He *will* breed them and that's the attitude you need to take. If you fail one year, it's not a reason to

get rid of the animals. You just learn by questioning why you didn't succeed. Often, the key is to recognize unnatural behaviors and how they differ from the normal behavior of a healthy animal.

And that's what I want to talk about: recognizing things the animals are doing. When they don't feed, that could be normal. The animal could be trying to tell you that it's on its off cycle, and you have to be able to recognize that it's not sick. For example you might ask, "At what temperatures do I need to keep an animal?" Well, the animal will tell you if you just watch it carefully. If we see our animals are all in the front of their cages and not using the heat source placed at the rear of their cages, that tells us that the tape is too hot. If you put the heat source on a rheostat and keep turning it down until the animal goes to the heat pad, then you have found out the correct temperature for that animal. One of the key things in hot climate areas, such as Arizona, is that we should keep animals cool with a hot place to go. They shouldn't be kept hot with a cool place to go.

Through the years we have found male colubrids to be especially sensitive to heat. Most colubrids kept over 82°F. and any of the montane ones kept over 80°, have infertile eggs. Pythons are just as susceptible, maybe more so, to heat than are colubrids. Most male snakes exposed to high temperatures over a long period become sterile, and females so exposed can have their eggs "killed." The length of time of exposure to heat is important here. Colubrids can bask in 95° temperatures for short periods, but they have to be able to get away from that heat source and cool off. Also, colubrids may not choose to go to a heat source if they can't hide while they are warming. A shy, timid animal won't go to a heat tape kept in the open even if the animal really needs the heat for its biological well being. So give the animal some options. Kingsnakes, for instance, like to get under something to get warm, while rattlesnakes like to get on top of something to get warm. So you look at the kind of snake you have and make your guesses. If you're trying to breed animals, you'll know when you're right because snakes react strongly to their environment, and their best reaction is reproduction.

**Q: 1) You said getting females ready involves frequent feeding, perhaps giving them more food more often. Why do you think you don't ever see any fat females in the wild?**

**2) Is there such a thing as a snake being too fat?**

**3) Why don't you find many females in the wild if they are so busy being out and about feeding?**

A: In captivity we do have a definite problem in overfeeding animals because they don't have the same daily activity as they do in the wild. A lot of the snakes don't move much, but they do have a daily routine of some amount of activity. In captivity they consume too many calories in acquiring sufficient amounts of vitamins and minerals, and don't get enough exercise to burn these extra calories off. When they are out of hibernation their metabolism is really pretty high and they move around every day. Colubrids in our area here in southern Arizona come out in March, go through reproductive behavior until the rains hit in July, and then the reproductive behavior is pretty much over. During this time, they have very well-defined territories and strong units or groups of animals. And yet, in order to get them fit enough to produce babies, you have to overfeed them and this means you have to provide them with exercise. In the wild, fit and well fed animals don't come up very much to be seen. The animals you see crawling around are usually sick and not very well fed. The reason I believe you don't find more animals out feeding is that they tend to stay out of sight and under cover where they live and wait for food to come to them.

**Q: When they first come out of hibernation, what are the dif-**

**ferences in how the males and the females act?**

A: Well, first of all, some animals don't "hibernate." In my opinion, the animals here in southern Arizona don't hibernate. They don't have dens and large groups of animals like they do back east. What they do here is congregate in breeding groups. For example, at a western diamondback rattlesnake "den" in Arizona, there are no juveniles, only large adult animals that are there to breed, so it's a breeding congregation. They come together in the fall to breed, they may breed again in the spring, and then they disperse. The whole geographic area of Southern Arizona is a little bit different, and since I've done most of my work here, I don't have a lot of experience with the denning behaviors found up north.

But for captive animals, it's probably a wise idea to bring your males out sooner than the females and you need to be sure the males are conditioned before you put them together with the females. In fact, for a lot of the colubrids, I don't even hibernate the males. I keep them fairly warm all winter.

**Q: When is the time to bring the males and females together after hibernation?**

A: There are a lot of indicator signs to know when they are ready. A good healthy female colubrid having been put into hibernation should cycle two weeks after its first shed, or during the period two days before to two days after its second shed. If you know how to palpate an animal, you can feel the ova in the female. This can be done by letting the female crawl through your hand. This way you can feel the eggs and count them. Pythons and boas develop their eggs in clusters and you can feel them in the middle of the animal as a clump in the early stages, and later the ova spread all the way down in the animal's body. With colubrids, the ova spread out in the animal from the beginning. Another indicator of cycling for colubrids is regurgitation, which is a sign of hormonal change or impending death. A female kingsnake will regurgitate if fed on the day of her cycle and the next day she will be fine. So female snakes go through hormonal differences that cause noticeable changes. Males kept in the same room can detect this through pheromones and begin to actively and noticeably crawl around.

**Q: When you have females that haven't bred for a couple of years, do you ever have problems with peritonitis due to their holding the eggs or their resorbing eggs year after year?**

A: We've had animals that bred nicely as long term captives which had not been breeding for years. At other times we find long term captives that we get to cycle but which cannot produce eggs. This is generally due to injury, most often to heat stress, and in such cases you may cause the death of the animal by breeding it.

**Q: Do you think it's a bad idea to keep females by themselves and not breed them?**

A: If you don't intend to breed them, don't cycle them. That doesn't mean that they won't lay eggs. At one time I kept kingsnakes at a constant 84° with constant light and temperature and yet they bred every eleven months, with about 60 % successful breeding of the females. With a stronger cycling factor like hibernation you could expect a 95% breeding rate.

**Q: How long does a cycle tend to last?**

A: We don't know a whole lot about that. Based on my experience, I feel that it is about 10 to 14 days after the females first become receptive.

**Q: After a female colubrid lays her eggs and if you want to double clutch her, is there a particular amount of time that you wait before you try this?**

A: First of all, you can only set the stage by preparing her for

double clutching, you can't make her double clutch. In captive animals, if you give them enough food and if the environment and metabolism are stable, the animal will automatically cycle again after the first clutch and this will usually happen within a week after laying. They shed before they lay their eggs, and if they shed between breeding, they won't usually cycle again. I had one occasion where that was not true, but that was a rare instance. Note that females don't need to breed again in order to multiclutch. They can lay good eggs in the following clutches without having been bred again.

**Q: For multi-clutching snakes, their investment in the first clutch is only half of their reproductive budget for the year. Isn't it true that some snakes like rattlesnakes and pythons put so much investment into a single litter that it's hard for them to breed the next year?**

A: Egg layers can generally breed year after year, while live bearers generally don't unless you're "re-energizing" them well and their metabolism is being well balanced. Reptiles can breed once, twice, three times a year, or they can breed once every ten years. I had a California kingsnake which laid five giant eggs the first and second years I had her, eight good sized eggs the third year, two clutches of eight smaller eggs the fourth year, two clutches of 12 eggs each in the fifth year, and the sixth year she laid two clutches of 15 eggs each. When she double clutched, the eggs were a lot smaller; but the babies were approximately the same size.

It seems that the faster you raise snakes to adult size, the better they reproduce. I have developed a goal or formula that says we should be able to grow the animals to half way between average size and record size in captivity. The average king snake size is three feet, the record is five. So we set a goal of trying to raise them to be four feet. I set a size goal for each species. For 75% of the species I work with, I can actually achieve record lengths. That's because for captive snakes, we're dealing with optimum conditions.

**Q: Could you tell us something about what constitutes good housing?**

A: Probably the worst thing to have happened for those keeping snakes is the availability of plastic shoe boxes and it is because the animals have a behavioral need for something to do in their cage environment. We should create nice terrarium settings where the animal has a place to hide, a place to climb, and a place to do whatever that particular species wants to do. Yet, their cages don't need to be elaborate.

Another thing I do is related to the fact that snakes apply scent to the areas where they live. In captivity, one of the first things we do is keep the cages clean and remove almost everything the snakes have placed their scent on. The first thing most snakes do is scent their newly cleaned cages again. I've found, especially for "troubled" animals, that it is best to keep something in the cage with the animal with which it grew up. Sometimes, when you relocate juveniles to a new cage after they reach a certain size, they balk and stop growing. It may take them up to four months or longer to get going again. If you keep a piece of wood, a log, or a hide box with them that is never washed clean, the snake's scent stays on it and the animal is more comfortable and will continue to grow, often reaching adult size in a year. This is one of the techniques I use. Snakes need a lot of security in various forms. They need a place to hide, and they need the reassurance of familiarity with their surroundings to know that they are where they belong. Otherwise stress is likely to result.

**Q: Do you keep all your animals individually housed, or do you**

**keep them in groups?**

A: I keep them both ways. I learned the most about behavior when I used to keep animals together in groups. A lot of female colubrids like to be kept in groups of four or five. One interesting thing I observed was combat dancing in females. We all know that we have combat dancing in males, but we also have combat dancing in females related to territorial rights. Unless animals are kept in groups, you won't see many of these or other interesting behaviors.

**Q: Do you leave pairs together for extended periods of time or should you separate them after a while?**

A: Generally speaking, they will breed right away. If you've been housing males and females separately, you should put them together. It's interesting to note that if you put a male into a female's cage where he is in her territory, the male is going to roam quite a bit before he becomes attracted to the female. But when you put the female in with him in his cage, he's going to react to her immediately. Whenever some new factor is introduced into the male's territory, he's going to react. If it's food he's going to eat it, if it's a male he's going to combat it, and if it's a female he's going to breed it. Putting a female in a male's cage is one easy and quick way to see if a female is cycling or not. The male will immediately respond if she is. On the other hand, if you can tell by palpation that the female is cycling, and if the male ignores her when she's put into his cage, then I'd look for another male.

**Q: Is there any way to keep an active snake like *Masticophis* (whipsnake) from beating up its nose?**

A: I don't know how to do this and that's why I don't keep them. One reason I select certain types of snakes to keep is that they require small territories and you can house them reasonably. Others that require a lot more room can be kept also, but it's more costly and difficult. For example, I would say that a Sonoran mountain kingsnake, *Lampropeltis pyromelana*, in nature has a small base range of probably about six square yards, while *Masticophis* probably wanders over a territory of a hundred square yards or more. So you have to give *Masticophis* a completely different environmental feel in its cage than you would a "pyro." A lot can be done via illusion in building a cage environment to make the snake feel more at home in what is actually a very tiny territory. One thing is to let the snake see an open expanse of well lighted territory while the snake itself is in an area that is relatively densely packed with shelter and dark hiding places. Some of the more widely ranging animals need that and it may be possible to do this in a relatively small cage space.

**Q: Do you use tricks like making hide boxes with little screened areas, partitions and compartments in it for the snakes to use?**

A: Yes. There are many things you can do for your own enjoyment and for the comfort of the snake. One trick I've used with a Blair's kingsnake is to have a pile of shale rock pieces in the cage above a heat tape. The snake would go up to the top of the pile where it was coolest, I would feed it and it would then go down into the rocks where the heat tape made it warm. When it came up on top of the rocks again, I fed it again and the pattern would repeat. That snake was always ready to feed when it was on top of the rocks. Another thing most snakes like is to have a tight area that they can barely wedge themselves into and poke their heads out. This makes them feel very secure. Leave a couple of old sheds around since that also makes them feel comfortable.

**Q: In the case of more secretive colubrids that you never see, how can you tell when a female is ready to cycle?**

A: If you really never can see the animal, you probably don't have

the right environment set up, or the animal is not healthy. A healthy animal will usually come out to take food in the daytime if you present it. One example of how important it is to present the animal with the right environment is illustrated by an experience I had with some California kingsnakes. A female I had laid eggs and then began to crawl endlessly. I thought she was going to kill herself by never resting and I prepared to release her into the wild. I threw a snake bag in the cage, and she immediately crawled into the bag and didn't stir for two weeks. When she poked her head out again she began feeding. What she needed at that time, and what I didn't have for her at first, was a suitable hiding place.

**Q: Do you have any preference about what kind of hiding box to use?**

A: Actually, I'm developing into an advocate of black plastic trash bags. Snakes seem to love plastic. In fact one of the favorite tricks I used to catch snakes in California is to lay out black plastic in the Spring. In fact, for nesting boxes, I'll take a black plastic trash bag and put some potting medium in it and set it in a box with a piece of glass over it (just stay away from redwood and cedar shavings). When I put this in the cage with a gravid female, she'll usually go right in it and lay eggs. It's nice and dark and it holds some humidity. Snakes can tell if rock crevices or soil is too porous and loses too much moisture, and if she feels it will, she won't lay her eggs there. It's also very important not to disturb a snake while it's laying its eggs.

The better the nest, the quicker a snake will lay its eggs and the better the chance the mother will develop a second clutch. Although books on this subject often say that laying will take place about seven to 14 days after shedding, I've had them lay the day after. If they go more than two weeks after shedding before they lay, you are in trouble. Also, the old adage, "When you have a gravid female moving around the cage in whom you can see bulges from her ova, she is about ready to lay eggs," is false. What it really means is, "She is about to die." In the wild they develop and drop eggs very fast. Nonetheless there is great variability in breeding behavior between various types of snakes. For example, "pyros" have a communal nest, and a bunch of them will lay eggs in the same place. For "*thayeri*" (*Lampropeltis mexicana thayeri*) which is closely related, you don't find this behavior.

**Q: Should we use the offspring produced by our breeding successes to reintroduce animals into the wild?**

A: No. Except for certain scientifically controlled programs where a habitat is being regenerated and a number of individuals have been removed for the express purpose of being returned there, it is not a good idea to release any captive bred snake into the wild. The key to keeping a wild population of animals going is to protect their habitat, and in certain cases to limit overcollecting. Generally, most captive bred animals are no longer "natural" creatures, and are the result of at least some degree of domestication or modification of the ancestral form. This can occur in remarkably few generations, and in the wild, it lets snakes adapt very readily to environmental changes. What should be done with captive raised snakes is to use them for one's own enjoyment or sell them to collectors to reduce the collecting demand on wild populations.

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