



Floppy-tail Syndrome:

a problem which could endanger the captive population of crested geckos

Andy Tedder considers a serious and misunderstood health issue surrounding these popular lizards which is becoming increasingly prevalent, and explains what should be done to tackle the problem.

Perhaps the most over-looked and under-estimated condition threatening both the health of individuals and the 'fitness' of the captive crested gecko (*Rhacodactylus ciliatus*) population today is floppy-tail syndrome (FTS). The tail is hyperextended in affected individuals, which means that it rotates freely, and, in extreme conditions, hangs at an angle of 90° perpendicular to the body. It poses the risk of serious muscle and bone damage to geckos suffering from this condition, and also has the potential to have a serious impact on the captive 'gene-pool'.

The crested gecko tail

The tail of the crested gecko, compared with other members of its genus *Rhacodactylus*,

possesses some unique features, which make it highly specialised. Firstly, and perhaps most importantly is the presence of lamellae on the tail tip, which aid with grip in a similar fashion to the enlarged toe pads of geckos. In addition, the tail's prehensile capabilities allow this appendage to act as a fifth limb, helping the gecko to climb and balance more effectively. It is very important to note that both of these characters are probably difficult to evolve.

The third trait that this appendage possesses which is of significance in this context is caudal autotomy - the ability to 'shed' the tail when threatened. Although this trait is a common and well-documented in many gecko species, the tail of crested geckos will not regrow if it is lost. This is highly significant, and probably reflects

The common theories

A number of ideas have been put forward to explain this condition, as outlined below.

1. "The pelvis isn't designed to support the weight of a tail" – this is a very common suggestion as to the reason why this species develops FTS in captivity. There is of course a major problem with this, namely: the tail of crested geckos is a highly specialized, derived (as opposed to ancestral) character, and as such is likely the product of many hundreds of thousands (if not millions) of years of evolution. To suggest that selection for a trait like this could occur at the same time as selection for reduced muscle capability required to support it is clearly exceedingly unlikely.

2. Partial caudal autotomy – this theory suggests that incomplete 'loss' of the tail results in fracturing of the muscles only, thus significantly reducing the animal's ability to control its weight. In situations where the animal spends large amounts of time facing towards the ground, the tail will be able to 'hang', causing the hips to tilt. Over prolonged periods, this will then result in the associated hip damage. While this theory IS plausible, it does not fully explain the sheer number of cases which have been recorded, and has yet to be demonstrated in any veterinary situation. It is also likely that for muscle detachment to occur, the blood supply would be lost and so the tail would likely deteriorate rapidly, as dry gangrene set in.

3. A symptom of metabolic bone disease (MBD) – calcium plays a vital role within the body of all reptiles, and is involved in both bone maintenance and muscle function. With this in mind, it would seem plausible that MBD could play a role in the development of FTS. However, it would appear to be quite unlikely that the bone density of only the pelvis would be affected, and not the more commonly affected regions like the limbs and lower jaw. X-rays also show that bone density throughout the body is not being affected, and so calcium metabolism, while able to play a role in FTS is not likely to be the primary cause.

This means that of the theories regularly suggested as causes of FTS in crested geckos, none of them really fully explains the phenomenon. However they do offer some insight into what the potential cause is, and how it may continue to affect the captive population of this species in the future.



Breeding affected animals

It would perhaps appear to be a little naïve to suggest that this character IS fixed within the 'gene pool', although we see enough cases to suggest that it IS fixed in certain genetic lines. However, the most worrying thing for the future is that it is likely that this could happen to the entire captive population with continued breeding of individuals which display the FTS phenotype, (ie showing signs of the condition). I continually hear people suggest that FTS will not affect the chances of your animal breeding. Unfortunately I consider this VERY poor advice for several reasons:

- ▶ If the bone density of the pelvis is low, then damage to the bone and muscle tissue can and will arise from prolonged exposure to FTS. This pelvic damage is likely to impair a female's ability to pass eggs, greatly affecting the risk to health from breeding.
- ▶ Breeding individuals with reduced 'fitness' can lead to problems generally with the health of the offspring.
- ▶ Breeding individuals with a trait that is likely to be genetically linked will only increase the number of individuals in the population that carry the trait. This essentially means that you are damaging the 'gene pool' by allowing 'less fit' individuals to contribute (and this is NOT restricted to FTS, it goes for all reduced 'fitness' characters).

The final reason in the list above is potentially the most potent reason not to breed individuals with FTS. You truly risk damaging the future of the species in captivity by breeding any animal that expresses a phenotype with reduced 'fitness'. I cannot stress enough how bad this will be for this species in captivity if people continue to do so.

the gecko's inability to replicate the very specialised structure of the tail itself at the tip. Unlike the situation with many other species, the tail can only be lost in a single position, again suggesting that this is not an ancestral state, but a derived or evolved trait.

The symptoms of FTS

As mentioned briefly above, the most common sign of FTS is hyperextension or 'floppyness' of the tail. This part of the body will often be seen hanging slightly to the side, or most notably, hanging perpendicular to the body when the animal is itself upside down (or facing the ground). Other symptoms which often accompany this problem include slight 'lumps' or 'depressions' around the pelvic region, although these are not really conclusive. In severe cases though, clear damage to the pelvis can be seen. Many sources will suggest that a general weakening of the

tail muscles characterizes FTS, and thus the tail will no longer be able to grip. This, however, is not really true. The muscles involved in the prehensile action of the tail are seemingly not involved in FTS, and tail functionality is generally unaffected.

Genetic fixation of reduced pelvic bone density.

As many of you will know, crested geckos were considered to be extinct until as recently as 1994, reflecting a serious population decline. The captive population - which although now widespread - is based on relatively few individuals. One of the potential pitfalls when populations go through a 'bottleneck' like this, a serious population decline with correspondingly reduced genetic diversity, and then a population increase.

In other words, animals that would previously not have been able to compete for a mate due to health issues, are able to

successfully breed and pass their genetic material on to further generations. This can be a real problem, especially if these reduced 'fitness' individuals are mating with other reduced 'fitness' individuals. Such pairings can essentially lead to the fixation of these reduced 'fitness' traits in the



Clear pelvic tilt, with the tail no longer parallel to the body. © Annette Moore.



When horizontal, the tail lies to the side, out of the animal's control. © Annette Moore.



A pelvic 'depression' can be seen, and the tail does not hang correctly. © Jaclyn Linge.



In this case, the tail is hanging at 90° perpendicular to the body.

population.

In the case of the crested gecko, it is entirely possible that individuals with pelvic bone density lower than that required to maintain tail weight at certain angles were not at a selective disadvantage (as would be expected under normal circumstances) due to their small population size.

This theory follows in the footsteps of the first suggestion above that perhaps “the pelvis wasn’t meant to support the tail

weight”, although this is counter intuitive. However, if fixation of a negative character is involved because of necessary inbreeding, then this suggestion becomes a little more plausible. Furthermore, it is also quite likely that a slight calcium deficit would mean that the pelvis, with its already low bone density, could be the first area affected by the early symptoms of MBD.

Taking individuals with reduced ‘fitness’ into captivity and again being forced to

A healthy crested gecko climbing around its quarters.



Are crested geckos the only species affect by FTS?

Unfortunately the answer to this question is NO. However, for other species, the reason for FTS are easily understandable, and DO relate to calcium metabolism, or to be more specific, too little dietary calcium being fully utilized. Again, the best course of action if you think your animal may be suffering is to seek veterinary advice.

breed genetically related animals due to low numbers is likely to increase the probability of fixation. (In this case, all animals which share the negative character state are related, regardless of the sibling status). All the offspring produced will therefore share the trait too, and it has the potential to become a permanent fixture in the captive population.

What should I do if my animal has FTS?

The first port of call when you notice the symptoms of FTS is to seek the advice of a veterinarian that specializes in reptiles. This cannot be overlooked. You need to know the severity of the case, and the overall bone density of the animal in case there are further husbandry issues which need addressing. The vet will likely offer you an X-ray for this purpose, and I would highly suggest that you agree.

The results of the X-ray will allow you to assess accurately whether the gecko’s calcium metabolism is adequate, or whether you need to introduce further dietary calcium and a source of UVB to prevent the condition worsening. In extreme cases the vet can suggest amputating the tail in order to prevent further stress to the pelvis. In my opinion, this is an excellent strategy for preventing further physical damage to the animal, and should be considered in these cases. I would also suggest that people do not try to induce caudal autotomy in their animals however, as if carried out incorrectly, it can lead to serious health issues.

In terms of vivarium management, it is often suggested that glass vivariums somehow increase the incidence of ‘hanging upside down’ or ‘facing the ground’. I have no reason to think this IS the case, however many people will recommend dense planting of the enclosure to prevent the tail ‘flopping’ over. While this may prevent immediate damage to the animal, it perhaps masks the phenotype of FTS in the animal, increasing the chances of passing it to the next generation. ■

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