



Adult Fijian Crested Iguana (*Brachylophus vitiensis*) from Yadua Taba Island, Fiji. Photograph by Joe Burgess.

Lost in the South Pacific: The Fijian Iguanas (Genus *Brachylophus*)

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Abstract.—Two species of iguanas occur in the South Pacific: the widely distributed Banded Iguana and the larger Crested Iguana, which is more restricted in its distribution. Abundance data are available only for the Crested Iguana Sanctuary island of Yadua Taba in Fiji, and suggest that in optimal forest habitat densities may approach 200 iguanas per hectare. No other island in the Pacific is known to possess such a dense population of *Brachylophus* and, on most islands where iguanas occur, sightings are rare or extremely uncommon. As the Pacific iguanas are not hunted, eaten, or traded, their rarity is most likely due to the combination of habitat loss and degradation from forest clearing, burning, and goat grazing, and the introduction of exotic predators such as cats, mongooses, and perhaps rodents.

Key Words: Crested Iguana, Banded Iguana, *Brachylophus*, Island Conservation, Habitat Loss, Fiji Islands

“Though the beautiful Banded Iguana was not uncommon as recently as 1915, it must now be considered rare, if not extinct, on many of the islands.”

Arthur Loveridge
Reptiles of the Pacific World, 1945

Introduction

Of the eight living genera of lizards in the family Iguanidae, only *Brachylophus* occurs in the South Pacific. The Pacific Banded Iguana (*Brachylophus fasciatus* Brongniart 1800) and the Fijian Crested Iguana (*Brachylophus vitiensis* Gibbons 1981) have long been seen as biogeographical oddities, existing so far away from the seven iguanid genera of the Western Hemisphere. The family Iguanidae is regarded as a monophyletic group (all have descended from a common ancestor) and for many years were assumed to have evolved in the New World (Estes and Price 1973, Frost and Etheridge 1989). Phylogenetic work based on morphology (Etheridge and de Queiroz 1988) and a combination of morphological and molecular characters (Sites et al. 1996) both suggest that *Brachylophus* is a sister taxon to all other living iguanids.

How *Brachylophus* arrived in the South Pacific has been the subject of hot debate for decades. All other terrestrial vertebrates in the South Pacific are clearly derived from Indo-Malay and Gondwanan ancestors that arrived via over-water dispersal along the island chains of New Guinea and the Solomon Islands (Gibbons 1985a). Cogger (1974) and Gibbons (1981, 1985a) both suggested that long-distance rafting from the New World across the Pacific by ancestral *Brachylophus* was the most probable mechanism of colonization. They pointed out a series of biological and geographical traits that preadapted *Brachylophus* for this journey, including nasal salt glands for the excretion of excess salt, an extremely long egg incubation period, and the for-

tituous direction of the South Equatorial Current. No one suggests that *Brachylophus* traveled the 8000 km from the Americas to the South Pacific in a single trip. More likely, the ancestors of *Brachylophus* island-hopped by occasional rafting events and colonized a series of islands along the way, many or all of which are submerged today or have been submerged at some time since the initial colonization of *Brachylophus*.

More recent paleontological findings now question the romantic vision of the half-starved, gravid iguana being washed ashore on a South Pacific beach, surviving months at sea clinging to a water-logged tree. The oldest known fossil iguanids (and the closely related agamids) are more than 63 million years old and have been found in the Gobi Desert of Inner Mongolia, China (Gao and Hou 1995). These predate Estes and Price's (1973) South American iguanid fossils by some 11–13 million years. Thus, the current dichotomous world distribution of the Iguanidae may be due to a New World invasion (and subsequent adaptive radiation) by the ancestral Mongolian iguanids, while the Pacific iguanas may represent the sole surviving descendants of a true stay-at-home Asian lineage. Nevertheless, ancestors of *Brachylophus* still had to cross wide ocean barriers to arrive at their current locations in the South Pacific.

Extant Pacific iguanas are both small when compared to most other iguanas and strongly arboreal. The Banded Iguana has a maximum snout-vent length (SVL) of 193 mm and a maximum weight of 207 g, whereas the Crested Iguana grows to 223 mm SVL and weighs as much as 404 g (Gibbons and



A Crested Iguana on Yadua Taba Island.

Watkins 1982). The two species do not co-occur on any island. Larger, probably more terrestrial species did occur in the recent past, but were eaten and exterminated by early human inhabitants in both Fiji (*Lapitiguana impensa*; Pregill and Worthy 2003) and Tonga (*Brachylophus gibbonsi*; Pregill and Steadman 2004).

The two extant species of *Brachylophus* are morphologically distinct. Based on allozyme genotypes, they show little genetic distance compared to other squamate species, but not when compared to other iguanians (Colgan and Da Costa 1997). Zug (1991) suggested that these two species might be the result of a Pleistocene speciation event in Fiji, possibly resulting from the ancestors of the Crested Iguana being isolated on the high, dry western islands of the Yasawas during an interglacial rise in sea levels. When sea levels later fell, the divergence was retained and reinforced, owing to the Crested Iguana's adaptation to drier island environments.

The Fiji Islands

About 360 islands with areas greater than 0.5 km² occur in Fiji, of which about a hundred are permanently inhabited. The two largest islands, Viti Levu and Vanua Levu, encompass 88% of the total land area of Fiji, and over 90% of the total Fijian population lives on these islands. The climate is tropical, with cyclonic storms and heavy rain occurring in the wet season (December–March) and the southeast trade winds influencing the dry season (May–October). High islands on the windward side of the Fiji island group invariably receive more rain than those on the leeward, western side. As in many countries in the

Pacific, most of the land in Fiji today is communally owned by clans of indigenous people.

The large, high islands of Fiji reach over 1000 m above sea level, were emergent during the late Oligocene to middle Miocene and have been continuously above sea level for at least the last 16 million years (Chase 1971, Rodda 1994). Fiji has never been connected to a continental land mass. In the absence of any terrestrial mammals, several large flightless birds, giant amphibians, and an endemic crocodylian evolved. With the arrival of humans and commensal rodents about 3,500 years ago, many of these large endemic vertebrates disappeared (Worthy et al. 1999, Molnar et al. 2002).

The Pacific Banded Iguana

The Pacific Banded Iguana (*Brachylophus fasciatus*) is widely distributed in Fiji, occurs on four islands in Tonga (Gibbons and Watkins 1982), and a recently introduced population exists on the island of Efate in Vanuatu (Bauer 1988). The Tongan population appears to have been a late prehistoric human introduction from Fiji (<500 years ago), based on its total absence in the fossil record, where only the larger, extinct *Brachylophus gibbonsi* is found (Pregill and Steadman 2004). The Banded Iguana is listed by the World Conservation Union as endangered (IUCN 2003). Cahill (1970) reported that Banded Iguanas occurred on ten islands in Fiji, whereas Gibbons's 1981 distribution map suggests its presence on 24 Fijian islands, which increased to 31 islands on his most recent map (Gibbons 1985b). Many of these distribution records were based on verbal reports from students at the University of the South Pacific in Suva where Gibbons lectured, as well as from villagers and previous inhabitants from many of these islands. Gibbons suspected that many of these reports were based on old records or village folklore, and that the Banded Iguana might no longer exist on some of these islands (personal communication, 1985). Zug (1991) reported records for the Banded Iguana from 34 Fijian islands.

Banded Iguanas are slender and often brilliant emerald green in color. Adult males have two broad, pale transverse bands across the body and several more on the tail, whereas in females these bands are usually entirely missing or only barely visible. Today, the Banded Iguana appears restricted to islands with coastal and lowland forests, but historical evidence suggests



A gravid female Banded Iguana from the large inhabited island of Kadavu, where occasional sightings still occur.

that they once were also found throughout the highland rainforests on Fiji's largest islands (Gibbons 1984a, Williams 1858). The biological information available for this species is very scant, and is mostly inferred from captive studies. These lizards undoubtedly are mostly herbivorous, eating a selection of young leaves, flowers, and fruits from a wide range of plant species. In captivity, they also will eat insects, and some authorities have suggested that this species may be more insectivorous than the larger Crested Iguana (Gibbons and Watkins 1982).

Captive studies in Fiji suggest that Banded Iguanas lay eggs in the mid-wet season, from January to March (Gibbons and Watkins 1982). However, a wild-caught female that I examined on the island of Kadavu in mid-September 1989 was heavily gravid with shelled eggs. More likely, multiple clutches are produced in years of abundant food (as in captivity), and egg laying may occur at any time during the warmer months of October to March. In captivity, two to eight eggs have been recorded in a clutch. The incubation period is between 125 and 184 days, depending on temperature (Cogger 1974, Arnett 1979).

Only one population of Banded Iguanas has been surveyed to date. Two small, uninhabited limestone islands in the Lau group of Eastern Fiji, close to the large island of Lakeba, support a total population of 6000–8000 iguanas (Harlow 2003). The survival of this population may be because the remote and mostly inaccessible Aiwa Islands have remained free of introduced predators, invasive plants, and forest fires.

The Fijian Crested Iguana

The Fijian Crested Iguana (*Brachylophus vitiensis*) was first brought to the attention of the herpetological world in 1981, when John Gibbons recognized this species as being very different from the smaller Pacific Banded Iguana (Gibbons 1981). Its presence had long been known to the local Fijians, and the *Saumuri* (Crested Iguana) is well represented in legends, stories, and village folklore on the islands where it occurs (A. Bicilio, personal communication). Despite its relatively recent scientific discovery, today we know far more about the abundance, distribution, and biology of the Crested Iguana than we do about the Banded Iguana.



A Monuriki Crested Iguana with a temporary marking to avoid double-counting during a population census.



Yadua Taba Island photographed from Yadua island in 1979. The patches of grassland seen in this photo are now mostly covered by regenerating forest. Photograph by John Gibbons.

Crested Iguanas are more robust than Banded Iguanas and are easily distinguished by a high crest of enlarged middorsal scales from the nape to the base of the tail. Ground color in both males and females is green, with black-edged, narrow white transverse bands along the body and tail. Like the Banded Iguana, the Crested Iguana can change its background color from various shades of green to almost black in a matter of minutes. In captivity, the Crested Iguana can produce multiple clutches in a single season (Boylan 1989). Clutch size varies from two to seven eggs, with an average of four (Bach 1998). On the Crested Iguana Sanctuary island of Yadua Taba (pronounced *Yandua Tamba* in Fijian), lizards apparently lay only a single clutch each year in the mid-wet season (February to March), with the first hatchlings appearing at the end of October (personal observation). This suggests an incubation period of seven to eight months in the field, exceptionally long for any lizard. In captivity, incubation periods have ranged from 4 1/2 months (Boylan 1989) to 9 1/2 months (Bach 1998).

At the time of its discovery by Gibbons on the island of Yadua Taba in January 1979, most biologists doubted that the species existed anywhere else. Yadua Taba is a remote, uninhabited, 70-hectare island lying 120 m off the larger inhabited island of Yadua (1360 ha). Yadua Taba is rocky, mostly forested, about 1.2 km long, 500 m wide at its widest point, and reaches over 100 m in elevation.

A party searching for an idyllic island on which to film the original 1949 *Blue Lagoon* movie (starring Jean Simmons) briefly visited Yadua Taba in 1947. Although the island was not chosen for the film, Fijian resident Mr. A. C. Read collected an iguana on Yadua Taba. That individual appeared to be different than the Banded Iguana with which he was familiar, and he presented it to the Fiji Museum in Suva (Boylan, personal communication). The specimen was presumably preserved and added to the museum's reptile collection, but no locality data were recorded. This was 32 years before John Gibbons visited Yadua Taba and recognized the Crested Iguana as a distinct species.

In her 1970 Fiji Museum booklet on the Banded Iguana (the only Fijian species known at that time), Cynthia Cahill

referred to this specimen: “An old preserved specimen in the Fiji Museum certainly appears to be much more solidly built with a much larger crest than any of the present day specimens collected.” The 1947 Crested Iguana is undoubtedly the paratype in the description of the species by Gibbons (1981), and referred to as “Fiji Museum (no number), one adult male, but no collection data.”

Although only known from the island of Yadua Taba at the time, in August 1979, a Crested Iguana made a brief cameo appearance in the remake of the movie *Blue Lagoon* (starring Brooke Shields), which was filmed on the tourist resort island of Nanuya Levu in the Yasawa group, an arc of islands northwest of the largest Fijian island, Viti Levu, and about 90 km west of Yadua Taba. On becoming aware of this, John Gibbons traveled to the Yasawas and also visited the more southerly Mamanuca group of islands in search of Crested Iguanas — and confirmed that the species did occur on several islands within these groups (Gibbons 1984a, 1984b, 1985a, 1985b). He reported that the Crested Iguana was found on at least eight islands, but most of these records seemingly were based on verbal reports from villagers. He saw iguanas only on two islands: Matakawa Levu in the Yasawas and Monuriki in the Mamanucas. Tragically, John Gibbons, his wife Lily, and their two children drowned in a boating accident in Fiji in November 1986, and his notebooks and unpublished records were later destroyed.

In September 2000, I set out with a team of volunteers, staff, and students from the University of the South Pacific in Suva to verify these earlier distribution records of Gibbons and to investigate other potential islands where Crested Iguanas may still occur in the Yasawa and Mamanuca island groups. We surveyed eleven uninhabited and six inhabited islands for Crested Iguanas. All of these islands have large numbers of free-ranging domestic goats, and forest fires have occurred repeatedly on most of them over the last few decades. Our iguana survey transects were purposely placed through areas within beach forest remnants that had the maximum number and diversity of tree species known to be used by iguanas for food. Night searches for sleeping iguanas along a total of 11.2 km of beach forest transects were biased toward maximizing our chances of locating iguanas and were not designed to estimate average abundance. Groups of team members intensively searched the forest along each transect and collectively searched for over 123 hours at an average search rate of six meters per minute.

Our results suggest that Crested Iguanas are extremely rare or extinct on all of these islands. We found iguanas on only four of the 17 islands surveyed: three small, uninhabited islands (Devuilau, 0.23 km²; Monu, 0.73 km²; and Monuriki, 0.40 km²) and a single large inhabited island (Waya, 22.0 km²). We saw a total of six live iguanas on these four islands, plus one juvenile iguana that had been killed and partly eaten on Devuilau Island. Although the introduced mongoose does not occur on any island in the Yasawas and Mamanucas, feral cats are found on all inhabited islands, were seen on one uninhabited island, and probably exist on many of the other uninhabited islands we surveyed.

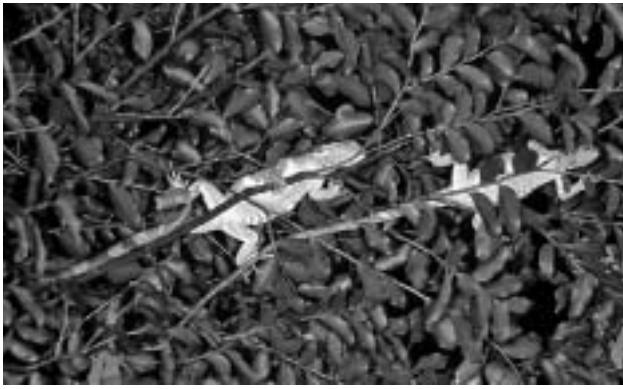
On many of the islands that we surveyed, beach forest remnants are restricted to steep valleys and along rocky ephemeral watercourses. The major part of these islands is covered by open

grasslands or impenetrable thickets of Vai Vai (*Leucaena leucocephala*), a small exotic tree introduced for goat food, but not eaten by iguanas. We selected ten islands for forest vegetation surveys, and found great inter-island differences in the density and diversity of Crested Iguana food trees. All of the islands that we surveyed had goats, and islands with evidence of regular forest fires were typically dominated by only three or four non-edible (to goats and iguanas) tree species. Other islands, which showed little or no evidence of forest fires, show greater tree species diversity, and several support abundant iguana food trees (e.g., Tavewa and Devuilau). On these islands, Crested Iguanas either were not recorded or were found in very low numbers, even though food does not appear to be a limiting factor. We suspect feral cats to be the major reason for the small number of iguanas seen on these islands.

The September 2000 iguana surveys found that the Crested Iguana Sanctuary of Yadua Taba held larger Crested Iguana population densities than any other surveyed island. Even considering that our transects were placed in optimal habitats and were thus biased toward finding iguanas, none of the four islands where we recorded iguanas had population densities greater than about two iguanas per hectare in the best available forest habitat (i.e., along watercourses). Average population densities over the entire forest remnant were much lower.



Pita Biciloa with a Crested Iguana captured on Monuriki island.



A pair of Crested Iguanas on Yadua Taba Island sleeping in a *Diospyros phlebodes* tree, a favorite food species.

Although Fijian villagers in the Yasawa and Mamanuca islands told us that Crested Iguanas are still occasionally encountered on several inhabited islands where large beach forest remnants remain (Nacula, Matakawa Levu, and Naviti), these populations are unlikely to survive in the long term because of the presence of feral cats and continuing forest habitat degradation. Most of the smaller inhabited islands in these groups have little or no remaining beach forests, and the inhabitants have no living memory of Crested Iguanas being present (e.g., Yanuca, Tavua, and Tokoriki).

The importance of the Crested Iguana Sanctuary island of Yadua Taba for the long-term conservation of the Fijian Crested Iguana is obvious, and the resources of the International Conservation Fund for the Fijian Crested Iguana are increasingly being directed to the upkeep of the Crested Iguana Sanctuary (see below). In 1980, Yadua Taba was declared a wildlife sanctuary, an attempt was made to remove the free-ranging domestic goats (which belonged to the villagers on Yadua), and an honorary ranger was appointed. Initially, Gibbons (1984a) estimated the size of the total population of Crested Iguanas on Yadua Taba at 100–200 adults. Mark-recapture and mark-resighting surveys subsequently provided more accurate population estimates for Yadua Taba. Cogger and Sadlier (1986) estimated a total population of 2,000–5,000, whereas Laurie et al. (1987) estimated a population size of 4,000–8,300. More recently, Harlow and Biciloa (2001) used line-transect surveys and estimated a total population size of 4,800–7,900 iguanas. About 25 ha of Yadua Taba are covered by beach forest habitat, in which Crested Iguanas occur in remarkable densities approaching 200/ha. Nighttime surveys of sleeping iguanas in this forest recorded an average of one iguana every five meters of transect searched (Harlow and Biciloa 2001).

The Future of Fijian Iguanas

Since European contact, Fiji has undergone massive environmental degradation, which has accelerated in the last few decades. The Indian Mongoose (*Herpestes auropunctatus*) was introduced in 1883 to the two largest islands, and the disappearance or extreme rarity of ground-nesting birds, large diurnal skinks, and Banded Iguanas was noted almost immediately (Pernetta and Watling 1978). Cats were introduced even earlier and are assumed to be responsible for the extinction or rarity of

these same species on mongoose-free islands (Gibbons 1984). All inhabited islands have feral cats and, as Fijians occasionally dump unwanted kittens onto uninhabited islands to “keep the rats down,” probably many uninhabited islands also have cats (personal observation).

In the 1970s and 1980s, a rapid increase in the value of goats meant that grazing uninhabited islands became a simple and lucrative farming technique. The typical regime of overstocking, often combined with regular dry season burning, has destroyed much of the native vegetation and caused catastrophic soil erosion on many islands. Selective grazing by goats on the seedlings of palatable tree species has resulted in the proliferation of unpalatable native species, as well as of invasive exotic species inedible to iguanas (Harlow and Biciloa 2001).

In Fiji, both species of Pacific iguanas can only be seen in captivity at Kula Eco Park near Sigatoka, on the South coast of the main island of Viti Levu. Although apparently widely distributed, even adventurous visitors to Fiji are unlikely to see an iguana of either species in the wild today, except on the sanctuary island of Yadua Taba. More likely, the visitor to an outer island who asks about iguanas will be told that one was seen a few months ago, or may be taken to a house where a pet iguana is tethered by string to a bush, or is living (temporarily) in a village Hibiscus or Tahitian Chestnut (*Inocarpus fagifer*) tree. Iguanas are rarely seen, often killed on sight, or occasionally captured and taken home as pets. On most inhabited islands where iguanas are found, encounters are such unusual occurrences that people will long remember the incident and its location, although not necessarily the year. Eighty-year-old men will tell a story about an unlikely incident with a *Vokai* or *Saumuri* (iguana), but after many bowls of kava (the popular and slightly analgesic Pacific drink) may admit it actually happened to their father or grandfather.

The fact that occasional sightings of iguanas still occur on many islands is reassuring. Both species of *Brachylophus* are arboreal and superbly camouflaged. As Fijians rarely venture into the forest at night (by far the best time to find iguanas), the rarity of encounters is not surprising. Arthur Loveridge's (1945; see introduction) suggestion that Banded Iguanas were rare and heading toward extinction in 1945 has seemingly not yet occurred. Whether the occasional sightings of *Brachylophus* today are indicative of low but stable population densities or represent populations that are slowly declining towards extinction is an unanswered question. If the latter is true, then the long-term conservation of Fijian iguanas will ultimately depend on having several well-protected populations of each species on small, uninhabited islands free of introduced predators and goats.

International Conservation Fund for the Fijian Crested Iguana (ICFFCI) (www.icffci.com)

The Fijian Crested Iguana is listed by the IUCN as Critically Endangered (IUCN 2003). Because recent surveys have confirmed that only one viable population of this species remains, international support is necessary to maintain the Crested Iguana Sanctuary island of Yadua Taba. Yadua Taba was declared Fiji's first wildlife reserve in 1980, but legal protection for the island was not assured until recently, when a 33-year lease was signed with the traditional owners.



The author on Yadua Tabu with Crested Iguanas bagged for fecal collection as part of a dietary study. *Photograph by Pita Biciloa.*

ICFFCI was established in 1999 by a Memorandum of Agreement between the government department in charge of protection and conservation of Fiji's natural resources, The National Trust of the Fiji Islands, and the two recognized centers for the captive breeding of the Fijian Crested Iguana (Kula Eco Park in Sigatoka, Fiji, and Taronga Zoo in Sydney, Australia). The urgent need for this international conservation fund was perceived and its creation accomplished primarily by Carol Bach (Taronga Zoo) and Philip Felsted (Kula Eco Park). The objectives of the fund are to: Develop through education and public awareness programs a better understanding and appreciation of the Fijian Crested Iguana and its habitat; assist in the conservation of existing wild Fijian Crested Iguana populations and their natural habitat; and create, manage, fund, and maintain one or more new Crested Iguana sanctuaries in the Republic of Fiji.

In the five years since its creation, ICFFCI has organized and funded two major projects. An endangered species education program in Fiji featured the Crested Iguana and was delivered in areas where critical habitat exists. All parties to the agreement developed programs directed at school children and successfully brought the Crested Iguana conservation message to many people via television, radio, magazine, and newspaper coverage within and outside Fiji. Probably the most important

result was the awareness that this program created among government officials in Fiji, who became instrumental in negotiating and funding the lease for Yadua Tabu, despite politically difficult times. Because the proceeds of the lease for Yadua Tabu do not benefit the nearby villagers on Yadua (who are not the traditional owners), a goodwill payment was made to the village school. A series of gifts to the village recognized the important role it plays in supporting the sanctuary. Since 2001, the Yadua school children have had an annual educational fieldtrip to the Yadua Tabu Crested Iguana Sanctuary with a guided tour by the ranger. For many of these children, this was their first visit to the sanctuary island and their first view of a Crested Iguana, despite the fact that the village is only four kilometers away.

Conservation efforts continue to concentrate on the needs of the Crested Iguana Sanctuary on Yadua Tabu. The sanctuary ranger, Pita Biciloa, Fiji's only wildlife ranger, visited Sydney in November 2000 for a two-week training program with local National Parks and Wildlife Service staff and vegetation regeneration specialists. In a joint funding arrangement with the National Trust of Fiji Islands, the fund paid for half of a new 28-foot sanctuary patrol boat and outboard motor.

Funding for these projects came from a variety of sources. Special recognition should go to the major sponsors, Bradley Trevor Greive and The Taronga Foundation, John Binns, Yamaha Motors of Australia, RandomBase Consulting, and the Australian Society of Zoo Keepers. The sale of Crested Iguana T-shirts, individual cash donations, and public donations of equipment and supplies all helped significantly. The immense time and effort contributed by volunteers and the staff of the parties to this agreement are priceless. Much more work needs to be done to guarantee the future of the spectacular and unique Fijian Crested Iguana, including the establishment of additional sanctuaries. The web page at www.icffci.com will contain further information and updates.

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References

- Arnett, J. R. 1979. Breeding the Fiji Banded Iguana *Brachylophus fasciatus* at Knoxville Zoo. *International Zoological Yearbook* 19:78–79.
- Bach, C. 1998. Egg data study of Fijian Crested Iguana, *Brachylophus vitiensis*. *Thylacinus* 22:12–13.
- Bauer, A. M. 1988. A geological basis for some herpetofaunal disjunctions in the southwest Pacific, with special reference to Vanuatu. *Herpetological Journal* 1:259–263.

- Boylan, T. 1989. Reproduction of the Fijian Crested Iguana, *Brachylophus vitiensis*, at Taronga Zoo. *International Zoological Yearbook* 28:126–130.
- Brongniart, A. 1800. Essai d'une classification naturelle des reptiles. *Bulletin de la Société Philomathique* 2:89–91.
- Cahill, C. 1970. *The Banded Iguana of Fiji*. Fiji Museum Educational Series, Fiji Museum, Suva.
- Chase, C. G. 1971. Tectonic history of the Fiji Plateau. *Geological Society of America Bulletin* 82:3087–3110.
- Cogger, H. G. 1974. Voyage of the Banded Iguana. *Australian Natural History* 18:144–149.
- Cogger, H. G. and R. A. Sadlier. 1986. Population size and structure in the Fijian Crested Iguana, pp. 507–512. In: Z. Rocek (ed.), *Studies in Herpetology*, Prague.
- Colgan, D. J. and P. Da Costa. 1997. Genetic discrimination between the iguanas *Brachylophus vitiensis* and *Brachylophus fasciatus*. *Journal of Herpetology* 31:589–591.
- Estes, R. and L. I. Price. 1973. Iguanid lizard from the Upper Cretaceous of Brazil. *Science* 180:748–751.
- Etheridge, R. and K. de Queiroz. 1988. A phylogeny of Iguanidae, pp. 283–367. In: R. Estes and G. K. Pregill (eds.), *Phylogenetic Relationships of the Lizard Families*. Stanford University Press, Stanford, California.
- Frost, D. R. and R. Etheridge. 1989. A phylogenetic analysis and taxonomy of iguanian lizards (Reptilia: Squamata). *Miscellaneous Publications of the Museum of Natural History*, University of Kansas (81):1–65.
- Gao, K. and L. Hou. 1995. Iguanians from the Upper Cretaceous Djadochta Formation, Gobi Desert, China. *Journal of Vertebrate Paleontology* 15:57–78.
- Gibbons, J. R. H. 1981. The biogeography of *Brachylophus* (Iguanidae), including the description of a new species, *B. vitiensis*, from Fiji. *Journal of Herpetology* 15:255–273.
- Gibbons, J. R. H. 1984a. Iguanans of the South Pacific. *Oryx* 18:82–91.
- Gibbons, J. R. H. 1984b. Discovery of a brand-new million-year-old iguana. *Animal Kingdom* 87:23–30.
- Gibbons, J. R. H. 1985a. The biogeography and evolution of Pacific island reptiles and amphibians, pp. 125–143. In: G. Grigg, R. Shine, and H. Ehmann (eds.), *Biology of Australasian Frogs and Reptiles*. Surrey Beatty and Sons, Sydney, Australia.
- Gibbons, J. R. H. 1985b. On the trail of the Crested Iguana. *Animal Kingdom* 6:40–45.
- Gibbons, J. R. H. and I. F. Watkins. 1982. Behavior, ecology, and conservation of South Pacific iguanas, *Brachylophus*, including a newly discovered species, pp. 419–441. In: G. M. Burghardt and A. S. Rand (eds.), *Iguanans of the World: Their Behavior, Ecology, and Conservation*. William Andrew Publishing, Noyes, New Jersey.
- Harlow, P. S. 2003. Searching for Banded Iguanans in the Lau Islands, Eastern Fiji. *Iguana (Journal of the International Iguana Society)* 10:103–107.
- Harlow, P. S. and P. N. Biciloa. 2001. Abundance of the Fijian Crested Iguana (*Brachylophus vitiensis*) on two islands. *Biological Conservation* 98:223–231.
- IUCN. 2003. *Red List of Threatened Animals*. World Conservation Monitoring Centre, Cambridge, United Kingdom.
- Laurie, W. A., H. Uryu, and D. Watling. 1987. A faunal survey of Yaduataba Island reserve with particular reference to the Crested Iguana (*Brachylophus vitiensis* Gibbons 1981). *Domodomo* 5:16–28.
- Loveridge, A. 1945. *Reptiles of the Pacific World*. The MacMillan Company, New York.
- Molnar, R. E., T. H. Worthy, and P. M. A. Willis. 2002. An extinct endemic crocodylian from Fiji. *Journal of Vertebrate Paleontology* 22:612–628.
- Pernetta, J. C. and D. Watling. 1978. The introduced and native terrestrial vertebrates of Fiji. *Pacific Science* 32:223–244.
- Pregill, G. K. and D. W. Steadman. 2004. South Pacific Iguanans: Human impacts and a new species. *Journal of Herpetology* 38:15–21.
- Pregill, G. K. and T. H. Worthy. 2003. A new iguanid lizard (Squamata, Iguanidae) from the late Quaternary of Fiji, Southwest Pacific. *Herpetologica* 59:57–67.
- Rodda, P. 1994. Geology of Fiji, pp. 131–151. In: A. J. Stevenson, R. H. Herzer, and P. F. Balance (eds.), *Geology and Submarine Resources of the Tonga-Lau-Fiji Region*. South Pacific Applied Geosciences Commission (SOPAC) Technical Bulletin, Suva, Fiji Islands.
- Sites, J. W., S. K. Davis, T. Guerra, J. B. Iverson, and H. L. Snell. 1996. Character congruence and phylogenetic signal in molecular and morphological data sets: A case study in the living iguanas (Squamata, Iguanidae). *Molecular Biology and Evolution* 13:1087–1105.
- Williams, T. 1858. In: G. S. Rowe (ed.). 1982. *Fiji and the Fijians. Vol. 1. The Islands and their Inhabitants*. Fiji Museum, Suva.
- Worthy, T. H., A. J. Anderson, and R. E. Molnar. 1999. Megafaunal expressions in a land without mammals — the first fossil faunas from terrestrial deposits in Fiji. *Senckenbergiana Biologica* 79:237–242.
- Zug, G. 1991. The Lizards of Fiji: Natural History and Systematics. *Bishop Museum Bulletin in Zoology* (2). Bishop Museum Press, Honolulu.

Author Biography

Peter Harlow has worked as a researcher on the ecology and biology of a wide range of reptiles, including crocodylians, lizards, snakes, and turtles, for over 20 years. While the majority of this work has been concentrated on Australian species, other projects have included the biology of reptiles used in the commercial skin industry in Indonesia, the ecology of southern African snakes, and population surveys and conservation biology of Pacific iguanas. He completed his Ph.D. on the ecology of sex-determining mechanisms in Australian agamid lizards, investigating why egg incubation temperatures determine hatchling sex in some agamid species, when other, often closely related species, use genetic sex determination. At present, he is the manager of the Herpetofauna Division at the Taronga Zoo in Sydney, Australia.