CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

Twenty-eighth meeting of the Animals Committee
Tel Aviv (Israel), 30 August-3 September 2015

Interpretation and implementation of the Convention

Species trade and conservation

Periodic Review of species included in Appendices I and II [Resolution Conf. 14.8 (Rev. CoP16)]

PERIODIC REVIEW OF *SPHENODON* SPP.

1. This document has been submitted by New Zealand.[1]

2. After the 27th meeting of the Animals Committee (Veracruz, April 2014) and in response to a request from the CITES Secretariat dated 13 May 2015, New Zealand committed to the evaluation of *Sphenodon* spp. as part of the Periodic review of the species included in the CITES Appendices.

3. The genus *Sphenodon*, and order Rhynchocephalia, is endemic to New Zealand and does not occur elsewhere in the wild.

[1] *The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat (or the United Nations Environment Programme) concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.*

DRAFT PROPOSAL TO AMEND THE APPENDICES
(in accordance with Annex 6 to Resolution Conf. 9.24 (Rev. CoP16), as amended)

Seventeenth meeting of the Conference of the Parties

Johannesburg (South Africa), 23 September --- 7 October 2016

---DRAFT---

CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

A. Proposal

To retain *Sphenodon spp.* (Tuatara) in CITES Appendix I.

The genus *Sphenodon* is listed on Appendix I of CITES. The taxonomy of *Sphenodon* has changed over time with two extant species, *Sphenodon guntheri* and *Sphenodon punctatus*, briefly recognised. Recent genetic research indicates that the genus *Sphenodon* comprises a single species, *Sphenodon punctatus,* with important geographical variations (Hay *et al.* 2009).

The order Rhynchocephalia, including the genus *Sphenodon,* is endemic to New Zealand. It is actively managed for conservation and highly regulated by domestic measures. It is not affected by national or international trade – partly because of its current Appendix I listing. Conservation recovery efforts are ongoing and showing signs of progress.

Sphenodon spp. meets the biological criteria for listing in Appendix I as given in Annex 1 established in Resolution Conf. 9.24 (Rev.CoP16). We recommend retention of the genus *Sphenodon spp*. in Appendix I.

B. Proponent

Switzerland, as the Depositary Government, on behalf of the Animals Committee (prepared by New Zealand) [*].

C. Supporting statement

1. Taxonomy

1.1 Class: Reptilia

1.2 Order: Rhynchocephalia

1.3 Family: Sphenodontidae

1.4 Genus, species or subspecies, including author and year: *Sphenodon punctatus* (Gray 1842). *Sphenodon guntheri* (Buller 1877) was briefly considered a separate species in the 1870s and 1990s.

1.5 *Sphenodon punctatus*

Under the New Zealand Threat Classification System, tuatara is classified as a single species, *S. punctatus*, and is assessed as At Risk, Relict (Hitchmough et al. 2013).

The IUCN Red List records *S. punctatus* as one of two extant species of tuatara. It status is recorded as Lowest Risk/least concern (needs updating). (Australasian Reptile

[*] *The geographical designations employed in this document do not imply the expression of any opinion whatsoever on the part of the CITES Secretariat (or the United Nations Environment Programme) concerning the legal status of any country, territory, or area, or concerning the delimitation of its frontiers or boundaries. The responsibility for the contents of the document rests exclusively with its author.*

& Amphibian Specialist Group 1996). *S. punctatus* is also listed as one of two extant species of tuatara on the checklist of CITES Species 2015.

Sphenodon guntheri is recorded as a distinct extant species from *S. punctatus* on the checklist of CITES Species 2015 and on the IUCN Red List where it status is listed as Vulnerable (needs updating) (Australasian Reptile & Amphibian Specialist Group 1996).

1.6 Scientific synonyms: None

1.7 Common names: (*Sphenodon punctatus)*

English:	Cook Strait Tuatara
French:	Hatteria ponctué, Sphénodon ponctué
Spanish:	Tuátara

(*Sphenodon guntheri)*

English:	Brother Island's Tuatara
French:	Hatteria de Günther, Sphénodon de Günther
Spanish:	None

1.8 Code numbers: None

2. Overview

Tuatara (*Sphenodon spp.*) are the only living members of the reptile order Rhynchocephalia and extant populations are now restricted to islands around New Zealand and some fenced sanctuaries onshore that are free of introduced mammalian pests.

Sphenodon punctatus has been listed in Appendix I of CITES since 1975. At CoP 9 in 1994 it was agreed to list the genus *Sphenodon* on Appendix I of CITES as, at the time, it was thought that additional species of *Sphenodon* existed (CoP9 Prop. 50).

The taxonomy of *Sphenodon* spp. is complex. The order Rhynchocephalia was originally regarded as comprising a single species, *Sphenodon punctatus*. In the 1990s the genus was briefly differentiated into two species: *S. punctatus and S. guntheri*. In 2009 DNA research confirmed Rhynchocephalia has a single species, *S. punctatus* with important geographical differences (Hay *et al.* 2009).

Only one species, *S. punctatus,* is recognised in New Zealand. It is protected under New Zealand's Wildlife Act 1953 and has been absolutely protected since 1907.

Today tuatara occupy a very small extent of their former geographic range and are found on 41 offshore islands and a few fenced sanctuaries onshore in New Zealand (Gaze 2001). Some tuatara are held in captivity in zoological gardens in New Zealand and overseas.

Sphenodon spp. has been subject to a huge decline in numbers and range due largely to predation by introduced mammalian predators. Populations are now increasing following active conservation management - primarily the eradication of introduced mammalian on offshore islands. Advances in captive incubation and head-starting have also allowed populations to be re-introduced to additional mammalian predator-free offshore and fenced sanctuaries onshore.

The occurrence of *Sphenodon spp.* in international trade, beyond the scientific exchange of specimens or captive-bred specimens for zoo purposes, is decreasing. There has been confirmed poaching and smuggling in the past with high prices received for specimens smuggled overseas. Suspected illegal trade is now significantly lower, although there is evidence of buyer interest if tuatara were available.

Sphenodon spp. is highly regulated by domestic measures, including the regulation of importation and exportation of specimens from New Zealand.

Sphenodon spp. meets the biological criteria for CITES Appendix I. Under Resolution Conf. 9.24 (Rev. CoP 16), Annex 1,

a) The wild population is small, and is characterized by:

   i. each subpopulation is very small; and

   ii. having a high vulnerability to either intrinsic or extrinsic factors.

b) The wild population has a restricted area of distribution and is characterized by:

   i. fragmentation or occurrence at very few locations (50% of the population found on one small island);

c) A marked decrease in the population size in the wild, which has been:

   i. observed as ongoing or as having occurred in the past (but with a potential to resume).

Therefore, we recommend the retention of *Sphenodon spp.* in Appendix I.

3. Species characteristics

3.1 Distribution

Sphenodon spp. once lived throughout the mainland of New Zealand. After human settlement, they survived in the wild on only about 32 offshore islands, ranging in size from 0.4–3100 ha, in the Cook Strait and to the east of the North Island from Bay of Plenty to Northland; about 0.5% of their former range (Cree 2014; Cree & Butler 1993; Gaze 2001).

3.2 Habitat

Sphenodon spp. exists on islands that are free of rodents and other introduced mammalian predators. These islands are usually occupied by breeding seabird colonies, increasing the fertility and invertebrate and lizard fauna richness required by tuatara as food (Cree 2014; Gaze 2001;) however there is some geographic variation in size. Tuatara live in open coastal forest or scrub with friable soil which tuatara require for digging their burrows. They have been known to share their burrows with seabirds such as shearwaters and fairy prions. Tuatara are active at night, particularly in warm wet conditions, and require open sunny areas to bask in during the day (ibid).

3.3 Biological characteristics

3.3.1 Reproduction

Sphenodon spp. reach reproductive maturity at about 15 years, and may breed for many decades (Cree 2014; Daugherty and Keall 2012). Males become sexually mature when they reach a snout-vent length of about 180 mm, and females at about 170 mm (Gaze 2001). In late summer, territorial males display to ward off intruders and to attract females and mating occurs (ibid).

Nesting frequency and clutch size vary among islands (Cree 2014; Gaze 2001). On Stephens Island or Takapourewa (the best-studied population), a clutch of 1-19 eggs is laid on average every two to seven years in spring (Daugherty and Keall 2012, Gaze 2001). The eggs take 11–16 months to hatch and may be destroyed by other burrowing females, desiccation or predation. Hatching success is about 42% (Gaze 2001).

Sex is determined by soil temperature at a particular stage of incubation; males are produced at high soil temperatures and females at low temperatures. The tipping point, where sex ratio of offspring is equal is generally in the range of 21.6-22.5°C with a transitional range of temperatures of ± 1.1-1.5°C where both sexes are produced, but beyond those limits, just one sex is produced (Mitchell *et al.* 2008; Mitchell *et al*. 2006).

3.3.2 Mortality

Sphenodon spp. have one of the slowest growth rates of any reptile, and they keep growing until they are about 35 years old. A tuatara's average life span is about 60 years but they probably live up to 100 years (Cree 2014; DOC website 28/05/2015).

Rats have been inferred as a major cause of mortality for *Sphenodon* spp. mortality, but have now been eradicated from all but one of the islands where tuatara occur. Norway, ship and Pacific rats are thought capable of preying on young tuatara and eggs. Several populations of tuatara have shown a marked increase in recruitment once Pacific rats were removed (Cree 2014; Towns *et al*. 2007).Other mammalian predators would also be a factor if the opportunity arose. Birds including the Swamp Harrier and New Zealand Falcon also prey on tuatara of all ages (Gaze 2001).

3.3.3 Diet

The diet of *Sphenodon* spp. is mainly made up of invertebrates such as beetles, wëtä, worms, millipedes and spiders, and the remainder is made up of lizards, frogs, seabird eggs and chicks. On occasion they will also eat their own young (Cree 2014; DOC website 28/05/2015).

3.4 Morphological characteristics

Sphenodon spp. are New Zealand's largest reptile, with adult males measuring up to about 600 mm in length and weighing between 300g and 1kg (females are somewhat smaller; Cree 2014). A distinctive crest of spines runs along the neck and back of males. Their colour of tuatara ranges from olive green to brown to orange-red, although the colour can change over their lifetime. Their skin is shed once per year (DOC website 28/05/2015).

3.5 Role of the species in its ecosystem

Tuatara is a nocturnal and diurnal feeder on invertebrates, lizards and seabird eggs and chicks.

4. Status and trends

Under the New Zealand Threat Classification System tuatara is classified as a single species, *S. punctatus,* and is assessed as At Risk, Relict (Hitchmough *et al*. 2013). It is noted as conservation dependent with a restricted range. This classification includes taxa that have undergone a documented decline within the last 1,000 years and now occupy < 10% of their former range and have > 20,000 mature individuals with a population which is stable or increasing at > 10%.

Two species of *Sphenodon* are listed on the IUCN Red List. *S. guntheri* is assessed as Vulnerable and *S. punctatus* is assessed as Lowest Risk/least concern (Australasian Reptile & Amphibian Specialist Group 1996). Both entries are noted as needing updating.

4.1 Habitat trends

Sphenodon spp. once lived throughout the mainland of New Zealand but survived in the wild only on a few dozen predator-free offshore islands that remained free of introduced mammals. The number of islands from which introduced mammalian have been eradicated has increased over the last two decades as suitable predator-free habitat has increased. Offshore islands remain at risk from the reintroduction or reinvasion of rats and other predators as well as chance events such as storms and fires.

Tuatara have been successfully introduced into a small number of recently established mainland sanctuaries surrounded by predator-proof fences (Cree 2014).

4.2 Population size

The total number of tuatara is difficult to quantify as island populations are not often surveyed. The population is estimated at around 50,000 – 100,000 (Daugherty and Keall 2012). Populations are now found on around 40 offshore islands and a small number of mainland sanctuaries.

About half the *Sphenodon* spp. population lives on Takapourewa/Stephens Island in the Cook Strait of New Zealand with densities of up to 2,500 per hectare and a total population of 30,000 – 50,000 (Cree 2014; Daugherty and Keall 2012).

The rest are located on other islands in the Marlborough Sounds, the Hauraki Gulf and off Northland, the Coromandel Peninsula and the Bay of Plenty. Most of these islands are small with tuatara population sizes in the tens to low thousands (Cree 2014; Gaze 2001).

In addition to these wild populations, tuatara in the low hundreds are kept in captivity – around 350 in New Zealand scientific institutions and zoological gardens (Cree 2014). Most are kept for scientific or educational purposes with some being reared for release back into the wild.

4.3 Population structure

One tuatara population has a very skewed sex ratio with many more males than females. This is apparently because these tuatara nest on sunny, north-facing slopes and are not able to lay their eggs in the shade. Rising temperatures associated with global climate change could make such skewed sex ratios more pronounced or common - threatening the viability of local populations (Mitchell *et al* 2008).

4.4 Population trends

Sphenodon spp. once lived throughout the mainland of New Zealand but were restricted to a few offshore islands after human settlement. A few populations continued to declining up until the end of the 20th century due to the presence of rats. During the last fifteen years the threat of predation and competition by rats has been reduced following advances in island predator eradication and the establishment of additional offshore and mainland island populations.

Advances in captive breeding and translocation have enabled new populations to be established and the range of the species to be extended. Examples over the last decade include:

2005: First mainland release in Zealandia Sanctuary, Wellington, North Island

2008: First evidence of tuatara successfully breeding on the mainland in over 200 years

2010: First evidence of tuatara hatching on Matiu/Somes Island since being transferred in 1998

2012: Over 200 tuatara transported to predator-free locations on the mainland near Gisborne and near Hamilton

2012: 60 tuatara translocated to Orokonui Ecosanctuary near Dunedin – the first time tuatara have existed in a location free of introduced mammals in the South Island in over a century

2015: About 200-300 captive-bred tuatara have been released on Te Hauturu-o-Toi/Little Barrier Island since it was declared pest free in 2006, having been bred and reared in captivity from eight survivors discovered in 1991.

4.5 Geographic trends

Recent DNA research of *Sphenodon* populations concluded that the tuatara is a single species, *S. punctatus,* with distinct geographical variants (Hay *et al.* 2009). Two genetic stocks are recognised:

- The previously named subspecies *S. punctatus punctatus (*Northern tuatara) is now recognised as being composed of populations present on New Zealand offshore islands from 35ºS to the Bay of Plenty (38ºS) (Cree 2014).

- The Cook Strait tuatara (an unnamed subspecies of *S. punctatus*) present on islands from 40ºS to 41ºS including Takapourewa/Stephens Island, North Brother Island and the Trio Islands in the Marlborough Sounds of New Zealand (Cree 2014, Gaze 2001).

In the 1990s it had been thought that a small population of fewer than 300 adults on the 4-hectare North Brother Island in Cook Strait of New Zealand represented a distinct species - *S. guntheri.* This

is no longer recognised as a separate species but is probably an inbred population of *S. punctatus* 'Cook Strait' (Cree 2014).

5. Threats

The major threat to *Sphenodon* spp. is the introduction of mammalian predators, especially rats. Because tuatara survive mainly on offshore islands, they are very vulnerable to changes in the islands' habitat (such as fires) and to the loss of genetic diversity within their small, isolated island populations.

5.1 Predation

The main cause of the decline of *Sphenodon* spp. was due the introduction of mammalian predators to New Zealand and the loss of predator-free habitat. Rats are considered the most serious threat to the survival of tuatara. Kiore or Pacific rats (*Rattus exulans*) were bought to New Zealand by Polynesian explorers and settlers about AD 1250–1300. Norway and ship rats arrived with European explorers and settlers. All three species of rat are thought capable of taking eggs as well as small tuatara and compete for invertebrate food. Norway rats also prey on adults. Predation of tuatara led to their extinction on the mainland, and on all offshore islands with Norway or ship rats; however small populations persisted in the presence of Pacific rats though with evidence for recruitment failure on most (Cree 2014; Towns *et al*. 2007).

Birds including the Swamp Harrier and the New Zealand falcon prey on tuatara of all ages (Gaze 2001). It is probable that mice would also have some effect on tuatara survival.

5.2 Genetic isolation

The low genetic diversity of *Sphenodon* spp. is a threat to survival of at least some populations. Tuatara generally do not disperse more than 20 metres from their burrows and cannot cross even small channels between islands. This low genetic diversity is predicted to reduce the ability of *Sphenodon* spp. to cope with future environmental change e.g. future climate change. (DOC website http://www.doc.govt.nz/nature/native-animals/reptiles-and-frogs/tuatara/ accessed 28 May 2015). It also affects *Sphenodon* spp. vulnerability to new pathogens, limits reproductive success and viability of newly established populations.

5.3 Climate Change

Climate change could threaten *Sphenodon* spp. (Cree 2014; Mitchell *et al*. 2008). Tuatara are sensitive to temperature and one population has been found to have a very skewed sex ratio. A rise in temperature could accelerate the decline in the proportion of female tuatara and cause local extirpation or even extinction if not actively managed.

Other factors associated with climate change which may affect the survival of tuatara in the future such as rising sea levels and increased coastal erosion (reducing the available habitat on small islands) as well as changing patterns of rainfall and drought are discussed by Cree (2014).

Translocating individuals to areas where there is habitat variability for nesting and to cooler southern latitudes such as the Orokonui Ecosanctuary in Dunedin, is an important mitigation strategy to address climate change impacts.

6. Utilization and trade

6.1 National utilization

Sphenodon punctatus is absolutely protected under New Zealand's Wildlife Act 1953. Under the Wildlife Act no-one may kill or possess such animals unless they have a permit from the Department of Conservation. There is no national utilization other than for permitted scientific or conservation purposes (see 8.3.2).

6.2 Legal trade

Sphenodon spp. have been exported from New Zealand since at least the 1870s with hundreds shipped to museums and private collectors. More recent history includes infrequent domestic and international transfers, with around 30 individuals estimated to be held in captivity (at scientific institutions or zoological gardens) overseas (Cree 2014).

There have been 46 reported instances of legal international trade in *Sphenodon* spp. in records dating from 1975 to 2013 (UNEP-WCMC CITES trade database, accessed 29 May 2015). The UNEP-WCMC database reports:

- exports of 101 live specimens from New Zealand to Australia, Canada, Germany, Hungary and the United Kingdom between 1978 and 1999. Since the late 1980s most of those exported have been noted as captive-bred.

- exports of 7 eggs from New Zealand to Australia in 1998;

- other exports from New Zealand of dead specimens (bodies or bone) for scientific purposes;

- and the export of 1 live specimen from the Netherlands to Spain in 1985 and 20 from Australia to New Zealand in 1987. There has also been other international trade in dead specimens, including blood or DNA samples, for scientific purposes.

6.3 Parts and derivatives in trade

There is no evidence of parts and derivatives of *Sphenodon* spp. in trade apart from the exchange of blood samples, bodies and bones for scientific purposes.

6.4 Illegal trade

Poaching has diminished in recent years. This is attributed to ongoing successful enforcement activities, current strong domestic and international legal protection and because other New Zealand reptiles are more readily poached and sought by overseas collectors. Conversely, as tuatara are translocated to more accessible island locations, the risk of poaching increases.

From time to time, most recently in 2012, informants suggest that tuatara are being smuggled out of New Zealand. No recent evidence has been found to support these allegations. The last conviction related to illegal tuatara trading was in 1992. The offender was sentenced to 1 year and 11 months imprisonment for attempting to unlawfully export tuatara. Overseas contacts suggest that difficulties in breeding tuatara in captivity make them less attractive to illegal traders and that the CITES Appendix I listing is also an effective deterrent. However, internet activity highlights that overseas interest in tuatara still exists and buyers would step forward if tuatara were available.

6.5 Actual or potential trade impacts

There is no current information about trade impacts on *Sphenodon* spp. Many specimens legally exported since the 1990s have been captive-bred (UNEP-WCMC, accessed 29 May 2015). Any removal of individuals from small populations could further decrease genetic diversity and make them more vulnerable to environmental change.

7. Legal instruments

7.1 National

Tuatara are absolutely protected under the Wildlife Act 1953. No-one may kill or possess an animal unless they have a permit from the Department of Conservation (DOC). Permits for captive management are only issued when there is a clear benefit for the species involved. Applicants have to prove that they are experienced and able to provide appropriate captive conditions.

Legal protection of *Sphenodon punctatus* was first enacted in 1895 when the species was added to the native game list on the Fourth Schedule of the Animals Protection Act 1880 thereby excluding it from hunting (Miskelly 2014). In 1898 absolute protection of tuatara and their eggs was claimed under the Animals Protection Act 1880 Amendment Act 1886 but legislative deficiencies meant legal protection was not fully enacted until the Animals Protection Act was introduced in 1907 (ibid).

Sentences for illegal wildlife trading were increased in 2012 in a bid to deter wildlife poachers. The maximum penalty for smuggling the likes of tuatara increased from six months' jail or a $100,000 fine, to up to five years' jail and $300,000.

7.2 International

Sphenodon punctatus was listed in Appendix I of CITES in 1975. At CoP 9 in 1994, the entire genus of *Sphenodon* was listed on Appendix I of CITES following taxonomic developments which differentiated the genus into two species (*S. punctatus and S. guntheri*) as well as unnamed subspecies (CoP9 Prop. 50).

8. Species management

8.1 Management measures

Committed action by conservationists, scientists, iwi and volunteers and active conservation management since the 1980s has reversed the decline of tuatara in recent years. An expert working group has been established for tuatara recovery comprising people with knowledge of the ecology and management needs of the species. Two recovery plans have been produced: Cree & Butler (1993) and Gaze (2001) although the most recent plan is now out of date.

The long-term management objective of the most recent plan is to maintain the genetic diversity of tuatara by establishing wild populations throughout their pre-human range as part of a healthy ecosystem (Gaze 2001). Conservation management is primarily by islands than by species and has four foci:

- Success in eradicating mammalian pests – particularly rodents - from offshore islands;
- Advances in egg incubation allowing eggs to be collected from the wild and incubated in laboratories;
- Rearing in captivity whereby tuatara are hatched and kept in captivity until they are large enough to be released onto offshore islands;
- Translocating tuatara to predator-free offshore and mainland islands to restore or establish populations, or to extend the range in which tuatara are found.

Future work will focus on maintaining the pest-free status of suitable habitats and further breeding and translocation programmes and restoring tuatara as part of healthy ecosystems.

8.2 Population monitoring

Population counts on the various islands on which tuatara around found are conducted infrequently by New Zealand's Department of Conservation or universities, but the continued pest-free status of the islands is monitored regularly.

8.3 Control measures

8.3.1 International

Tuatara are held in seven overseas zoos (Cree, 2014).

In addition to controls under CITES, an export permit is required under New Zealand's Wildlife Act 1953 to export tuatara from New Zealand. The export permit stipulates that tuatara remain the property of the Crown, New Zealand and cannot be transferred to a third party.

We are not aware of any additional international control measures.

8.3.2 Domestic

S. punctatus are absolutely protected under the Wildlife Act 1953. Under the Wildlife Act no-one may kill or possess such animals unless they have a permit from the Department of Conservation. Permits are needed for the following activities:

- catching, handling and releasing wildlife at one site

- holding wildlife in captivity
- disturbing or killing wildlife or their eggs
- exporting live/dead wildlife
- catching and/or holding wildlife for rehabilitation
- holding dead specimen (e.g. any part of the wildlife)
- transferring captive wildlife from one facility to another
- catching protected wildlife in order to hold them in captivity
- releasing captive wildlife into the wild
- catching wildlife in the wild and moving them to another wild location into which they are released.

All holders of tuatara in captivity must comply with the Tuatara Captive Management Plan and Husbandry manual (Blanchard *et al*. 2002).

8.4 Captive breeding and artificial propagation

Under New Zealand's Wildlife Act 1953, permits are required for captive management and are issued only when there is a clear benefit to the species. Applicants have to prove that they are experienced and able to provide appropriate captive conditions. Permitting considerations in the management of captive tuatara are described in Blanchard *et al.* (2002).

Captive breeding of tuatara has been attempted with varying degrees of success since 1885 (Cree, 2014). During the 1980s and 1990s biologists' understanding of successful breeding factors increased and captive management strategies similarly increased. Captive-bred specimens have contributed to the establishment of four new island populations and have supplemented other small populations. Captive-bred specimens also provide opportunities for the public to see and learn about tuatara.

A fungus associated with skin lesions, not previously identified in New Zealand, has been discovered in captive populations held in two NZ institutions. Its origins and distribution are unknown as is whether its presence will affect the release of captive-bred specimens to the wild. This is the focus of current disease investigation and research efforts.

In 2010, approximately 350 individuals were estimated to be held in captivity in around 20 institutions, including zoos, sanctuaries and universities in New Zealand (ibid).

8.6 Safeguards

Regardless of any classification under CITES, the genus will continue to be regulated by New Zealand's Wildlife Act 1953. The lead agency for actions regarding this species is the New Zealand Department of Conservation.

9. Information on similar species

Sphenodon punctatus is the sole living member of the reptile order Rhynchocephalia and is endemic to New Zealand. There are no similar species or genera in existence.

10. Consultations

Tuatara biologists and conservations as well as wildlife crime experts were consulted in the course of undertaking this periodic review and proposal. The proposal was reviewed by Associate Professor Alison Cree, University of Otago; Simon Eyre, Wellington Zoo; Associate Professor Nicola Nelson, Victoria University of Wellington; Don Newman; Rod Hitchmough, Department of Conservation.

11. Additional remarks

Cree (2014) wrote an authoritative work on tuatara "*Tuatara: Biology and conservation of a venerable survivor*". This provides a comprehensive and current account of tuatara and has been a valuable resource in undertaking this periodic review.

12. References

Australasian Reptile & Amphibian Specialist Group 1996. *Sphenodon guntheri*. The IUCN Red List of Threatened Species. Version 2014.3. <www.iucnredlist.org>. Downloaded on 13 May 2015.

Blanchard, B. and the Tuatara Recovery Group 2002: Tuatara Captive Management Plan. Department of Conservation, Wellington. http://www.doc.govt.nz/documents/science-and-technical/tsop21.pdf

Cree, A. 2014: Tuatara: Biology and conservation of a venerable survivor. Canterbury University Press.

Cree, A. & Butler, D. 1993: Tuatara Recovery Plan (*Sphenodon* spp.). Threatened Species Recovery Plan No. 9. Department Of Conservation. http://www.doc.govt.nz/Documents/science-and-technical/TSRP09.pdf

Daugherty, C. and Keall, S. 'Tuatara - Life history', Te Ara - the Encyclopedia of New Zealand, updated 13-Jul-12 http://www.teara.govt.nz/en/tuatara/page-1

Department of Conservation http://www.doc.govt.nz/Documents/about-doc/concessions-and-permits/conservation-revealed/tuatara-lowres.pdf

Gaze, P. 2001: Tuatara Recovery Plan 2001-2011. Threatened Species Recovery Plan 47. Department Of Conservation. http://www.doc.govt.nz/documents/science-and-technical/TSRP47.pdf

Hay, J.M.; Sarre, S.D.; Lambert D.M.; Allendorf, F.W.; Daugherty, C.H. 2010: Genetic diversity and taxonomy: a reassessment of species designation in tuatara (Sphenodon: Reptilia). *Conservation Genetics*, 11 (3), 1063–1081. Published online: 3 July 2009. doi:10.1007/s10592-009-9952-7

Hitchmough, R.; Anderson, P.; Barr, B.; Monks, J.; Lettink, M.; Reardon, J.; Tocher, M.; Whitaker, T. 2013:Conservation status of New Zealand reptiles, 2012. *New Zealand Threat Classification Series 2*. Department of Conservation, Wellington. 16 p. (PDF, 650K (opens in new window)) Supplemental data (XLSX, 39K (opens in new window))

Miller, K. 2012: Securing the Demographic and Genetic Future of Tuatara through Assisted Colonization. *Conservation Biology* Volume 26, No. 5. http://faculty.gvsu.edu/moorejen/Miller2012_ConBio.pdf

Miskelly, M. 2014: Legal protection of New Zealand's indigenous terrestrial fauna – an historical review. *Tuhinga 25: 25–101* https://www.tepapa.govt.nz/SiteCollectionDocuments/Tuhinga/Tuhinga-25-Article-3-Legal-protection-of-New-Zealands-indigenous-terrerstrial-fauna-an-historical-review.pdf

Mitchell, N.; Kearney, M.; Nelson, N.; Porter, W. 2008. Predicting the fate of a living fossil: how will global warming affect sex determination and hatching phenology in tuatara. *Proc Royal Soc B* 275: 2185-2193. http://dx.doi.org/10.1098%2Frspb.2008.0438

Mitchell, N.; Nelson N.; Cree A,; Pledger S,; Keall S.; Daugherty C. 2006. Support for a unique pattern of temperature-dependent sex determination in archaic reptiles: evidence from two species of tuatara (*Sphenodon*). *Frontiers of Zoology*.3: 9. http://www.frontiersinzoology.com/content/3/1/9

New Zealand Government 1994: CoP9 Prop. 50 Amendments to Appendices I and II of the Convention, Other Proposals. http://www.cites.org/sites/default/files/eng/cop/09/prop/E09-Prop-50_Sphenodon.PDF

Towns, D.; Parrish, G.; Tyrrell, C.; Ussher, G.; Cree, A.; Newman, D.; Whitaker, A.; Westbrooke, I. 2007: Responses of Tuatara (*Sphenodon punctatus*) to Removal of Introduced Pacific Rats from Islands. Conservation Biology, Volume 21, Issue 4, pages 1021–1031. http://onlinelibrary.wiley.com/doi/10.1111/j.1523-1739.2007.00742.x/full