Conservation of the Fijian ground frog (*Platymantis vitianus*) in an ex-situ captive management programme

EX-SITU CONSERVATION MAY, IN THE SHORT TERM, PROVIDE THE ONLY REALISTIC PROSPECT FOR MANY ENDANGERED AMPHIBIAN SPECIES, SUCH AS THE FGF.

By Edward Narayan, Ketan Christi and Craig Morley

The Fijian ground frog (FGF) *Platymantis vitianus*, which is one of the only two endemic anurans found in the Fiji Islands listed as endangered under the current IUCN Red List Category, due to the loss of habitat and estimated decline in abundance. Currently they are only found on four mongoose-free islands including Taveuni, Gau, Viwa, and Ovalau and a remnant population is holding out in Waisali Reserve, Vanua Levu. The FGF has been extirpated from the main islands of Viti Levu and several other locations around the Fiji Islands, mainly because of habitat modification and invasive species (IS); particularly the small Indian mongoose (*Herpestes auropunctatus*), and three species of rats (*Rattus rattus, R. norvegicus* and *R. exulans*), dogs (*Canis familiaris*), cats (*Felis catus*) and pigs (*Sus scrofa*). In-situ conservation efforts have included comprehensive studies on their distribution patterns and population studies (together with a strategic eradication project to eradicate IS on several of the FGFs' natural habitats. Despite the loss of habitat of the FGF and considering the difficulties associated with addressing many of the in-situ threats of FGF declines there has been no scientific attention driven towards their ex-situ captive management to date.

Ex-situ conservation may, in the short term, provide the only realistic prospect for many endangered amphibian species, such as the FGF. In 2004, a permanent ex-situ captive breeding programme for the FGF was established at Kula Ecopark, Sigatoka. In order to then study the reproductive success of the frog in more detail, a more intensive scientific programme needed to be undertaken at the University of the South Pacific (USP), Suva. A purpose-built exterior enclosure was constructed to house the frogs because of the difficulties associated with studying them in the wild. The primary aim of this study was to formulate a captive management strategy for the FGF by closely monitoring a few wild frogs using video surveillance. The focus was to find out whether the breeding behaviour of the FGF would be favoured in the absence of natural predators. The overall benefit of this study will be a variety of recommendations to improve any captive management techniques used by places like the Kula Ecopark, so that more froglets will survive and be released into previously inhabited locations once the in-situ threats are removed.

Five adult male and five adult female frogs were collected from Viwa Island (a 60 ha island, 30 km northeast of Suva and 0.95 km from Viti Levu) for this study. As a standard procedure, health checks on each frog were carried out when they were collected on Viwa Island. This was done via skin swab preparations taken from the upper and lower body surfaces of each individual, which were later analysed for growth and morphology identification of microbial colonies. The morphometric data of each frog included the frog's body weight and length (SVL). The sex of each frog was recorded and the gravid females were identified by observing through their semi-transparent underbelly skin to see if they had any eggs.

Within the outdoor enclosure (5 x 5 x 4 metres) tap water was sprinkled onto the ground to maintain the moisture content. The enclosures were illuminated by low intensity light bulbs to provide light for the four digital video cameras. There was no need for a pond within the enclosure as the FGF's are terrestrial (they do not lay their eggs in water and spend most of their time on land). However, we did include four small plastic basins filled with tap water for bathing. These water sources were changed regularly with fresh water to prevent the possible introduction of pathogens.

It was essential to establish a reliable food supply before the FGF were released into the enclosure. The four low intensity lights also served to attract flying insects into the enclosures at night. The lights were positioned 30 cm above the ground so the insects were within reach of the frogs in the enclosure. This allowed the frogs to feed whenever they liked. To attract a different range of invertebrate food types, I also placed fruits such as raw pawpaw (*Carica papaya*) and pineapples (*Ananas comosus*) in the corners of the enclosure to encourage ground-dwelling insects into the enclosure. Wild-caught and captive reared house crickets (*Achetus domesticus*) were provided for protein. Occasionally other insects such as spiders, beetles, cockroaches, moths, etc were also given to the frogs.

Each frog was released into the exterior enclosure for 30 days for adaptation and quarantine. The body weight of each frog was recorded ten days apart. This assured close monitoring of the health status and metabolic activity of the individuals. Photographs of their skin patterns, their weight, and length were used to help identify each frog. Microscopic analyses of fecal samples were carried out throughout the study to identify any signs of parasitic infection. The substrate and refuge materials used in the enclosure were collected and dried one week prior to the introduction of the frogs to prevent fungal growth.

The enclosure was constructed of galvanized wire netting and a 50 cm concrete base, to protect the frog from predators. Wherever the frogs may have been exposed to the wire netting, aluminum insect wire up to 1 m high was fixed to the walls to protect the frogs from possible harm. The insect wire also ensured the adults, as well as any froglets, stayed confined to the enclosures. The enclosure floor was covered with the same material normally found in the frogs' natural environment (e.g. moist soil, bamboo (*Piper aduncum*), coconut (*Cocos nucifera*) husk, leaf litter, and rotting logs). Two burrows were created on the topsoil and covered with leaf litter and coconut husks, to act as possible nesting chambers.

Breeding coincided with a peak in the wet season (early December 2006 and January 2007) and it occurred in dark naturally vegetated habitats within the enclosure. The average body weight of each frog varied each month and all frogs maintained their body weight so long as they obtained sufficient food. Interestingly, it was noticed that the body weight of the frogs varied according to the weather conditions. For example, males and non-gravid females had lower body weights during periods of very heavy rainfall and this may be associated with lower prey consumption when it rained heavily. Therefore, it was essential to provide some additional food supplements (i.e. crickets).

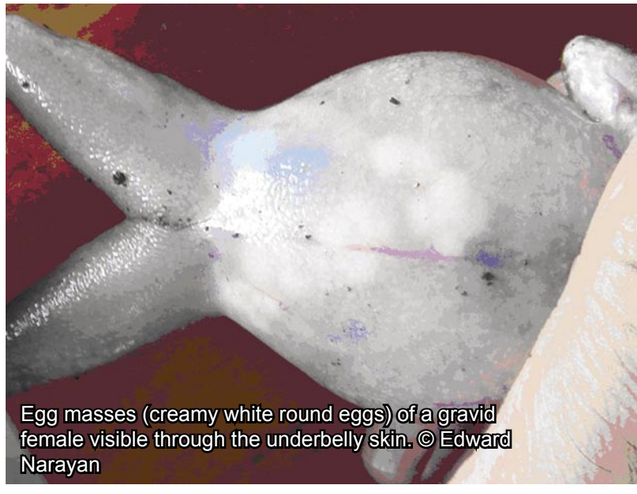
As a result of this study, advice on captive husbandry and captive management can be provided to zoological parks and individuals wishing to maintain captive populations. From our experience, and that of Kula Ecopark, we know that endangered ground frogs are able to survive in an ex-situ environment, when provided a semi-natural environment and sufficient quality prey items. Even so, close monitoring of their health during captivity is required. The physical conditions for breeding must mimic natural environmental conditions. We recommend that any breeding programmes of captive animals should involve an element of research into their management plans so that greater awareness about the breeding biology and survival of the animals can be raised

Furthermore, by including more research into captive management programmes we hope to recruit more froglets so that they can be released into the wild once the in-situ dangers are eliminated. The next phase of this study will investigate the reproductive biology of the ground frog on Viwa Island and will incorporate cutting-edge non-invasive reproductive endocrinology techniques to better understand the reproductive behaviour of frogs in their natural environment.

Edward Narayan is a postgraduate student at the Biology Division of USP. He and his supervisors (Drs. Christi and Morley) are collaborating with the Kula Eco Park to determine the requirements for an effective captive breeding system for the FGF. Dr. Christi teaches animal physiology at USP and Dr. Morley is a conservation biologist.

The outdoor enclosure constructed at the USP for Fijian ground frog. © Edward Narayan

An adult female Fijian ground frog hiding within coconut husks substrates within the outdoor enclosure. © Edward Narayan



Egg masses (creamy white round eggs) of a gravid female visible through the underbelly skin. © Edward Narayan