

# HERPETOLOGY IN MAURITIUS A HISTORY OF EXTINCTION, FUTURE HOPE FOR CONSERVATION

A. WAHAB OWADALLY

*Conservator of Forests, Forestry Service, Curepipe, Mauritius)*

and

MICHAEL LAMBERT

*Chairman, BHS*

*This is another of a range of articles published, in the BHS Bulletin on herpetology in different Commonwealth countries and of importance in relation to the first World Congress of Herpetology (of which BHS is a Co-Host) taking place in the UK in September 1989. His Royal Highness the Duke of Edinburgh (President of the World Wildlife Fund and Vice-President of IUCN) is Patron and Prof. Angus Bellairs (BHS Honorary Life Member 1982) Honorary President. Every encouragement is to be given to Commonwealth nationals, especially from developing countries in the tropics (where most of the world's herpetofauna occur), to attend and participate in the Congress.*

## INTRODUCTION

Mauritius, making up an area of 805 square miles (2085 km<sup>2</sup>), includes Rodrigues, and the dependent islands of Agalega and St Brandon. Excluding the latter two islands, Mauritius and Rodrigues, together with Réunion (an Overseas Department of France), make up the Mascarene islands (named after the Portuguese navigator, Pedro Mascarenhas) in the west of the southern Indian Ocean. Called Dinarobin on earlier Arabs' maps, Mauritius first became known to the Portuguese in 1511. Visited by the Dutch in 1598 (a Dutch colony from 1638-1710) and possessed in 1715 by the French, who settled there in 1720, Mauritius remained under French administrative power until 1810. Under British Rule for 158 years, Mauritius became an independent member of the Commonwealth in 1968 with French and the local creole the main languages, but with English, an official language with French, also widely spoken.

Mauritius enjoys a sub-tropical maritime climate with high humidity and a wide range of rainfall and temperature resulting from mountainous areas. The island is subject to cyclones that strike with demonic force at irregular intervals between January and March. The lowland areas of the island are blanketed green almost everywhere by sugar cane, but some natural vegetation intensely mixed with exotics survives in upland areas especially in the south-west. The Black River Peak (826m) is Mauritius's highest mountain. As a helpful introductory work on Mauritius, although now a little out-of-date, a book by Wright (1974) was published by David & Charles in the Islands Series. This is usefully complemented historically and politically, however, by Mannick's (1979) more detailed *Mauritius: the development of a plural society*.

Sugar is the main export and 'up-market' tourism a major source of income, but Mauritius is probably best known for the rare Mauritius Blue postage stamp and as home of the extinct Dodo. In September 1987, Their Royal Highnesses the Duke and Duchess of York made a visit to Mauritius which received much publicity in Britain.

During the 19th century, Nicholas Pike (1873), American Consul in Mauritius, took an interest in the general natural history of the island and described his wanderings in a delightfully entitled book (only available secondhand) "Subtropical rambles in the land of the Aphanapteryx". More recently, Gerald Durrell (1977) provided a light description of his experiences collecting rare species for captive-breeding at the Jersey Wildlife Preservation Trust (JMPT) in a book entitled "Golden bats and pink pigeons". His wife, Lee, accompanied him on later expeditions, but one of his companions on the early ones was his assistant, John Hartley, who gave a lecture on their work at a BHS evening in October 1981.

## A HISTORY OF EXTINCTION

Extinction of species that have evolved in isolation appears to be a feature of Mauritius and other Mascarene islands. The best known species, the Dodo, a kind of terrestrial pigeon the size of a turkey, and a lesser known bird, the *Aphanapteryx*, were persecuted and became extinct between 1638 and 1710. Giant tortoises also inhabited the Mascarene islands at that time, and in an excellent account of the ecological history of Mauritius and other Mascarene islands, Cheke (1987b) reviews the early literature on these enormous creatures (which were sought as a food supply) and recounts their extinction. He concludes from the log of a ship, the *Courrier de Bourbon* (1721), that tortoises were extinct on mainland Mauritius by 1721. They survived on Rodrigues for longer, effectively until 1805, although only pronounced extinct forty years later ([Corby, 1845], cited by Cheke, 1987b). Certain plant species have also become or are very close to extinction on Mauritius, the Tambalacoque tree, which still just survives, probably being the best known of these. Temple (1977) suggested that the demise of this tree is due to the extinction of the Dodo for some mechanism of endocarp abrasion is required to facilitate germination and he proposes that this was accomplished by the Dodo's gizzard. In a recent note, Iverson (1987) proposes that the giant tortoises were responsible for this function, especially since the seeds of certain species germinate more readily after passage through the gut of both Galapagos (Pacific Ocean) and Aldabran giant tortoises, but Cheke (1987b), who also suggested that tortoises were involved, surmised that removal of the endocarp was carried out in the mouth (on account of the large size of the seeds) and not the gut.

The giant tortoises of Mauritius and other Mascarene islands were undoubtedly abundant herbivorous inhabitants during the Pleistocene. They have inspired a certain degree of interest among herpetologists since Günther's (1873, 1874, 1877) work on "gigantic land tortoises". This stimulated further work (e.g. Boulenger, 1891; Gadow, 1894; Haddon, 1879; Rothschild, 1906, 1915; Sauzier, 1892, 1893; Vaillant, 1885, 1893, 1899, 1903). More recently, Arnold (1979, 1980) and Bour (1980) have considered the systematics and distribution of species on the Mascarene islands, the latter author reviving the genus *Cylindraspis* (see also Bour, 1978), and concluded that two species occurred on Rodrigues (*Geochelone vosmaeri* and *G. peltastes*), two on Mauritius (*Geochelone inepta* and *G. triserrata*, named by Günther) and one (*Geochelone borbonica*) and probably another, *G. triserrata*, on Réunion (Arnold, 1979). There have been new doubts over the allocation of names to species for *gigantea*, usually applied to Aldabra tortoises (*Dipsochelys* and *Aldabrachelys* have also been used as generic names for this species), was apparently based on a Mascarene specimen in the Paris Museum of Natural History (Bour, 1984).

Arnold (1980) and Cheke (1987b) have also recently considered other extinct forms of reptiles on Mauritius, Rodrigues and Réunion. A giant skink, *Leiolopisma (Didosaurus) mauritiana* Günther occurred on Mauritius and reached a snout-vent length of around 340mm. It is related to the smaller (up to 171mm) *Leiolopisma telfairi* (Desjardins), which now survives only on Round Island, one of the islands off the north coast of mainland Mauritius. There are also two endemic Round Island geckos: *Nactus (Cyrtodactylus) serpensinsula* (Loveridge) – also on Serpent Island (another northern Mauritian island) – and *Phelsuma guentheri* Boulenger, and two bolyerine snakes: *Casarea dussumieri* (Schlegel) and perhaps another, *Bolyeria multocarinata* (Boise), which has not been seen on Round Island since 1975 (Bullock, 1977) and then only previously in 1967 (Vinson, 1975). Bullock has also quite recently discovered a small gecko, *Nactus coindemirensis* n. sp., new to science on Gunner's Quoin (Coin de Mire) off the north coast of the Mauritian mainland which has been described by Bullock, Arnold & Bloxham (1985). *Phelsuma gigas*, the world's largest gecko, is now extinct on Rodrigues, having become so in the 1840s.

## CONSERVATION

When Chairman of Council of the Fauna (now & Flora) Preservation Society (FFPS), Sir Peter Scott was invited to visit Mauritius in 1973 and advise on conservation problems, he recommended the need for properly managed national parks and nature reserves to protect remnant habitats (Scott, 1973). Round Island and Maccabee Forest (comprising the Black River Gorge), among other areas, were set up as National Reserves. After a two-year investigation from early 1973, Temple (1974b) outlined the Mauritian wildlife conservation problems in

FFPS's journal, *Oryx*, having already publicised the threat of habitat alteration to the rare reptiles on Round Island from the ravages of goats and rabbits that had bred prolifically after being released there in about 1850 (Temple, 1974a). A fuller account of conservation problems in Mauritius has been given by Procter & Salm (1975) and a list of the reserves on Mauritius and their sizes by Owadally (1981). Cheke (1987a) has also provided an update on the conservation situation in Mauritius.

Besides terrestrial species, there are other species that can be considered to be indigenous to Mauritius with its situation in the Indian Ocean. These include three marine turtles (*Chelonia mydas*, *Eretmochelys imbricate* and *Dermochelys coriacea*) and a sea snake (*Pelamis platurus*). *Chelonia mydas* (Green Turtle) is classified as an endangered species under CITES and as a harvestable species requiring protection under the Draft Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region. In a White Paper on conservation strategy in Mauritius (Ministry of Agriculture, Fisheries and Natural Resources, 1985), the Green Turtle is reported to have become extremely rare around Mauritius but is fairly common on some islets of the St Brandon Shoal. Fishing of turtles is prohibited, but the protection of the nesting ground where the species is most vulnerable is still required. It was proposed that turtle reserves should be created at Pearl and Frigate islands in the St Brandon Shoal by protecting nesting grounds of the species and allow for maximum hatching success and recruitment in the turtle population. The Ministry for Rodrigues and the Outer Islands would be responsible for the implementation of management plans.

The first opportunity to visit Mauritius was given to Lambert in May 1981 in order to conduct a training course at the behest of the Mauritian Government through sponsorship of the Overseas Development Administration (ODA). He had the good fortune at that time, through John Hartley, to meet Gerald and Lee Durrell, whose visit to make a film on their work in Mauritius coincided. Gerald Durrell in desperation felt that strychnine used under the name of 'bunny-slumber'(!) could be one quick, albeit somewhat drastic, way of resolving the rabbit nuisance on Round Island. However, a successful solution to the problem has now been found after putting a proposal by a New Zealand expert Don Merton (Merton, 1985, cited by Cheke, 1987a) into action in July 1986. A further visit by Lambert was provided again through ODA in March/April 1987 and Owadally was invited to contribute to a training course on pesticide management. He spoke on the side effects of pesticides and other agrochemicals on the fragile Mauritian wildlife, Cheke (1987a) having suggested that DDT used for malaria control in the 1960s is a contributory factor in the decline of the Mauritian Kestrel. Interestingly, the kestrel feeds largely on the endemic *Phelsuma* geckos (Jones, 1987), which it catches on tree trunks (Fox, Fox & Bailey, 1985).

## RECENT HERPETOFAUNA

The beautiful green Day Geckos of the genus *Phelsuma* are typical Indian Ocean species and have attracted the attention of herpetologists over the years. Four occur on the Mauritian islands and have a complex nomenclatural history. Loveridge (1942) provided a revision of the genus and included the Mascarene forms, *P. newtoni* Boulenger (Rodrigues), *P. inunguis* (Cuvier) (Réunion, Mauritius) and *P. guentheri* (Round Island). A further revision of the genus was provided by Robert Mertens of the Senckenberg Museum, Frankfurt am Main (Mertens, 1962), who included *P. inunguis* under *P. cepediana* (Merrem). Mertens (1963b) then included the earlier described *P. vinsoni* (Mertens, 1963a) and described *P. guimbeaui* n. sp. for Mauritius. Later, Mertens (1966) gave *P. cepediana* and *P. vinsoni* nominated subspecific status in describing *P. cepediana borbonica* and *P. vinsoni inexpectata* for Réunion, and resurrected (Mertens, 1970) *P. ornata ornata* for *P. vinsoni* on Mauritius and *P. ornata inexpectata* for the form on Réunion. A complete run-down of the *Phelsuma* geckos and their distribution (with localities) on the coasts and islands of the Indian Ocean has been provided by Böner (1972).

Reptiles have featured in Mauritian postage stamps and in 1983, two species of *Phelsuma* were used: *P. cepediana* and *P. guimbeaui*.

New reptiles species from Mauritian islands have been described in recent years. The gecko, *Phelsuma agalegae* n. sp., was found on the island of Agalega and described by Cheke (1975), although he subsequently reduced this (Cheke, 1982) to a race of *P. borbonica* (itself raised to full specific status, the nominate occurring on Réunion). The previously mentioned *Nactus*

*coindemirensis* on Gunner's Quoin occurs with *Phelsuma ornata* and the skinks, *Scelotes (Gongylomorphus) bojerii* (Desjardins) and *Cryptoblepharus boutonii*, which are also found on Round Island.

Round Island off the north-west coast of mainland Mauritius has received much attention from conservationists in recent years while the extant herpetofauna has aroused interest amongst herpetologists. A local naturalist, Jean Vinson (formerly Director, Mauritius Institute, Port Louis), worked on the reptiles of Mauritius with his son, Jean-Michel (Vinson & Vinson, 1969). Jean Vinson made nine visits to Round Island between 1948 and 1965 to carry out investigations on the reptiles and insects. Further visits were made by his son between November 1966 and February 1975 which amounted to 477 man-hours, 350 of which were devoted to exploration, and notes were made specifically on the reptile species (Vinson, 1975). Already known on Round Island and well known on the mainland in the early 19th century, the skink, *Scelotes bojerii*, was also rediscovered deep in the Maccabee Forest of mainland Mauritius (Vinson, 1973). *Cryptoblepharus boutonii* is also rare on mainland Mauritius. In his light-hearted account, Gerald Durrell (1977) describes his experiences collecting rare reptiles on Round Island for the purpose of captive-breeding at JWPT. Accounts of their successes with two lizard species: the gecko, *Phelsuma guentheri* (Bloxam & Tonge, 1980), and the skink, *Leiopisma telfairii* (Bloxam, 1977; Tonge, 1985), have been produced, two in BHS publications. After initial difficulty, there has also been recent success with the bolyerine Round Island Boa, *Casarea dussumieri* (e.g. Tonge, 1986). Detailed investigations on the reptiles of the northern Mauritian islands have also been made in recent years, one during an expedition from Edinburgh University over five weeks in July and August 1975 (Bullock, 1977) and another in 1982 (Bullock & North, 1984), the findings being given provisionally in *Oryx*. Further details of the ecology of the reptiles on Round Island and Gunner's Quoin have been published in *Biological Conservation* (Bullock, 1986). A day was also spent in 1982 looking for reptiles on Isle aux Aigrettes (D.J. Bullock, *in litt.*), a nature reserve off the southern coast of Mauritius, and during a further visit to Mauritius planned for July/August 1989, a revisit to Isle aux Aigrettes is intended with a view to setting up a study of the comparative ecology of the reptiles. We give a complete list and island distribution of Mauritian herpetofauna in Table 1.

TABLE 1. Amphibians and Reptiles of Mauritius (including Rodrigues), living and extinct, and only showing those on the other Mascarene island of Réunion that occur there also.

	MARIITIUS		RODRIGUES	REUNION
	Main island	North islands		
AMPHIBIA				
Bufonidae				
<i>Bufo gutturalis</i>	II			II
<i>Bufo marinus</i>	(I)			
Ranidae				
<i>Rana (= Ptychadena) mascareniensis</i>	II			II
REPTILIA				
Cheloniidae				
<i>Chelonia mydas japonica</i>	+	+ <sup>1</sup>	(+),* <sub>6</sub>	I+P
<i>Eretmochelys imbricata bissa</i>	+	+ <sup>1</sup>	*	+
Dermochelyidae				
<i>Dermochelys coriacea</i>	+			
Trionychidae				
<i>Amyda (= Trionyx) cartilaginea</i>	II			
Pelomedusidae				
<i>Pelusios subniger</i>	I			
Testudinidae				
<i>Asterochelys radiata</i>	I			I
<i>Cylindraspis indica</i>	E	)E <sup>1</sup>		
<i>Cylindraspis inepta</i>	E			
<i>Cylindraspis peltastes</i>			E	
<i>Cylindraspis vosmaeri</i>			E	
<i>Dipsochelys elephantina</i>	I P			I
Gekkonidae				

**MARITTIUS**                      **RODRIGUES REUNION**  
**Main island**   **North islands**

<i>Ebenavia inunguis</i>	II		
<i>Gehyra mutilata</i>	II	II	II
<i>Hemidactylus frenatus</i>	II, ?*	II	II
<i>Hemidactylus mabouia</i> (= <i>mercatorius</i> )	II	I	II
<i>Hemiphyllodactylus typus</i>	II	II	II
<i>Lepidodactylus lugubris</i>		"	
<i>Nactus</i> (= <i>Cyrtodactylus</i> ) <i>serpensinsula</i>	E	* 1 2	
<i>Nactus coindemirensis</i>		* 3	
<i>Phelsuma borbonica agalegae</i>		* 5	
<i>Phelsuma cepediana</i>	*		I
<i>Phelsuma edwardnewtonii</i>		E	
<i>Phelsuma gigas</i>		E	
<i>Phelsuma guimbeau</i>	*		
<i>Phelsuma guentheri</i>	E	* 1	
<i>Phelsuma lineata</i>			I
<i>Phelsuma ornata</i>	*	* 1 3 4	+
Agamidae			
<i>Calotes versicolor</i>	II		II
Scincidae			
<i>Cryptoblepharus boutonii</i>	(+)	* 1 3 4	E
<i>Leiolopisma</i> (= <i>Didosaurus</i> ) <i>mauritiana</i>	E		
<i>Leiolopisma telfairii</i>	E	* 1	E
<i>Scelotes</i> (= <i>Gongylomorphus</i> ) <i>bojerii</i>	(+)	* 1 2 3 4	E
Typhlopidae			
<i>Ramphotyphlops braminus</i>	II		II
<i>Typhlops cariei</i>	E		
Colubridae			
<i>Lycodon aulicus</i>	II		II
Tropidophidae			
<i>Bolyeria multocarinata</i>	E	? + 1	
<i>Casarea dussumieri</i>	E	* 1	
Hydrophiidae			
<i>Pelamis platurus</i>	+		

**Footnotes:**

<sup>1</sup> Round Island

<sup>2</sup> Serpent Island

<sup>3</sup> Gunner's Quoin (Coin de Mire)

<sup>4</sup> Flat Island

<sup>5</sup> Agalega (over 1200 km from Rodrigues)

<sup>6</sup> St. Brandon (over 500 km from Rodrigues)

\* Present (indigenous)

+ Indigenous (accidental)

(+) Indigenous (rare)

E Extinct

II Introduced, common

I Introduced, but rare or localised (P = captive)

(I) Introduced, but not extant

**Common species:**

While based at Flic en Flac, 14 km from quatre Bornes, on a warm, relatively dry part of the west coast of Mauritius, Lambert saw several species between 20 March and 6 April 1987 that could be regarded as common and which any short-term visitor to Mauritius might expect to see without much difficulty:

*Phelsuma guimbeau*, an indigenous (endemic) species of green Day Gecko. An individual plied the surfaces of the fronds of a palm tree for small insects at 3-4m above the ground in Flic en Flac and was seen emerging in the morning sunshine at about 7.30 on several occasions. The species is characterised by a dark median line in the neck region. It occurs on the western part of the island (Port Louis to Baie du Cap) and several were also seen in Casela Bird Park.

*Phelsuma cepediana*, another indigenous (endemic) green Day Gecko. Characteristically bearing a large red dot between the eyes, occasional individuals of this species, which is widespread over most of the island, but mainly on the east side, were seen on ornamental garden trees

and shrubs. One was seen on a banana tree in a garden in Curepipe (28.iii) and the species is most common in moist, shady areas and enters houses.

*Hemidactylus frenatus*, a small introduced gecko. A sub-adult of probably this species was observed on a low wall around the garden of a house at Tamarin (21.iii) about 5 km along the coast south of Flic en Flac. Others of probably this species (or *H. mabouia* = *mercatorius*) were seen inside buildings at Flic en Flac. This species and other introduced geckos, such as *Gehyra mutilata*, and sometimes the indigenous *Phelsuma cepedianana*, are common in houses. Certain pesticides are used to control geckos in houses, both being used as baits with sugar. One, surprisingly (on account of its low toxicity to mammals – also vertebrates), is K-Othrine (deltamethrin), which is available as a wettable powder formulation in 70 g sachets and is sprinkled around the house at the rate of 15 mg m<sup>-2</sup>; the other is Diptorex (trichlorophon). It is perhaps regrettable that these small geckos commonly found in houses in the tropics are not more greatly appreciated locally as natural insect pest controllers!

*Calotes versicolor*, the Indian Garden Lizard. Several were seen on trees and on wire-mesh fences basking in the morning sunshine, especially after rain during the evening before. A native of southern Asia (India to Java), this small agamid is locally known as “chameleon”. Although introduced earlier, in about 1900, it was deliberately introduced to Mauritius from Réunion in 1914 as a predatory control agent, unsuccessfully, against the Pink Stem Borer of sugar cane (Greathead, 1971). Rustling sounds gave escaping individuals away amongst the fronds of sugar cane when walking along the side of the road between Flic en Flac and the junction with the main Port Louis-Black River coast road (21.iii). Three adults were also to be seen basking on the trunks of bottle palms by the sides of the driveway to the administration buildings of the University of Mauritius at Reduit (26.iii), their bodies directed downwards and the head, neck and fore part of the body held away from the surface. One was found as a road-kill on the 3 km of tarmac road behind the beach between Flic en Flac and Wolmar (30.iii). It feeds mainly on insects and occasionally on small birds. It has also been introduced to the Hawaiian Islands and Sean McKeown of the Fresno Zoological Society (Roeding Park Zoo), California, USA, has reported it to be saurivorous. It could be a problem species in Mauritius for its impact on indigenous lizard species is not known and so a study of its trophic ecology would probably be worthwhile. It occurs in the Isle aux Aigrettes nature reserve.

*Lycodon aulicus*, Indian Wolf Snake. This species has been introduced to Mauritius from southern Asia and is known locally as “couleuvre”. It is found especially where conditions are warm and dry, and a road-kill specimen was collected near Wolmar (30.iii).

*Bufo gutturalis*, Common African Toad. Known locally (and appropriately) as “crapaud”, this species is common at Flic en Flac. Several half-grown and adult individuals were seen on concrete beach paths in the early hours of darkness, especially after heavy afternoon rain, and on the road between Flic en Flac and Wolmar as road-kills, five being counted one morning (30.iii). The species was introduced in 1922 as a predator to control the scarab beetle, *Clemora smithi*, but it feeds little on this pest species (Greathead, 1971). Interestingly, the giant *Bufo marinus* has similarly been introduced to Mauritius as a predator of *C. smithi* with attempts being made on two occasions. In 1938, 80 toads from Puerto Rico were released in eight localities, and in 1950-51, 346 toads were sent from Trinidad by what is now CAB International Institute of Biological Control (CIBC), but only 164 survived to be released and none was recovered. The reason for the lack of success of *B. marinus* is obscure (Greathead, 1971) for it has become often all too easily established in tropical islands elsewhere (e.g. Papua New Guinea, Jamaica).

*Rana (Ptychadena) mascareniensis*, Mascarene Frog. A small 2.5 cm long frog, undoubtedly of this introduced species, jumped upon disturbance from the edge into the water of a pond just outside the neatly kept entrance of the driveway to the Casela Bird Park, near Clarence, some 5 km north of Tamarin. Known locally (and appropriately) as “grenouille” and a native of Madagascar, it is primarily nocturnal and not often seen for it does not occur in such large numbers as the crapaud (*Bufo gutturalis*).

## GIANT TORTOISES IN CAPTIVITY

A number of Giant Tortoises (*Dipsochelys elephantina*) brought from Aldabra Atoll (Seychelles) are kept in collections in Mauritius. Besides the long lily pond in which great pads of *Victoria amazonica* are floating (as in the tropical house at Kew Gardens), the Pamlemousses Botanical Garden (created by the first governor, le Comte de Labourdonnais, around his home of Mon Plaisir between 1735 and 1746) includes an enclosure for Giant Tortoises. Lambert observed males mounting females in May 1981, but the creatures have not bred. About five Giant Tortoises and four Radiated Tortoises (*Astrochelys radiata*) – presumably brought in from Madagascar – are also kept in a large enclosure in the Casela Bird Park. In a small pen separate from the adults within the main enclosure, about twelve juvenile and immature tortoises were being kept. These included *D. elephantina*, suggesting that some breeding had taken place. Small collections of Aldabran Giant Tortoises are also found at Balfour Garden, Beau Bassin (about ten specimens); Robert Edward Hart Garden (ex – Les Salines), Port Louis (about 12 specimens); Le Reduit Ground (about six specimens) and on the small offshore Ile aux Cerfs on the east coast of Mauritius for the benefit of tourists (about six specimens). A few sugar estates also hold small collections e.g. Mon Désert/Mont Tresor and Belle Vue Mauricia. Private people in various parts of the island also have one or two Giant and Radiated Tortoises as pets.

Having observed the conditions in which some of these striking reptiles are being kept in Mauritius, it is appropriate to make suggestions here on how their maintenance could be improved:-

- a. the tortoises should not be kept in paved or concreted areas, as observed at Balfour Garden and Pamlemousses Botanical Garden.
- b. the tortoises should be provided with a variety of food items so that protein and vitamin intake can be increased – the main food item at present is *Euphorbia lactea* – and calcium should be included with the diet.
- c. tortoises in private collections should have dogs, cats and other domestic animals kept away from them, nor should rats be able to come into contact with them, especially in the case of young tortoises. Children should not be allowed to ride or jump on them.
- d. tortoises, especially in private collections, should be allowed access to water for drinking purposes.
- e. to avoid the development of infections, tortoises should not be kept on heaps of sand.

## LA VANILLE CROCODILE FARM

On the road between Nouvelle France and Souillac in the south of Mauritius, just 2 km from the small village of Rivière des Anguilles and approached through fields of sugar cane, there is a small crocodile park. Apart from the main exhibit of captive-bred crocodiles (*Crocodylus niloticus*), there were several amphibia and reptiles, and other vertebrates, on display for the park has an educational function. An enclosure contained several big adult breeding crocodiles, introduced from breeding stock in Madagascar, and others hatchlings of different ages from egg clutches laid in 1980, 1981 and 1983. The other herpetofauna, mainly illustrating those species found in Mauritius, included *Lycodon aulicus*: five snakes in a vivarium with about a dozen eggs being allowed to incubate in a transparent-lidded plastic box kept separately inside the vivarium; *Phelsuma cepedianana* and *P. guimbeaui*: one each in separate vivaria (another green Day Gecko, *P. ornata*, common in lowland parts of Mauritius, especially on the west side, was not on display and is differentiated from the other two species on the main island by a white line above the eyes – all three species are being bred in California, USA, by Sean McKeown at Roeding Park Zoo). *Astrochelys radiata*: about three adults and ten juveniles (indicating breeding success) in a large vivarium; *Chrysemys picta* (from USA): six adults in an extemporised tank; *Calotes versicolor*: four in a vivarium; *Amyda (Trionyx) cartilaginea* (native to China and introduced in 1920 to rivers in Mauritius including River Cascade, Grand River North West, River Moka, Rivière des Creoles, Belle Eau River and Riche Mare River, but is not generally widespread): none in a tank; *Bufo gutturalis*: two in a vivarium, and *Rana mascareniensis*: two 2.5 cm frogs in a vivarium.

## CASELA BIRD PARK

Besides several large aviaries containing some colourful bird species, including the indigenous (and endemic) Mauritian Pink Pigeon, there are a few reptiles also being kept in addition to Giant and Radiated Tortoises. Basking on an artificial rock in the middle of the waders' aviary pond and presumably included to add variety, three Painted Terrapins, *Chrysemys picta*, were to be seen (29.iii). Several brilliantly coloured *Phelsuma guimbeaui* were also seen scuttling about wild, no doubt finding a kind of sanctuary in the bird park. The small geckos were basking and plied the edges of the aviaries containing a range of parrot species and the Pink Pigeons for their prey on insects. Three *Calotes versicolor* shot across the dried-leaf strewn ground upon disturbance and scrambled up the trunks of small ornamental trees in their haste to escape. There is a splendid view from the bird park across the sugar cane fields over to Tamarin Bay in the south-west.

## BLACK RIVER BIRD SANCTUARY

The Black River Breeding Project is organised by the Mauritian Government, the International Council for Bird Preservation and JWPT (Cheke. 1987a). The breeding project is run by Carl Jones at the Forestry Quarters, Black River (on the west of the island) and was started in 1979. Visited by the Duke and Duchess of York while in Mauritius in September 1987, Carl Jones demonstrated the feeding of Mauritian kestrels. Young kestrels depend mainly on green *Phelsuma* geckos as food, and the natural availability of the geckos in undisturbed habitats is probably crucial to this most endangered raptor's survival. Pink Pigeons are also being bred at the sanctuary. Besides birds, Round Islands reptiles, *Leiolopisma telfairii* and *Phelsuma guentheri*, which have been bred successfully by JWPT, are also being maintained as a breeding stock there. The work is partly an outcome of the White Paper on conservation strategy in Mauritius (Ministry of Agriculture, Fisheries and Natural Resources, 1985).

## MAURITIUS INSTITUTE, PORT LOUIS

In the Mauritius Institute at Port Louis, the capital town, there is in addition to a library on the island's literature a small natural history section. Concentrating on marine organisms, there is a stuffed Hawksbill Turtle, *Eretmochelys imbricata*, amongst the specimens on display. There is also a specimen each of the Round Island boas, *Casarea dussumieri* and *Bolyeria aultocarinata*. The best existing skeleton of the giant skink, *Leiolopisma (Didosaurus) mauritiana*, has also been retained in the Institute.

## ACKNOWLEDGEMENTS

Thanks are due to Anthony Cheke (Oxford) and David Bullock (School of Life Sciences, Scraftoft, Leicester Polytechnic) for helpful comments on a first draft of this article. We are also indebted to the former for his authoritative appraisal of a subsequent draft.

## REFERENCES

- Arnold, E.N. (1979). Indian Ocean giant tortoises: their systematics and island adaptations. *Philosophical Transactions of the Royal Society of London B* 286, 127-145.
- Arnold, E.N. (1980). Recently extinct reptile populations from Mauritius and Reunion, Indian Ocean. *Journal of Zoology, London* 191, 33-47.
- Bloxam, Q.M.S. (1977). The maintenance and breeding of the Round Island skink *Leiolopisma telfairii*. *Jersey Wildlife Preservation trust Annual Report* 13, 53-56.
- Bloxam, Q. & Tonge, S. (1980). Maintenance and breeding of *Phelsuma guentheri* (Boulenger 1885). In *The care and breeding of captive reptiles*, 51-62. Townson, S., Millichamp, N.J., Lucas, D.G.D. and Millwood, A.J. (Eds). London, British Børner, A.R. (1972). *Revision der Geckonidengattung Phelsuma Gray 1825*. Köln, published by the author.
- Boulenger, G.A. (1891). On the skull of an extinct land-tortoise from Mauritius indicating a new species *Testudo microtypanum*. *Proceeding of the Zoological Society of London* 1891, 4-5.
- Bour, R. (1978). Les tortues des Mascareignes; description d'une espèce nouvelle d'après un document (Memoires de l'Academie) de 1737 dans laquelle le crâne est figuré. *Compte rendu de l'Academie des Sciences, Paris* 287D, 491-493.



- Bour, R. (1980). Systematique des tortues terrestres des îles Mascareignes: genre *Cylindraspis* Fitzinger 1835 (Reptilia, Chelonii). *Bulletin du Museum national d' Histoire naturelle, Paris* (4)2A, 895-904.
- Bour, R. (1984a). L' identité de *Testudo gigantea* Schweigger, 1812 (Reptilia, Chelonii). *Bulletin du Muséum national d' Histoire naturelle, Paris* (4)5A, 343-382.
- Bour, R. (1984b). Données sur la repartition géographique des tortues terrestres et d' eau douce aux îles Maurice et Rodrigues. *Info-Nature Ile Réunion* 21, 7-38.
- Bullock, D. (1977). Round Island – a tale of destruction. *Oryx* 14, 51-58.
- Bullock, D.J. (1986). The ecology and conservation of reptiles on Round Island and Gunner's Quoin, Mauritius. *Biological Conservation* 37, 135-156.
- Bullock, D.J., Arnold, E.N. & Bloxam, Q. (1985). A new endemic gecko (Reptilia: Gekkonidae) from Mauritius, *Journal of Zoology, London (A)* 206, 591-599.
- Bullock, D. & North, S. (1984). Round Island in 1982. *Oryx* 18, 36-41.
- Cheke, A.S. (1975). An undescribed gecko from AGalega: *Phelsuma agalegae* sp. nov. *The Mauritius Institute Bulletin* 8, 33-48.
- Cheke, A.S. (1982). A note on *Phelsuma* Gray 1825 of the Agalega Islands, Indian Ocean (Sauria: Gekkonidae). *Senckenbergiana biologica* 62, 1-3.
- Cheke, A. (1987a). The legacy of the dodo – conservation in Mauritius. *Oryx* 21, 29-36.
- Cheke, A.S. (1987b). An ecological history of the Mascarene Islands, with particular reference to extinctions and introductions of land vertebrates. In *Studies of Mascarene Island birds*, 5-89. Diamond, A.W. (Ed.). Cambridge University Press.
- Courrier de Bourbon* log of 1721. Extraits du Journal de Navigation du *Courrier de Bourbon* (1720-1722). *Revue Retrospective Ile Maurice* (1952) 3, 149-166.
- (Corby, T.) 1845. (Letter to J.A. Lloyd, HM Surveyor General in Mauritius, dated 30.x.1845, on the subject of Rodrigues.) MS in Public Record Office, London: CO167, vol. 262.
- Durrell, G. (1977). *Golden bats and pink pigeons*. London, Collins.
- Fox, N., Fox, B. & Bailey, T. (1985). *The predation ecology of the Mauritius kestrel Falco punctatus*. Report to ICBP, unpublished.
- Gadow, H. (1894). On the remains of some gigantic land tortoises, and of an extinct lizard, recently discovered in Mauritius. *Transactions of the Zoological Society of London*, 13, 313-324.
- Greathead, D.J. (1971). *A review of biological control in the Ethiopian Region*. Technical Communication No. 5. London, CAB Commonwealth Institute of Biological Control.
- Günther, A.C.L.G. (1873). Preliminary notice of some extinct tortoises from the island of Rodrigues and Mauritius. *Annals and Magazine of Natural History* (11) 4, 397.
- Günther, A.C.L.G. (1874). The gigantic Mascarene tortoises. *Philosophical Transactions of the Royal Society* 1874, 373-377.
- Günther, A.C.L.G. (1877). *The gigantic land tortoises (living and extinct) in the collection of the British Museum*. London, Trustees of the British Museum.
- Haddon, A.C. (1879). On the extinct land tortoises of Mauritius and Rodrigues. *Transactions of the Linnean Society of London, series 2, Zoology* 2, 155-163.
- Iverson, J.B. (1987). Tortoises, not dodos, and the tambalacoque tree. *Journal of Herpetology* 21, 229-230.
- Jones, C.J. (1987). The larger land-birds of Mauritius. In *Studies of Mascarene Island birds*, 208-300. Diamond, A.W. (Ed.). Cambridge, Cambridge University Press.
- Loveridge, A. (1942). Revision of the Afro-Oriental geckos of the genus *Phelsuma*. Bulletin of the Museum of Comparative Zoology at Harvard College 89, 437-482.
- Mannick, A.R. (1979). *Mauritius: the development of a plural society*. Nottingham, Spokesman Books.
- Mertens, R. (1962). Die Arten und Unterarten der Geckonengattung *Phelsuma*. *Senckenbergiana biologica* 43, 81-127.
- Mertens, R. (1963a). Studien über die Reptilienfauna Madagascars IV. Zwei neue Arten der Geckonengattung *Phelsuma*. *Senckenbergiana biologica* 44, 349-356.
- Mertens, R. (1963b). The geckos of the genus *Phelsuma* on Mauritius and adjacent islands. *The Mauritius Institute Bulletin* 5, 299-304.
- Mertens, R. (1966). Die nichtmadagassischen Arten und Unterarten der Geckonengattung *Phelsuma*. *Senckenbergiana biologica* 47, 85-110.
- Mertens, R. (1970). Neues über einige Taxa der geckonengattung *Phelsuma*. *Senckenbergiana biologica* 51, 1-13.

- Merton, D. (1985). *Round Island Nature Reserve, for Native Wildlife or Rabbits? A rabbit eradication proposal*. Report to ICBP, unpublished.
- Ministry of Agriculture, Fisheries and Natural Resources (1985). *White paper on objectives and policies for a national conservation strategy*. Port Louis, Mauritius, Government Printer.
- Owadally, A.W. (1981). *Annual report of the Forestry Service for the year 1980*. Mauritius, No. 27 of 1981. Port Louis, Mauritius, Government Printer.
- Pike, N. (1873). *Subtropical rambles in the land of the Aphanapteryx. Personal experiences, adventures & wanderings in and around the island of Mauritius*. London, Sampson Low, Marston, Low and Serle.
- Proctor, J. & Salm, R. (1975). *Conservation in Mauritius 1974*. Morges, Switzerland, IUCN. Cyclostyled.
- Rothschild, W. (1906). A new species of giant tortoise. *Novitates zoologicae* **13**, 753-754.
- Rothschild, W. (1915). On the gigantic land tortoises of the Seychelles and Aldabra-Madagascar group with some notes on certain forms of the Mascarene group. *Novitates zoologicae* **22**, 418-442.
- Sauzier, T. (1892). Tortue de terre gigantesque. *Nature, Paris* 1892, 395-398.
- Sauzier, T. (1893). *Les tortues de terre gigantesques des Mascareignes et des certaines autres îles de la Mer des Indes*. Paris, G. Masson.
- Scott, P. (1973). *Conservation on Mauritius*. Unpublished report to the Government of Mauritius.
- Temple, S.A. (1974a). Last chance to save Round Island. *Wildlife* **16**, 370-374.
- Temple, S.A. (1974b). Wildlife in Mauritius today. *Oryx* **12**, 584-590.
- Temple, S.A. (1977). Plant-animal mutualism: co-evolution with dodo leads to near extinction of plant. *Science* **197**, 885-886.
- Tonge, S. (1985). The management of juvenile Telfair's skinks, *Leiopisma telfairii*, with particular reference to the role of ultra-violet light. In *Reptiles: breeding, behaviour and veterinary aspects*, 61-72. Townson, S. and Lawrence, K. (Eds). London, British Herpetological Society.
- Tonge, S. (1986). Round Island boa breakthrough. *On the Edge* **51**, 3.
- Vaillant, L. (1885). Remarques complementaires sur les tortues gigantesques de Madagascar. *Compte rendu hebdomadaires des séances de l' Academie des sciences* **100**, 874-877.
- Vaillant, L. (1893). Les tortues eteintes de l île Rodrigues d' après les pieces conservés dans les galeries du Muséum. In *Centenaire de la fondation du Muséum d' Histoire, Naturelle, volume commémoratif*, 253-288. Paris, Muséum d' Histoire naturelle.
- Vaillant, L. (1899). Nouveaux documents historiques sur les tortues terrestres des Mascareignes et des Seychelles. *Bulletin du Muséum d' Histoire naturelle* **5**, 19-23.
- Vaillant, L. (1903). Les tortues de terre gigantesques. *Revue scientifique*. Paris (4) **19**, 705-715.
- Vinson, J. & Vinson, J.-M. (1969). The saurian fauna of the Mascarene Islands. *The Mauritius Institute Bulletin* **7**, 203-320.
- Vinson, J.-M. (1973). A new skink of the genus *Gongylomorphus* from Macabé forest (Mauritius). *Revue agricole et sucrière de l' Ile Maurice* **52**, 39-40.
- Vinson, J.-M. (1975). Notes on the reptiles of Round Island. *The Mauritius Institute Bulletin* **8**, 49-67.
- Wright, C. (1974). *Mauritius*. The Islands Series. Newton Abbot, David & Charles.

**Ed. note.** Wahab Owadally has been involved with wildlife conservation in Mauritius for many years. As conservator of Forests since 1969, he has taken a particular interest in the impact of introduced plant and animal species on the island's forests, which include several endemic tree species (Owadally, A.W. (1980). Some forest pests and diseases in Mauritius. *Revue agricole et sucrière de l' Ile Maurice* **59**, 76-94). He assisted Gerald Durrell and his team from JWPT in Mauritius, and is a "Ridder" of the Most Excellent Order of the Golden Ark, which he received from HRH Prince Bernhard of the Netherlands, and a recipient of the Peter Scott Award (1984). He was last in the UK in 1984 for an ITV programme "This is your life", which featured Gerald Durrell.