Endangered Species Foundation

Protecting New Zealand's rarest of the rare

Tuatara

Sphenodon punctatus

Conservation Status: Relict

Creature of myth

Tuatara in fairy prion seabird burrow, Stephens Island. DOC

Quickfacts

Often thought prehistoric, but recent research has shown it to be superbly adapted to its environment.

Secure on island homes.

Now being returned to other islands and to protected sites on the mainland as far south as Dunedin.

Primitive?

Tuatara are often described as primitive, archaic, or living fossils. But this is not all true – while tuatara have some anatomical features that are not present in many animals, modern tuatara have evolved (and continue to evolve) to fit the requirements of their environment. Scientists now know that tuatara have the ability to withstand the harsh winters of Central Otago, have complex social lives, and have a highly efficient metabolism that allows them to survive long periods of food scarcity (one is known to have survived longer than three months with no food or water). Evidence for the success of modern tuatara is the number on the islands they inhabit – there are up to 2,732 tuatara per hectare living on some islands!

Unfortunately, on islands where there are rats, the huge numbers of tuatara have either vanished, or are very rare. Because of their slow breeding rate, even small exotic predators like mice, which eat tuatara hatchlings, can eventually eliminate a tuatara population by eating all the hatchlings and the adult tuatara eventually die-out from old age. Larger predators such as rats, cats and stoats quickly eat all the tuatara on an island, and this may only take 5 years. Maori also

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TIPU MŌREAREA O AOTEAROA

ate tuatara, though this probably would have had a much smaller impact on the populations of the time than the impact of Polynesia rats that arrived in New Zealand with Maori. Luckily tuatara still live on 11 islands along the east of New Zealand between the Bay of Islands and Marlborough Sounds. Here they are safe due to advances in preventing pests arriving on islands ('island biosecurity'). There has also been amazing advances in removing pests from islands, and from within sites on mainland New Zealand. Removing pests has allowed the return of tuatara (with assistance from conservationists) to another eight islands.

Tuatara have also been returned to 5 sites on mainland New Zealand. One of these mainland sites is much further south than the others: Orokonui Ecosanctuary, on the outskirts of Dunedin, is seeking to return tuatara to an environment much cooler than where they now live. To bring tuatara to such a cold place it was important to first know whether tuatara - that all now live in warmer climates - could adapt to a place where snow is not uncommon in winter. Researchers from the nearby University of Otago under the guidance of Professor Alison Cree investigated tuatara thermal behaviour (tuatara are cold-blooded and they need to sunbathe in warm sunspots to raise their body temperature to allow their food to be digested and to speed up their ability to hunt and socialise – though they are capable of movement when their body temperature is 5 degrees), egg incubation (tuatara lay eggs, and eggs laid in cold nests hatch as females and eggs in warmer nests hatch as males) and growth rate. The results of this research were favourable and sometimes surprising – tuatara show a remarkable ability to adapt to new environments. Recently scientists sequenced the entire genome of a large adult male tuatara and found that its DNA contained links to mammals, as well as to other reptiles. It also had 50% more DNA than in a human cell, and much of it is repeated segments of DNA, with no obvious biological function.

Tuatara-like animals were present 250 million years ago, in the same era when dinosaurs roamed the earth, and they are the only remaining example of their order, the Rhyncocephalia. Tuatara are New Zealand's largest reptile, and are only very distantly related to the other lizards in New Zealand (the skinks and geckos). They are ambush predators that wait for lizards, small birds (previously including extinct wrens and quail), or large insects to walk past before lunging forward and grabbing their prey. In the past, they inhabited areas of well-drained soils, such as hills, dunes and river terraces, as far south as Southland, and some of the places would have been covered in snow during winter. The now-extinct laughing owl *Sceloglaux albifacies* (now known to be a species of *Ninox* owl, related to the still-living morepork) was their main predator, and it was only tuatara larger than 400 mm in length that were safe. Tuatara are also host to their own unique tick, *Amblyomma sphenodonti*, which is rarer than tuatara – being only present of 4 of the 11 island groups naturally occupied by tuatara.

Tuatara do have some unusual features: the teeth are actually projections of the jawbone, they have a 'crush then saw' jaw action in which prey are ground into pieces by a backwards and forwards ratchetting movement of the jaw, they have ribs

(gastralia) along their abdomen, males have no penis, and they have a vestigial third (pineal) eye on their forehead (this becomes covered in thickened scales), among many other features. There have been some incredible myths about tuatara – one is of an animal said to have survived 300 years in a kumara (sweet potato) storage pit. Nowadays, scientists believe a tuatara's lifespan is about 100 years.

What next?

Little needs to be done to ensure the survival of tuatara. The main task required is preventing rats arriving on islands by restricting access to the most important of the islands and rigid biosecurity tests for those who do gain permission to visit.

As tuatara are fairly secure, they are an ideal subject for community projects seeking to restore islands (and in some cases, mainland sites). Approval is needed from the Department of Conservation to catch or move any tuatara (and any native New Zealand lizard).

More information

Article: Tuatara enigma unravelled. By Jamie Morton. New Zealand Herald, 9 August 2016. Link

Scientific paper: Tuatara (*Sphenodon punctatus*) predation on landbirds (Aves: Passeriformes and Galliformes). By Colin M. Miskelly. Notornis, Vol. 62, pages 38-40. 2015.

Scientific paper: Distance-dependent patterns of molecular divergences in tuatara mitogenomes. By Sankar Subramanian, Elmira Mohandesan, Craig D. Millar & David M. Lambert. Scientific Reports, Vol. 5, pages 1-5. 2015.

Book: Tuatara; biology and conservation of a venerable survivor. By Alison Cree. Canterbury University Press. 2014.

Scientific paper: Distribution and phylogenetic analyses of an endangered tick, *Amblyomma sphenodonti*. By Hilary C. Miller, Ailis M. Conrad, Stephen C. Barker & Charles H. Daugherty. New Zealand Journal of Zoology. Vol. 34, pages 97-105. 2007.

Book: The lost world of the moa. By Trevor H. Worthy and Richard N. Holdaway. Indiana University press, Bloomington. 2002.

Article: Tuatara – a survivor from the dinosaur age. By Charles Daugherty and Alison Cree. New Zealand Geographic, Issue 006. 1990.

Photos

X-ray of live tuatara. Animal on left shows eggs. DOC

Measuring tuatara, Poor Knights. DOC

Tutara with identifying beads atttached to neck crest. Alan Cressler

Tuatara breeding facility, Little Barrier Island/Te Hauturo-o-Toi. DOC

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