



FOCUS ON CONSERVATION

# Saving the Fiji Crested Iguana (*Brachylophus vitiensis*)

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One morning in October 2010, a groundsman at Likuliku Lagoon Resort on Mololo Levu Island in Fiji came across a bright green iguana lying injured on the ground. No-one working at the resort had seen this kind of creature before on the island. The investigation that ensued revealed that it was a Fiji Crested Iguana (*Brachylophus vitiensis*), unique to dry forests of the Fijian Islands.

Four species of iguana currently exist in Fiji—the Fiji Banded Iguana (*Brachylophus bulubula*), the Lau Banded Iguana (*B. fasciatus*), the Gau Iguana (*B. gau*), and the Fiji Crested Iguana (*B. vitiensis*). The first three are assessed as Endangered (EN) and the last as Critically Endangered (CR) on the IUCN Red List of Threatened Species Version 2021-3 (<https://www.iucnredlist.org>) and all are listed in Appendix 1 of the Convention of International Trade in Endangered Species (CITES) (<https://cites.org/eng/app/appendices.php>).

An interesting feature of the iguanas in Fiji is that they are not migratory and do not move between islands. As a result, each island colony has evolved in isolation, developing a unique DNA signature in the process. Limited numbers of each genetically unique species are found on selected islands in the Fijian Archipelago today.

Prior to 2010 no official sighting of an iguana had been recorded on Malolo Levu for 25 years. The general consensus was that the species had become extinct on that island due to habitat loss and non-native predators such as feral cats and dogs. However, the individual found at the resort was proof that the species had indeed survived — and the main concern now was just how tenuous the existence of the remaining population had become.

This is the story of how management of the Ahura Resorts (owner-operator of the Likuliku Lagoon and Mololo Island Resorts on Mololo Levu Island) worked together with scientists, the Fijian government, and other agencies to protect and nurture this species and its natural habitat. The first task was to gauge the size and health of the surviving population in the immediate vicinity of the resorts. The second was to develop and implement a conservation strategy to protect and revive the species and its ecosystem. This involved establishing a captive assurance and breeding colony and pro-

<sup>1</sup> Steve Anstey was Group General Manager of Ahura Resorts (Likuliku Lagoon Resort and Malolo Island Resort) from March 2005 to October 2020 and is now a trustee of the Ahura Resort Conservation Foundation.



The Fiji Crested Iguana (*Brachylophus vitiensis*) is found only in western Fiji. Photograph by Adam Clause.



The injured Fiji Crested Iguana (*Brachylophus vitiensis*) found at the Likuliku Lagoon Resort on Mololo Levu Island in Fiji in 2010. Photograph by Likuliku staff.

## IKULIKU LAGOON IGUANA BACKGROUND

**THREATS**  
HABITAT LOSS & DEGRADATION

Disturbance of riparian dry forest by the building of the Likuliku Lagoon Resort. This forest is a natural habitat for the Fiji Crested Iguana. The forest is a natural habitat for the Fiji Crested Iguana. The forest is a natural habitat for the Fiji Crested Iguana.

**INVASIVE SPECIES**

Non-native land crabs, rats and mongoose attack and eat the Fiji Crested Iguana. Invasive species are especially vulnerable when they are young. Invasive species are especially vulnerable when they are young.

## IKULIKU LAGOON IGUANA SANCTUARY

**THE SANCTUARY**

Ahura Resorts is dedicated to collaboration, inclusive environmental stewardship. This vision is exemplified by our innovative Fiji Crested Iguana Sanctuary. Together with the United States Geological Survey, San Diego Zoo Global, Taronga Zoo Sydney, and local government partners, we are proud to present three new iguanas. Our initiatives are guided by the Fiji Crested Iguana Species Recovery Plan of the International Union for the Conservation of Nature.

**POPULATION MONITORING**

Our field surveys have revealed a half dozen small, isolated Fiji Crested Iguana populations on Malolo Levu Island. These include growing populations at Likuliku Lagoon Resort and Malolo Island Resort. The majority of these iguanas have been DNA tested and field work is underway for the remaining populations. To help track individual iguanas over time, we have also created a comprehensive iguana photographic portfolio.

**CAPTIVE IGUANA COLONY**

After discovering Fiji Crested Iguana at Ahura Resorts, we established an iguana capture awareness colony at Likuliku Lagoon Resort. Capture awareness colonies promote endangered animals from threats in the wild, and are an effective emergency conservation method. They also serve as an educational tool, helping to increase local and international awareness of regional wildlife. From 2012 to 2017, the colony reared 100 iguanas from the resort leas, but no captive colonies exist, safeguarding them until we could have more than 1000 of the wild population.

**FIJI CRESTED IGUANA**  
*Brachylophus vitiensis*

The Fiji Crested Iguana is one of four iguana species native to Fiji. The others are the Fiji Blackfoot Iguana (*Brachylophus hubbardi*), the Blackfoot Iguana (*B. ferox*), and the Blackfoot Iguana (*B. ferox*). All occur naturally only in Fiji. They closely resemble those found over 8,000 km away in North America.

The Fiji Crested Iguana is distinguished by a dramatic spine crest on its back. These spines can grow to nearly 10 centimeters long (including the neck, and through to the groin). Because of their spectacular colors and remarkable geographic isolation, Fiji iguanas are famous around the world.

The Fiji Crested Iguana is classified as Critically Endangered on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species, and is listed under Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

**CULTURAL SIGNIFICANCE**

The Fiji Crested Iguana is a national symbol of Fiji. It is a national symbol of Fiji. It is a national symbol of Fiji.

**FUN FACTS**

- The scientific name *Brachylophus* comes from the Greek *brachy* meaning "short" and *lophos* meaning "crest" or "ridge".
- Iguanas are active by day, but because they live high in the forest canopy and are well camouflaged against the foliage, they are easily invisible to us.
- Iguanas can change color from green to a sandy brown when stressed or threatened. They will also expand their skin, both their head, and even large at a general threat.
- Iguanas are strictly herbivores. They feed on leaves, stems, flowers and fruit of many species of trees and shrubs.
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- Iguanas have one of the longest incubation periods of any reptile. Eggs hatch about seven months.

**AHURA'S STORY: PROTECTION OF A DISAPPEARING SPECIES**

2010: A Fiji Crested Iguana was found dead on Malolo Levu Island. It was the only one found there.

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Robert Fisher, Research Biologist with the United States Geological Survey, Adam Chaser, Ahura Resorts Environmental Manager, and San Diego Zoo Global, Center of Herpetology and Ichthyology of San Diego Zoo Global, with a wild caught adult female Fiji Crested Iguana from Ahura Resorts.

Ahura Resorts' deep commitment to inclusive sustainability has never been stronger. Although the iguana population and riparian dry forest at Ahura Resorts are now expanding due to our focus on environmental work, the results are the most endangered in the world. These projects are supporting the conservation of Fiji's unique biodiversity.

**POPULATION MONITORING**

In addition to Malolo Levu Island, we have recently surveyed for iguanas on four other islands in the Malolo Levu group. We targeted these islands to help support our captive colony and support local landowners and tourism, often with participation from regional stakeholders. Unfortunately, we found no iguanas on these islands, despite the presence of suitable habitat. This is a major concern for the future of the Fiji Crested Iguana on Malolo Levu Island. We do not yet have the resources to conduct more extensive surveys of these islands, but the findings highlight how special it is that Malolo Levu Island still supports Fiji Crested Iguana.

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Once we recognized the severity of the wild iguana population through monitoring of non-native mammal predators, we started our captive colony over time in a breeding colony. This breeding colony serves two purposes – produce babies for release back to the wild, and to serve as a general insurance for the species. We maintain the captive colony at Likuliku Lagoon Resort. We do not yet have the resources to conduct more extensive surveys of these islands, but the findings highlight how special it is that Malolo Levu Island still supports Fiji Crested Iguana.

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Interpretive signs about the Fiji Crested Iguana (*Brachylophus vitiensis*) at the Likuliku Lagoon Resort 2019.

grams to preserve and enlarge what remained of the natural dry-forest habitat and to reduce the number of non-native predators.

A key message in this tale is that commercial development and the preservation of healthy natural ecosystems are not mutually exclusive. In many cases, the trade-offs can be minimized through careful planning that incorporates the insights of natural science. Indeed, the outcomes can be beneficial for all stakeholders. Awareness of the island's ecology is heightened when the iguanas begin to thrive in a restored habitat, and the opportunity to learn about native wildlife for both guests and staff.

### Collaboration with Scientists

The injured iguana found that day in 2010 was conveyed to Kula Adventure Park (formerly Kula Eco Park) on Viti Levu for veterinary care, but soon died. However, herpetologists Dr. Robert Fisher of the United States Geological Survey and Dr. Peter Harlow of the Sydney Taronga Zoo — both world authorities on Fijian iguanas — happened to be conducting research in Fiji at the time and were able to retrieve the specimen from Kula. They immediately saw that this individual might be the long absent (and supposedly extirpated) population of Fiji Crested Iguanas, first recorded on Malolo Levu by the late John Gibbons. DNA tests from tissue samples sent to San Diego Zoo's Global Institute for Conservation Research and the U.S. Geological Survey in the USA subsequently confirmed that it was distinct from other Fijian iguanas and indeed was the species from Malolo Levu. The specimen was preserved and is now in the herpetological collection of the University of the South Pacific's herbarium in Suva, Fiji.

Ahura Resorts staff were alerted to this astonishing fact, and two young iguanas were found on the resort grounds during the following year. A few additional individuals were discovered during the next few years but, despite regular surveys, no iguanas were sighted in their natural tree-top habitat during this initial period.

### Restoring a Viable Ecosystem

On the advice of Robert Fisher, Peter Harlow, and Kim Gray (from San Diego Zoo Global), Ahura Resort management immediately implemented a plan to protect iguanas in the areas leased by the resorts. They also began work on a longer-term plan to restore sufficient natural habitat to support a healthy population.

**Removal of non-native predators.**—The first initiative was to remove non-native predators such as feral cats and dogs, as well as rats. Female iguanas are especially vulnerable to feral cat attacks when they descend from their tree-top habitat to lay eggs in the ground. Of course, newly born iguanas also are vulnerable before they ascend into the trees. Rats consume unhatched eggs and newly born juveniles. Accordingly, cat traps and rat baits were systematically deployed across the resort grounds and closely monitored.

**Immediate habitat work: Protection from fire.**—The second initiative was to protect and restore the iguanas' natural tropical dry-forest habitat in the areas leased by the resorts. In this regard, one of the key priorities was to prevent any further damage by fire.

The presence of villages on Malolo Levu means that it is prone to bush fires, and protecting the remaining dry-forest habitat is crucial. As it turns out, a fire break had been established around the areas leased by the resorts during the development of Likuliku Lagoon Resort in 2005. This was well

maintained and proved highly effective over the following 16 years. Fires in the vicinity reached the break on average two to three times a year, but on no occasion did they breach it.

Although the initial intention of the fire break was to protect guests, staff, and resort assets, the absence of regular fires also allowed an invasive plant species, the Australian Pine (*Casuarina equisetifolia*), to grow back in what had become grassland. While the young *Casuarina* forest lacks the rich diversity of a fully developed dry forest, it does create arboreal habitat that can be used by iguanas. Despite being inedible, *Casuarina* provides a good base for the creation of a larger and more complete ecosystem — although further active intervention is required. In particular, the Australian Pines can serve as a nursery forest for slow-growing, native understory species.

*Longer-term restoration of the tropical dry forests to their former glory.*—Tropical dry forests, which grow in low rainfall regions (1,500–2,500 mm per annum), are unique but endangered ecosystems in the Pacific. The Mamanuca islands, lying in the western rain shadow of Viti Levu, provide a perfect environment. Prior to human settlement, such forests covered most of the island areas and their dense canopies provided an ideal habitat for the iguanas and other native species. Then, in an all-too-familiar pattern, they were progressively displaced by human settlement and development (with the accompanying demand for land, invasive species, and wildfires). Today, only a small portion of the original dry forest on Mololo Levu (the largest island in the Mamanuca group) remains in small isolated pockets covering roughly 3% of the island's area (29 of 960 ha). Further, the quality of the remaining forest (composition, structure, and density) has been affected. The loss of forest coverage also has compromised much of the land, which has become less stable and less fertile, supporting only grass and *Casuarina*. In contrast, uninhabited islands such as Monuriki, Monu, and Qalito, with their mostly pristine dry forests, still provide examples of what all islands in the group would have looked like before settlement.

*Development of habitat specific to the needs of the Fiji Crested Iguana.*—Further intervention was required to nurture the development of dry-forest habitat capable of supporting iguanas on Malolo Levu. This involved thinning the *Casuarina* stands and replacing them with a balanced range of dry-forest species at properly spaced intervals. To this end, resort management decided to establish a dry-forest nursery in 2011. This was the easy part — execution proved more challenging!

The first problem was how to select the right mix of plants from the hundreds of species that grew in these forests. Fortunately, guidance was available in the form of a study of the Fiji Crested Iguana's purely vegetarian diet (Morrison et al. 2006. Diet and habitat preferences of the Fiji Crested Iguana (*Brachylophus vitiensis*) on Yadua Taba, Fiji. *Australian Journal of Zoology* 55: 341–350). The fecal analyses identified 26 species of plants consumed by iguanas, but also revealed that the population was “primarily dependent on only a few species.” The study also surveyed iguana perches, identifying 33 preferred species of trees.

The nursery initially focused on the 12 most important trees that had been identified by the study. The next problem was sourcing. No one grew dry-forest trees, seeds procured from local forests failed to germinate, and most saplings failed to thrive. Consequently, a great deal of time and painstaking effort was necessary to build up nursery stocks, but eventually conditions were in place for the next stage of the project.

In March 2017, a 10 x 10 m grid at the Likuliku Lagoon Resort was planted with 20 saplings of the 12 most important tropical dry-forest species, all spaced according to a natural forest setting. This grid — to our knowledge the first of its kind in the world — served as an effective prototype for natural, self-propagating iguana habitat. Distribution was based on factors such as rate of growth and eventual height, trunk size, and canopy coverage. A second grid was planted in 2018.



Pristine dry-forest cover on uninhabited islands compared to predominantly grassland coverage on islands with human settlements. Photographs by Steve Anstey.



Members of IUCN/SSC Iguana Specialist Group inspect the dry-forest nursery in 2018. Photograph by Steve Anstey.

The grids provided a blueprint for the required plants and their spacing and, once a productive nursery had been established, the necessary supply of saplings became available for a planting program. By 2020, gardeners at the resorts had planted over 8,000 of these dry-forest plants across the leased area. The plan is for them to continue planting an additional 2,500 plants each year. The nursery now supports up to 50 individuals of each species, including a growing selection of dry-forest tree species. Kudos to the environment and gardening team at Likuliku for successfully nurturing these plants and then deploying them in the field under the guidance of Ahura Resorts Conservation Manager, Sialisi (Sia) Rasalato, and Head Gardener, Vido Sainivalati. The resorts also have committed to planting additional mangroves on their leases.

While the restoration work continues, a marked change is already evident in the profile of vegetation in the leased areas,



The before and after of successful reforestation. Photograph by Sia Rasalato.

with a diverse range of dry-forest species now occupying a much larger land area than before.

*Further sightings and a key appointment.*—Beginning in 2010, Robert Fisher, later joined by Kim Gray, conducted nocturnal surveys of the dry-forest areas on the east wing of Likuliku Lagoon Resort every six months. These surveys revealed no iguanas for five years and, then suddenly, six new iguanas were sighted in a single night on 29 June 2015. Two were captured, DNA samples were taken and the iguanas were PIT-tagged and released.

These new sightings were an encouraging sign that the initiatives to protect and restore iguana habitat within the resort areas were working. These exciting results were discussed at the annual IUCN/SSC Iguana Specialist Group meeting in Florida in November 2015. Consequently, in 2016, the resorts sponsored Adam Clause, a Ph.D. student in reptile conservation at the University of Georgia, to extend the survey to cover dry-forest patches in neighbouring areas and to consolidate the data collected so far into a centralized database. Adam also was given the task of establishing a breeding colony with four pairs of iguanas.

In the three months of Adam's internship on the island, he documented nearly 30 iguanas in the vicinity of the resort alone. Over half of these were juveniles, which pointed to a young and growing population. This was surely proof that the initiatives undertaken over the previous five years were paying off. Adam also uncovered two subpopulations of iguanas in dry-forest pockets elsewhere on Malolo Levu.

Heartened by these findings, the resorts appointed Sia Rasalato to the role of Group Environment Manager in January 2017. Sia is a graduate of the University of the South Pacific and worked previously with Birdlife International. He came with a solid background in Fijian flora and fauna conservation and was experienced in research, habitat restoration, and the prevention, control, and eradication of alien species. His brief was to oversee both the restoration of dry-forest habitat (including the ongoing development of the nursery and grids) and the captive assurance and breeding colony (see below). These roles called for close working relationships with local and central government authorities and with the scientists providing guidance. Sia also was responsible for training staff and educating villagers and guests about the program and its objectives.

### Captive Assurance and Breeding

The final part of the plan was to create a captive assurance and breeding colony for the iguanas. A captive assurance colony safeguards endangered species from threats in their environment and protects against catastrophic loss in the wild. One such colony was created at Likuliku Lagoon Resort soon after the first sightings in 2010. Most of the iguanas found in the resort areas between 2011 and 2015 were housed in this facil-



Jone Niukula, Steve Anstey, Kim Grey, Peter Harlow, Adam Clause, and Robert Fisher at the 2015 annual meeting of the IUCN/SSC Iguana Specialist Group in Florida. Photograph by Tandora Grant.



Robert Fisher, Adam Clause, and Kim Gray with a young Fiji Crested Iguana. Photograph by Steve Anstey.

**Likuliku LAGOON TROPICAL DRY FORESTS**

**WHAT IS A DRY FOREST?**  
A healthy tropical dry forest is a lush, green landscape with a variety of trees and plants. It is a vital ecosystem that provides habitat for many species of plants and animals.

**FIJIAN DRY FORESTS**  
Malesi Levu is the largest island in the Mamanuca island group, with an area of 960 hectares. Once covered by tropical dry forest, today only 2% of the habitat remains. This loss of dry forest has caused serious damage to the land and waters of Fiji, threatening both humans and biodiversity.

**A DECLINING ECOSYSTEM**  
Tropical dry forest ecosystems are disappearing at an alarming rate in Fiji. This forest loss is driven by human-caused activities, including logging, agricultural development, and expanding tourism infrastructure. The loss of this forest has caused serious damage to the land and waters of Fiji, threatening both humans and biodiversity.

**THE DRY FOREST'S FUTURE**  
The survival of Fiji's tropical dry forest, and the highly threatened plants and animals it supports, depends on successful human activities, habitat development, and infrastructure. Significant work is being done to restore and protect these forests, including the establishment of new reserves and the implementation of strict regulations to protect the remaining forest. This program is made possible through the support from our generous partners.

Interpretive boards about the tropical dry forest at the Likuliku Lagoon Resort 2019.

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ity. The initial objective was to protect them until more was known about the viability of the wild population and its habitat. Furthermore, these iguanas were visible to resort guests, allowing the colony to serve as an educational and promotional tool.

However, once Adam provided evidence of greater numbers and a healthy demographic profile (with a high proportion of young iguanas) in the local habitat, the purpose of the captive colony shifted from assurance to breeding. Captive breeding produces young that can be released into the wild, while continuing to provide opportunities for observation, education, and promotion. As long as the wild population and its habitat continued to recover and thrive, the number of iguanas maintained in the colony could remain stable and no additional iguanas would need to be brought into captivity.

Adam identified eight iguanas of breeding age that were paired, PIT-tagged, and DNA samples were taken before

they were housed in separate enclosures designed to replicate natural habitat. These spacious enclosures contain live shrubs and are exposed to natural weather conditions. They also have deep soil beds for laying eggs.

For the first time ever, two baby Fiji Crested Iguanas were hatched naturally (without artificial incubation) in captivity in August 2017. A further 13 eggs have since hatched successfully. Iguanas that hatch in captivity usually are held until they reach a weight of 80–85 g, large enough to be safely pit-tagged. At this stage, DNA samples are taken and the young iguanas are released.

**Conclusion**

Since the introduction of the breeding program in 2016, a total of 14 iguana eggs have successfully hatched in captivity. This may not seem like a lot in a five-year period, but these reptiles have a slow breeding cycle — females lay only 2 or



An iguana breeding enclosure at Likuliku Lagoon Resort. Sia Rasalato holding young Fiji Crested Iguanas that had hatched in the enclosures. Photographs by Steve Anstey.



Juvenile Fiji Crested Iguana (*Brachylophus vitiensis*) at the Likuliku Lagoon Resort in 2015. Photograph by Steve Anstey.

3 eggs at any one time (each egg is around 4 cm long and 2 cm wide) and they take nine months to incubate, the longest incubation period known for any iguana.

Furthermore, since Adam's survey in 2016, an additional 37 iguanas have been sighted in natural habitat in the resort areas. These have been PIT-tagged and DNA samples were taken before they were released back into natural habitat.

With the success of the iguana breeding program and increased sightings in the wild, the focus since 2017 has shifted to restoring the dry-forest habitat. This has included increasing the number of species cultivated in the nursery and extending the area of replanting. Significant progress has been achieved. Concerted planting from the nursery has substantially increased the share of land leased by the resorts that is covered by mature and developing dry forest. Also, local land-

owners have requested plantings of dry-forest species outside the lease areas.

The overall success of the program has led to the acquisition of new data and expertise that have already been incorporated into best-practice recommendations for captive iguanas in the IUCN Fijian Iguana Recovery Plan 2022–2027 and in the establishment of the Ahura Resorts Conservation Foundation in February 2020.

These successes have not come without a cost. In particular, the resorts incurred expenses associated with scientific surveys, establishing a nursery and forest regeneration grid, initiating a planting program, and appointing an environment officer to oversee the project. These can be considered appropriate costs borne by Ahura Resorts in fulfilment of its duty to care for the environment around its resorts. However, commercial benefits from the recovery program exist. In a world increasingly challenged by environmental degradation, people are drawn to places where they can enjoy nature in its pristine form, with all its rich diversity of plant and animal life. Indeed, experiencing nature from the comfort of resorts that sit lightly in their landscapes and embrace the natural heritage around them is a growing market.

Finally, the recovery program has not been without recent challenges. The global covid pandemic caused the resorts to be closed for business in March 2020. Only a skeleton staff was retained to maintain the properties. Sadly, the Delta and Omicron variant spread rapidly through the Fijian community in 2021. The Fijian government responded with a concerted vaccination program and was able to open its borders to tourists again in December 2021. In August 2021, a fire on Malolo Levu Island breached the firebreak (for the first time since its creation 16 years ago) and swept through much of the area leased by the resorts. The small team of staff and the resort buildings were not affected. Inevitably, some of the dry-forest



The guest Interpretive Centre at the Likuliku Lagoon Resort 2019. Photograph by Steve Anstey.



Likuliku staff Sam Naitau, Tulia Seru, and Bill Naitau with Fiji Crested Iguana hatchlings. Photograph by Adam Clause.

habitat was damaged, but fortunately the captive iguanas were not harmed, and according to early indications the eastern area — where the majority of wild iguana reside — was not severely impacted. This incident highlights the vulnerability of this species and its fragile ecosystem. If anything, it has deepened our resolve to persevere with the program.

#### Keys to Success

1. An abiding passion for wildlife conservation and a deep commitment to the ideal of sustainable tourism.
2. The dedication of a group of professional like-minded people with the expertise to provide science-based guidance, support, and learning.
3. The flexibility and trust of owners that enable resort management to identify and pursue opportunities that are both economically and environmentally beneficial. This includes being able to design and implement long-term plans for the ongoing preservation of surrounding flora and fauna (both marine- and land-based), as well as to make quick on-site decisions in response to challenges and opportunities.

#### Acknowledgements

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