GEKKO

The Journal of the Global Gecko Association
Volume Two, Issue Two

Letter from the GGA Board

Dear Friends,

The publication of this issue of Gekko brings to a close the second year of the existence of the Global Gecko Association. A massive vote of thanks is due to our loyal and growing membership. It is only through the unstinting support of our members in 23 countries across the globe that we have achieved so much in such a short space of time.

Please renew your membership as speedily as possible in order that we can continue to bring the very best information on geckos to you. Preparation of Gekko Vol.3 No.1 is already well underway and it looks like another superb issue. Also in the pipeline is the next issue of our renowned newsletter Chit-Chat. Don't forget that Chit-Chat is only ever available to members of the GGA—it cannot be obtained elsewhere for love nor money!

We are sure that year three of the GGA will be the best year yet—the best journals, the best newsletters, the best for our website, the best for the Gecko Listserv, the best Gecko Night and importantly, the best for membership growth.

We look forward to the active involvement of all our members, existing or new, young or old, professional or hobbyist in achieving these goals.

Together we can forge the GGA into a real force for good within the herpetological community and continue to put the study of geckos where it belongs—centre stage!

Best wishes,
The Executive Board of the GGA

The Global Gecko Association

A not-for-profit membership based organization dedicated to meeting the needs of the international gecko community.

The GGA promotes interest in geckos in a whole variety of ways, from responsible captive care, to study in the wild, conservation, academic research and beyond.

Membership is open to all, whether hobbyist, professional herpetologist or institution. Members will receive two issues of Gekko, the Journal of the GGA, annually, together with four issues of Chit-Chat, the regular members-only newsletter.

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Please address all membership inquiries to:

GGA
4920 Chester Street
Spencer
OK 73084-2560
U.S.A.

e-mail: membership@gekkota.com

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The Husbandry and First Recorded Captive Breeding of the Chameleon Gecko *Carphodactylus laevis* Gunther, 1897

Three month old Carphodactylus laevis.

Robert Porter
39 Luxton Court
Tallebudgera Valley
Queensland 4228
Australia

Introduction

Australia is the home of unusual and wonderful gecko species, many of which are familiar worldwide. The endearing knob-tailed geckos (*Nephrurus)* and the striking leaf-tailed geckos (*Saltuarius* and *Phyllurus*) are good examples of these. One of the strangest, however, is a poorly known species from the monotypic genus *Carphodactylus*. The Chameleon or Carrot-tailed Gecko (*C. laevis*) is a member of the Carphodactylini tribe of the gecko sub-family Diplodactylinae. The tribe was so named because it was thought that this species exhibited the greatest number of primitive traits of all species in the group (Kluge, 1967). It was first described by Gunther in 1897 and the scientific name translates to 'smooth stick-toe', referring to the smooth skin and the long, thin digits (Ehmann, 1992).

Description

Carphodactylus is a truly unique gecko in its appearance. It reaches a maximum snout-vent length of around 13cm and a tail length of 8-10cm. The general body color is invariably light brown, its common name of Chameleon Gecko probably referring to its ungainly walking style rather than an ability to alter its color. The eyes are large and black and appear even bigger due to the presence of a large black patch directly in front of the eye socket. The body is somewhat compressed laterally, a feature which is emphasised by the presence of a mid-dorsal ridge running from the neck to the base of the tail. As suggested by its alternative common name, the tail bears a resemblance in shape to a carrot, wide at the base and tapering rapidly to its tip. The original tail is strikingly colored in velvet black with several thin white bands and is rarely observed in wild specimens, which usually display the mottled fawn and dark brown regenerated version. The species readily sheds its tail so it is unclear if the predominance of regrown appendages is a true reflection of extremely high predation pressure or the result of its nervous disposition. Like many of its close relatives, the tail has only a single cleavage point at its base. Interestingly, the tip of the original tail terminates in a tiny knob that is difficult to see with the naked eye (Bauer, 1990). This may be a relic of the ancestry of the Carphodactylini, which also includes the Australian knob-tailed geckos (*Nephrurus*). One further unusual feature of the tail is that it squeaks! When discarded in the face of a predator it writhes like any good lizard tail but at the same time it produces a noise to further distract any would-be hunter. To date this has only been recorded in regrown tails (Wilson & Knowles, 1988).

Natural History

Phylogenetic analysis of the Carphodactylini indicates that *Carphodactylus* is most closely related to the Australian leaf-tailed geckos (*Saltuarius* and *Phyllurus*) (Bauer, 1990). This relationship is reflected in the behavioral and ecological characteristics of the genera. All three are primarily inhabitants of rainforests or wet sclerophyll forests and require relatively high humidity levels. Their thermal needs are low, certainly compared to other Australian gekkonids. They exhibit similar foraging techniques and general life styles and reproductive cycles, at least in captivity.

Carphodactylus is an endemic inhabitant of the tropical rainforests of northeastern Queensland, from Tully in the south to Cooktown in the north (Bauer, 1990). Most records originate from upland rainforest areas, although a recent report showed that they are not restricted to this habitat (Torr, 1998). The life history of the species is virtually unknown as little field research has been carried out and the relevant literature mostly comprises anecdotal observations. Their nocturnal foraging is restricted to locating a favorable vantage point and remaining motionless for hours awaiting a passing prey item. The trunks of young saplings in particular are preferred by these lizards, although larger trunks and fallen logs may also be utilised. Their orientation is usually vertical, with the head pointing directly at the ground, a position also observed in many leaf-tailed gecko species, for example, *Saltuarius* and *Uroplatus* (Porter, 1997). This foraging position may indicate that much of the food is terrestrial in origin, the gecko moving down the trunk as ground-dwelling invertebrates approach the base. Diurnal resting areas are beneath leaf-litter, in hollow limbs or decaying trunks or amongst epiphytic plants (Wilson & Knowles, 1988). Captive behavior tends to suggest terrestrial retreats are commonly used, which is divergent from the leaf-tail group that prefer to remain secreted off the ground, at least in captivity.

Specimens can be located in their natural habitat at night by spotlighting for reflected eye shine. With the appropriate head torch the large

Juvenile *Carphodactylus laevis* in a threat pose standing high off the ground with the tail waving from side to side.

sensitive eyes of this species produce a strong reflection of a very pale blue from distances of twenty meters or more. They are almost invariably resting in the head down posture, usually within a meter of the ground, and will remain motionless even when approached. However, if the animal is disturbed it reacts quite dramatically, dropping to the ground before running for cover in a rather ungainly fashion. This nervous behavior is reflected by the gecko's shy, retiring nature in captivity. Captive-bred juveniles exhibit somewhat more spirit than wild caught adults and will enact a defensive behavior very similar to that utilized by Australian leaf-tailed geckos; the body is pushed high up on the spindly legs and the tail is raised and waved sinuously from side to side.

Although listed as a species of conservation concern in previous publications (Czechura & Covacevich, 1985; Ehmann & Cogger, 1985), these authors recognised that this was based more on the lack of knowledge of the species and its requirements rather than any true rarity. Ehmann (1992) indicates that the species will utilise areas of disturbed forest and lists the species as common and secure.

Captive Maintenance

Upon introduction to captivity, wild specimens take some time to settle and begin feeding. It is important that, during this transition stage, disturbance is kept to an absolute minimum and that the lizards are maintained separately. Even the presence of another *Carphodactylus* may invoke panic and subsequent stress in new captives. Both sexes are very nervous initially but the males in particular display a highly-strung, temperamental disposition. This characteristic is reflected by the reluctance of new captives to feed when in view. Following collection my female was first seen to feed after three months in captivity; the male was not actually observed feeding for over twelve months after capture. Feeding must have been taking place, as the lizard's condition did not deteriorate markedly during this period but despite many attempts to strategically place live insects or offering food from forceps no feeding response could be elicited. When the enclosure was approached, the lizards usually froze and, as in their response to danger in the wild, they remained virtually motionless unless touched, when they rapidly ran for shelter. Activity appears to begin within a few minutes of the lights going out, the lizards emerging to rest on a branch or piece of bark, a position they will often remain in for several hours.

The enclosures used successfully for this species measured 50 x 35 x 70cm high and were constructed from 12mm plywood, stained and sealed using a polyurethane-type product. Access was through a door making up

approximately two-thirds of the front of the enclosure, the center of which comprised a 40cm square piece of window glass. Vents were cut into the bottom of the front below the door and at each side towards the top. These vents were covered internally with aluminum fly screen mesh and externally with 12mm square galvanized weld-mesh for extra security. With this configuration of ventilation, an efficient airflow was created within the enclosure, the warmer stale air leaving via the top vents being replaced by fresh cooler air at the bottom. This air turn-over must never be underestimated, particularly for species being maintained in high humidity environments that encourage the proliferation of potentially pathogenic bacteria and fungi.

An incandescent light fitting was installed in the top corner and fitted with a low wattage (25 or 40 watts) blue bulb. This low heat source was further controlled by a rheostat to provide extra control and flexibility. None of the geckos were ever observed to actively thermoregulate adjacent to this light fixture. During hot summer spells the room housing these animals would occasionally reach 30°C, which did not seem to cause any major problems for the adults provided it was over a restricted time period and relative humidity was maintained. Some juveniles, however, did succumb to these temperatures after only a few days of exposure. Ideally, the gradient within the enclosure would be maintained between 22-28°C during the day, dropping around 5-6°C at night. In winter, temperatures may drop as low as 8-10°C at night without any problems. Natural light was provided from a nearby window and no supplementary illumination was provided. This provided a natural photoperiod equivalent to that of the New South Wales Central Coast with an approximate light/dark ratio of 14:10 hours in summer and the reverse in winter.

As a dweller of rainforests, it is essential that humidity is maintained between 75-100% at all times. This was achieved by a thorough daily misting of the enclosure with tepid water, the presence of a small water bowl at all times plus the addition of a plastic container of permanently moist substrate. The latter consisted of a small sandwich box around 250 x 250 x 70mm high filled with an equal mix of fine sand and palm peat. Water was added to this substrate two to three times per week during warm weather and once per week at other times to ensure it was consistently moist. This also served a secondary function as an oviposition site for the female during the breeding season.

Several substrate types were trialled, including palm peat (a derivative of coconut fiber) and fine washed beach sand. Both appeared suitable with the latter preferred because of its ease of cleaning, ready availability and low cost. As with most geckos, *Carphodactylus* produces a firm fecal pellet and it is an easy task once or

Juvenile *Carphodactylus laevis* showing the large black eyes accentuated by the dark patch directly in front.

A clutch of eggs in the incubation container before being covered with a final layer of moist sphagnum moss.

twice a week to remove and discard these. This is really all the regular maintenance that is required along with a complete substrate change every two to three months. Provided only a fine grade of sand is used there does not appear to be any problems with ingestion of substrate causing gut impactions. A major proportion of fecal matter may consist of this substrate but it appears to pass through the digestive system without any further problems. Other enclosure furnishings consist of several layers of vertically placed pieces of tree bark leaning against the back of the enclosure providing secluded hiding spots between them and one or two diagonal climbing branches. Some horizontal bark strips or inverted plant pot saucers with an entry hole cut in one side are situated on the moist substrate of the plastic oviposition container and act as refuges. Unlike the leaf-tailed geckos that tend to rest during the day in areas off the ground, at least in captivity, *Carphodactylus* appears to prefer to utilise cover on the ground when it is available.

Once settled in captivity this species does not appear to be a fussy eater and will readily take most of the standard insect food items. The specimens in this study were maintained almost solely on cultured crickets, which were offered two to three times a week to both adults and juveniles. *Carphodactylus* are not gluttonous feeders and males in particular will not usually consume more than two or three crickets in a feed and always retain an appearance bordering on apparent emaciation. Interest in food items is often relatively muted, especially when compared to the eager reaction of the closely related leaf-tails to a potential meal. Supplementation with 'Repcal' and 'Herptivite' in a 2:1 ratio is made sparingly once a week during the breeding season and once every two to six weeks outside of this time.

Reproduction

Sex determination is straightforward in this species with the mature males possessing distinct hemipenal swellings while maintaining a much less robust build than the females. These sexual characteristics become visible at around twelve to fourteen months of age. Once settled into captivity or raised as hatchlings, the sexes can be successfully maintained together all year round. Despite the generally lighter stature of the males, they do not seem to be intimidated by the presence of the larger females and appear to coexist compatibly by mutual avoidance.

Mating was never observed but the first mating of the season probably occurs in late September or October based on the first clutch being produced in October/November. Gravidity in the females becomes evident approximately half way through development by the

The first recorded captive hatchling of *Carphodactylus laevis* emerging from the egg.

presence of the cream coloration of the eggs in the flanks. The developing eggs appear to sit higher in the body than other gecko species and are easily visible from the side. This is possibly due to the lateral compression of the body in this species. This conspicuous indication of the presence of eggs simplifies the task of ascertaining when oviposition has taken place. Clutches are laid in the moist substrate of the plastic container described above, usually at a depth of around 60mm. Whilst this was not the full depth of the container provided, it is unclear if clutches are normally laid more deeply by females in the wild.

Clutches invariably consisted of two eggs with a size range of 22.4-26.5 mm (mean = 24.9mm; n = 20) in length, 13-15.4mm (mean = 14.3mm; n = 20) in width and 2.53-3.19gm (mean = 2.82gm; n = 20) in mass. All eggs were removed for incubation using a sphagnum moss substrate. This system incorporates a 100ml clear plastic container filled with moss that has been soaked in water. Before being transferred to the container much of the water is squeezed out providing a ratio of moss to water of approximately 1:10 by weight. This technique has been used successfully for many gecko species as it permits excellent air supply between the moss fibers while maintaining a high humidity at all times. The eggs are placed in the center of the moss, the top is fitted and the container labeled. The lid is not removed at any stage during the incubation period. The average incubation temperature applied was approximately 24°C, with a range over the incubation period of 21-27°C. On hatching, the neonates are able to work their way to the top of the moss and can be easily seen through the clear lid. Incubation times range from 96-133 days (mean = 117 days; n = 8). Neonates range in size from 41.3-49.5mm snout-vent length (mean = 47.2mm; n = 10) and 1.7-3.1gm in weight (mean = 2.59gm; n = 10).

The hatchlings shed their skin within a few hours of hatching and are then immediately transferred to raising enclosures. These are round, clear plastic containers approximately 20cm in diameter by 25cm high with the center of the lid cut away and replaced with aluminum fly screen mesh melted into the plastic with a soldering iron. Furnishings are simple; fine sand substrate, one or two pieces of bark on the floor of the container and several vertical pieces of bark stacked on top of each other leaning against the back of the enclosure. Hatchlings are maintained in these containers for their first six to eight months before transfer to larger enclosures. The small size of these containers ensures that the young lizards regularly come into contact with food items during that important initial growing period. Regular misting maintains humidity and one area of sand is also kept moist at all times. Although clutch mates have been kept successfully together, it does appear that those lizards kept individually fare better and grow at a faster rate. Feeding takes place twice per week with two to three crickets provided for each gecko. Dusting of food items for juveniles is carried out more frequently than for adults, with calcium/multivitamin supplementation being

added one to two times per week. Like the adults, juveniles are not voracious feeders and this is reflected in the slow growth rates observed in captivity, another feature the species has in common with Australian leaf-tailed geckos (Porter, 2000).

Adult *Carphodactylus laevis* in situ, Lamb Range, Queensland. Note the narrow diameter of the sapling trunk.

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