

DEPARTMENT OF AGRICULTURE, WATER AND THE ENVIRONMENT

MS20-001592

To: Minister for the Environment (For Decision)

INSTRUMENT TO AMEND THE LIST OF SPECIMENS SUITABLE FOR LIVE IMPORT UNDER SECTION 303EC OF THE *ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999* (THE LIVE IMPORT LIST) TO INCLUDE *OTOCYON MEGALOTIS* (BAT-EARED FOX)

Timing: Decision about whether to make the instrument is required within 30 business days of the Minister receiving the Report (section 303EG of the EPBC Act).

Recommendations:

1. That, having considered the report (**Attachment B**), prepared in accordance with paragraph 303EC(5)(a) of the EPBC Act, you decide to add *Otocyon megalotis* (Bat-eared Fox) to Part 2 of the Live Import List.

Agreed / Not agreed

2. That you give effect to your decision by signing the Legislative Instrument at **Attachment C**.

Signed / Not signed

3. That you approve the Explanatory Statement, with a Statement of Compatibility with Human Rights, for the Instrument at **Attachment D**.

Approved / Not approved

Minister:

Date:

Comments:

Clearing Officer: Sent: 23/03/2021	Elyse Herrald-Woods	A/g Chief Environmental Biosecurity Officer	Ph: s. 47F(1) Mob: s. 47F(1)
Contact Officer:	s. 22(1)(a)(ii)	Listings and Threat Abatement	Ph: s. 22(1)(a)(ii) Mob: s. 22(1)(a)(ii)

Key Points:

1. This brief seeks your decision to amend the '*List of Specimens Taken to be Suitable for Live Import (29/11/2001)*' (Live Import List) made under section 303EB of the *Environment Protection and Biodiversity Conservation Act 1999* (the Act) to include *Otocyon megalotis* (Bat-eared Fox).

2. Under subsection 303EC(1) of the Act, you may amend the Live Import List by including or deleting items, as well as varying or revoking restrictions or conditions to which the inclusion of a specimen in Part 2 of the Live Import List is subject. This power is exercisable by you personally and has not been delegated.
3. In May 2020, Darling Downs Zoo made an application to include *Otocyon megalotis* (Bat-eared Fox) on the Live Import List for public display and education purposes (**Attachment A**).
4. The department has made an assessment of the potential impacts on the environment of listing of the Bat-eared Fox as required under paragraph 303EE(3)(b) of the Act. The department has prepared a report on those impacts in accordance with section 303EF of the Act (**Attachment B**), finding:
 - a. the species has a moderate risk of establishing in Australia if released,
 - b. a moderate risk of becoming a pest if it were to establish, and
 - c. the species poses a low risk to native wildlife, livestock and the public.
5. The department concludes that any risks of the species establishing a feral population and impacting on the environment would be adequately mitigated by limiting import of this species for exhibition purposes only.
6. For the reasons set out in the Report at **Attachment B**, the department recommends that *Otocyon megalotis* (Bat-eared Fox) be included in Part 2 of the Live Import List with the following condition: **Import for the purposes of exhibition only**.
7. The Legislative Instrument necessary to make the recommended changes is at **Attachment C** for your signature. The instrument is disallowable. The associated Explanatory Statement, including a Statement of Compatibility with Human Rights, is at **Attachment D**.

Sensitivities and Handling: Nil

Consultation: YES

8. In accordance with paragraph 303EF(2)(b) the department published the applicant's draft assessment report for public comment between 7 July to 28 August 2020. In addition, consultation was undertaken with the relevant states and territories between 7 July to 28 August 2020.
9. The NSW Government and one non-government organisations responded (**Attachment E**):
 - a. The NSW Government did not support the amendment as the species is listed as of "least concern" for conservation purposes by IUCN and 'therefore there is no justification for import to support international conservation efforts'. They were also concerned that the species may act as a vector for disease and advise that it is classed as 'prohibited dealings' under the NSW *Biosecurity Act 2015*.

- b. The Animal Justice Party did not support the listing on the grounds the species is not conservation breeding dependent and was concerned with animal welfare; especially the concern that these animals will be kept in small cages with reduced opportunities for social interaction.
10. Comment and clarification was also sought in September 2020 from the Zoo and Aquarium Association Australasia (ZAA) who confirmed that the Bat-eared Fox is not a priority species for conservation breeding.
11. The department's report at **Attachment B** was circulated with relevant state and territory government agencies for comment between 20 October to 9 November 2020 but no additional responses were received.

Attachments:

- A:** Applicant's assessment report
- B:** Report prepared in accordance with section 303EC (5)(a) of the Act
- C:** Legislative Instrument
- D:** Explanatory Statement
- E:** Comments received

Attachment A

Draft Terms of Reference – Bat-eared Fox**• 1. Provide information on the taxonomy of the species**

Kingdom: Animalia

Phylum: Chordata

Class: Mammalia (mammals)

Order: Carnivora (Carnivores)

Suborder: Caniformia (dogs, bears, mustelids, procyonids, and pinnipeds)

Family: Canidae (dogs)

Genus: *Otocyon*

Species: *megalotis*

Synonyms: *Canis megalotis* Desmarest 1822; *Canis lalandii* Desmoulins 1823; *Otocyon caffer* Mueller 1836; *Agriodius auritus* Smith 1840; *Otocyon virgatus* Miller 1909; *Otocyon canescens* Cabrera 1910; *Otocyon steinhardti* Zukowsky 1924.^{1,2}

None of these synonyms are in current use, other than *Otocyon virgatus* and *Otocyon canescens* being retained as subspecies (*Otocyon megalotis virgatus* and *Otocyon megalotis canescens* respectively).

Common name: Bat-eared Fox

Alternative common names: none in general use, although Clark Jr. (2005) notes the alternative names of Big-eared Fox, Black-eared Fox, Delalande's Fox, and Cape Fox.³ Note that Cape Fox is the common name for a true fox from South Africa, *Vulpes chama*.

Scientific binomen: The Bat-eared Fox was first described by Desmarest in 1822, under the name *Canis megalotis*. The genus *Otocyon* was erected by Mueller in 1836.^{4,5}

Subspecies: Two or three subspecies are recognised. The nominate *Otocyon megalotis megalotis* is found in southern Africa (this subspecies includes the synonyms *auritus*, *caffer*, *lalandii* and *steinhardti*). The second subspecies is *Otocyon megalotis virgatus* of eastern Africa. Some authors separate a third subspecies, *Otocyon megalotis canescens* of Ethiopia and Somalia, although this is normally included within *Otocyon megalotis virgatus*.^{6,7}

The majority of Bat-eared Foxes kept in zoos are treated as being "non-subspecific", probably due to most founder stock being of unknown origin. ZIMS has additional listings of the nominate subspecies, mostly from within range countries, although these are few in comparison to "unknown" animals.⁸

¹ Wilson, D.E., and D.M. Reeder (eds) (2005) "*Mammal Species of the World: a taxonomic and geographic reference*" (3rd edition), John Hopkins University Press

² Clark Jr., H. O. (2005) "*Otocyon megalotis*" in *Mammalian Species* no.766, pp. 1-5

³ Clark Jr. (2005), *op. cit.*

⁴ Wilson and Reeder (2005), *op. cit.*

⁵ Clark Jr. (2005), *op. cit.*

⁶ Castello, J. R. (2018) "*Canids of the World*" Princeton University Press

⁷ Kingdon, J., and M. Hoffman (eds) (2013) "*Mammals of Africa*" (Volume 5), A & C Black

⁸ *Species360* Zoo Aquarium Animal Management Software (ZIMS)

- **2. Provide information on the status of the species under CITES**

CITES Listing: not listed

IUCN Red List Status: LC (Least Concern)

The Bat-eared Fox is not included in the CITES Appendices.^{9,10}

The species is listed by the IUCN as LC (Least Concern).¹¹

The Bat-eared Fox has a large distribution covering at least twelve countries in eastern and southern Africa.^{12,13} The IUCN states "Subspecies *O. m. virgatus* ranges from southern Sudan, Ethiopia and Somalia down through Uganda and Kenya to south-western Tanzania; *O. m. megalotis* occurs from Angola through Namibia and Botswana to Mozambique and South Africa", and further notes that they are considered to be "common" and that there have been range extensions in some countries due to changes in climate.¹⁴

⁹ CITES home page: <https://cites.org/eng>

¹⁰ IUCN page for "*Otocyon megalotis*": <https://www.iucnredlist.org/species/15642/46123809>

¹¹ IUCN page for "*Otocyon megalotis*" as above

¹² Kingdon, J., and M. Hoffman (eds) (2013) "*Mammals of Africa*" (Volume 5), A & C Black

¹³ Castello, J. R. (2018) "*Canids of the World*" Princeton University Press

¹⁴ IUCN page for "*Otocyon megalotis*" as above

- **3. Provide information about the ecology of the species.**

A) Longevity: what is the average lifespan of the species in the wild and in captivity?

The lifespan of the Bat-eared Fox is given by most sources as being nine years in the wild, and 13 or 14 years in captivity (e.g. in Castello (2018)¹⁵ and Hunter (2018)¹⁶). The wild-longevity of nine years comes from a 2006 paper by Kamler and Macdonald¹⁷ regarding what they term "an unusually old" female fox, from which an age of nine years and one month was determined via tooth study after the animal's natural death. The authors note that up to that point "longevity in wild bat-eared foxes has never been reported" (and apart for this one paper, this still appears to be the case). This particular animal was considered to be exceptionally old for a wild animal based on the condition of the teeth (worn to nubs), and a suggestion for the attaining of this age was the lack of larger predators in the area (the study area was a sheep farm). For captive animals, the record for a captive lifespan is given as 13 years and 9 months in Jones (1982).¹⁸ However Weigl (2005) gives a record for a wild-caught animal dying in captivity at an estimated 17 years of age.¹⁹

B) What is the maximum length and weight that the species attains?

The Bat-eared Fox is a small canid. Nowak and Paradiso²⁰ and Clark Jr.²¹ give a head-body length of 46-66cm and tail-length of 23-34cm. In contrast, Hunter²² gives a reduced head-body range of 46.2-60.7cm, while Castello²³ gives a wider range of 40-66cm. Weight in all sources is given as 3.0-5.4kg.^{24,25,26,27} As a comparison with familiar species in Australia, the Tasmanian Devil (*Sarcophilus harrisi*) has a head-body length of 55-65cm and a weight of 7-9kg; the domestic Cat (*Felis catus*) has a head-body length of 38-60cm and weight of 2.5-6.5kg; and the Red Fox (*Vulpes vulpes*) has a head-body length of 60-74cm and weight of 3.5-8kg (all measurements taken from Menkhorst and Knight²⁸). Castello²⁹ says that female Bat-eared Foxes are "slightly larger" than males, while Kingdon³⁰ says that "females may weigh more than males", however this does not seem to be a constant. In wild studies, a sample of 25 males and 29 females from Botswana appeared to show that the females averaged heavier, but in a series of specimens from the Limpopo Valley in southern Africa there were no discernable differences between sexes.³¹

C) Discuss the identification of the individuals in this species, including if the sexes of the species are readily distinguishable, and if the species is difficult to distinguish from other species.

The Bat-eared Fox is a very small canid with a fluffy pelage, relatively long and slender legs, and extremely large ears, giving it a distinctive appearance. It is much smaller than most canid species (dogs, wolves, jackals, etc). It may fall within the size range of several other fox species, but the body proportions (long legs, narrow pointed snout, disproportionately large ears, and short bushy tail) coupled with colouration (grizzled greyish or buffy body, black legs, and raccoon-like facial mask) make it impossible to confuse with other species. Colouration is the same between males and females. Females may be larger than males but this cannot be considered accurate for sexing. However in zoo animals the sexes can be determined easily by the presence of teats in the female and a scrotum in the male.^{32,33,34,35,36}

D) Natural geographic range.

The Bat-eared Fox has a large distribution covering at least twelve countries in eastern and southern Africa (South Sudan, Ethiopia, Somalia, Uganda, Kenya, Tanzania, Angola, Botswana, Mozambique, Namibia, South Africa, Zimbabwe).^{37,38} The two subspecies, *O. m. megalotis* in southern Africa and *O. m. virgatus* in eastern Africa, have discrete distributions with about 1000km separating them, although they are thought to have been continuous until the Pleistocene.³⁹ The species is restricted to arid and semi-arid grassland environments, and the distribution appears to be tied to that of termites of the genera *Hodotermes* and *Microhodotermes* which form the basis of the species' diet.⁴⁰ Wild populations can fluctuate locally depending on rainfall and season (probably connected to changes in invertebrate prey availability).⁴¹ The presence of larger predators such as large Carnivores, raptors and pythons also impacts on the population levels of Bat-eared Foxes, with Black-backed Jackals (*Canis mesomelas*) in particular being a dominant predator as well as being an agent for diseases such as rabies, canine distemper, and canine parvovirus which can decimate Bat-eared Fox populations locally.⁴²

E) Is the species migratory?

Bat-eared Foxes are not migratory. Pairs or family groups occupy territories year-round, although the size of the territory can vary through the course of a year or between years depending on factors such as number of individual group members, prey availability, and predator levels.^{43,44}

F) Does the species have the ability to hibernate in winter or aestivate (go into stasis or torpor) in the summer months?

Bat-eared Foxes do not hibernate or aestivate. They are active year-round, although activity patterns can change between being diurnal and nocturnal depending on the time of year (largely relating to night-time temperatures in some parts of their range).^{45,46,47}

G) Does the species have the ability to breathe atmospheric air i.e. has accessory breathing organs? (fish and other mobile aquatic animals)

Not applicable.

H) Outline the habitat requirements for all life stages of the species.

Bat-eared Foxes are restricted to arid and semi-arid (xeric) environments, comprising grasslands, scrublands, and shrublands. Their predominant environment is short grassland, being less common in shrublands. They are not found in true desert or in forest.^{48,49} Habitats may be extremely hot by day and below freezing at night (in winter). They seek shade either below ground or under trees to escape high day-time temperatures, and huddle in groups to combat cold temperatures.⁵⁰ In some parts of their range (in southern Africa) they are active mainly by day during the winter to avoid freezing night-time temperatures, although this is thought to be more related to the activity of the temperature-sensitive termites upon which they feed than due to their own temperature restrictions.⁵¹ They use burrows as dens, either digging them or utilising existing burrows of other animals. Burrows may be up to three metres in length, and contain multiple chambers and exits. Several dens may be used within a family group's range.⁵² The species lives in xeric environments, does not live in or near water-bodies, and wild animals have not been observed to drink from free-standing water sources.⁵³

I) Social behaviour or groupings.

Bat-eared Foxes typically form monogamous pairs, and live either in these pairs or as family groups (especially before the dispersal of the offspring).^{54,55} Larger groups are normally composed of the pair plus grown young before dispersal, however female offspring may remain with the pair once mature and breed with the male (their father) to form multi-female groups.^{56,57} Territories of pairs/family groups may be discrete or overlapping depending on food sources and season.⁵⁸ Interactions between pairs/groups from different territories is described as "usually amicable".⁵⁹ In some areas high availability of insect prey means that polygyny, allo-suckling, and communal breeding may occur more frequently than monogamous breeding.⁶⁰ Bat-eared Foxes typically ignore large herbivores (ungulates).⁶¹ They avoid larger Carnivores because, due to their own small size, they are a prey item for most predatory species. However they are reported to ignore mongooses, except during breeding when they mob the mongooses to drive them away from den areas.⁶²

J) Is this species ever territorial or does it exhibit aggressive behaviour?

Bat-eared Fox pairs and family groups maintain loose territories using olfactory cues (i.e. urine-marking).⁶³ Interaction between different groups is usually "amicable"⁶⁴ although contact between members of the same sex may be aggressive.⁶⁵ The size of territories varies through the year, mostly according to prey availability which in turn is affected by rainfall and season.^{66,67} Clark Jr.⁶⁸ states that reported home-ranges vary between 0.3 and 3.5km² while Hunter⁶⁹ gives a figure of 1-8km² and Castello⁷⁰ giving 2-8km². Varying territory size also affects how separate groups interact with one another. During periods of abundant termite availability, territories become much smaller and

overlap considerably.^{71,72} Groups may also merge peaceably together at this time.⁷³ Unrelated pairs will also breed in close proximity to one another during such periods; for example Kingdon⁷⁴ notes an instance of six pairs breeding within separate dens in an area covering just 0.5km² in the Kalahari. Bat-eared Foxes typically either ignore or avoid non-prey species (depending on whether the animal is herbivorous or predatory), but have been recorded as mobbing small predators such as mongooses when these may be a threat to pups.⁷⁵

K) Characteristics that may cause harm to humans or any other species.

Bat-eared Foxes are very small and inoffensive canids. They have the most reduced tooth-size of any canid (although possessing the most individual teeth of any canid due to the presence of additional molars).^{76,77} The teeth also have less shearing surfaces than is typical for canids and an undeveloped carnassial blade, due to the adaptations for an insectivorous diet.^{78,79} They do retain larger incisors and can bite effectively, but because of their small muzzle size the length of each tooth-row, exclusive of the incisors, measures only 4-5cm.⁸⁰ They also have long blunt claws on the front paws, for digging, which project 1.8cm beyond the pad.⁸¹ Their teeth and claws could cause minor injuries to a person, in the same manner as bites or scratches from a domestic Cat or other small Carnivore.

¹⁵ Castello, J. R. (2018) "*Canids of the World*" Princeton University Press

¹⁶ Hunter, L. (2018) "*Carnivores of the World*" (2nd edition) Princeton University Press

¹⁷ Kamler, J. F., and D. W. Macdonald (2006) "Longevity in a wild bat-eared fox" in *African Journal of Wildlife Research*, vol. 36, pp. 199-200

¹⁸ Jones, M. L. (1982) "Longevity of Captive Mammals" in *Der Zoologische Garten Neue Folge Jena* vol. 52, pp. 113-128

¹⁹ Weigl, R (2005) "*Longevity of Mammals in Captivity; from the living collections of the world*" Kleine Senckenberg-Reihe 48

²⁰ Nowak, R.M., and J.L. Paradiso (1999) "*Walker's Mammals of the World*" John Hopkins University Press

²¹ Clark Jr., H. O. (2005) "Otocyon megalotis" in *Mammalian Species* no.766, pp. 1-5

²² Hunter (2018), *op. cit.*

²³ Castello (2018), *op. cit.*

²⁴ Nowak and Paradiso (1999), *op. cit.*

²⁵ Clark Jr. (2005), *op. cit.*

²⁶ Hunter (2018), *op. cit.*

²⁷ Castello (2018), *op. cit.*

²⁸ Menkhorst, P., and F. Knight (2010) "*A Field Guide to the Mammals of Australia*" Oxford University Press

²⁹ Castello (2018), *op. cit.*

³⁰ Kingdon, J., and M. Hoffman (eds) (2013) "*Mammals of Africa*" (Volume 5), A & C Black

³¹ Berry, M. P. S. (1978) "*Aspects of the ecology and behaviour of the bat-eared fox, (Otocyon megalotis Desmarest, 1822) in the Upper Limpopo Valley*" University of Pretoria

³² Nowak and Paradiso (1999), *op. cit.*

³³ Kingdon and Hoffman (2013), *op. cit.*

³⁴ Hunter (2018), *op. cit.*

³⁵ Castello (2018), *op. cit.*

³⁶ Clark Jr. (2005), *op. cit.*

³⁷ IUCN page for "Otocyon megalotis": <https://www.iucnredlist.org/species/15642/46123809>

³⁸ Castello (2018), *op. cit.*

³⁹ Kingdon and Hoffman (2013), *op. cit.*

⁴⁰ Kingdon and Hoffman (2013), *op. cit.*

- ⁴¹ Dalerum F., A. Le Roux, J. L. de Vries, J. F. Kamler, S. Page-Nicholson, C. Stuart, M. Stuart, B. Wilson, and E. Do Linh San (2016) "A conservation assessment of *Otocyon megalotis*", in Child, M. F., L. Roxburgh, E. Do Linh San, D. Raimondo, and H. T. Davies-Mostert (eds) "*The Red List of Mammals of South Africa, Swaziland and Lesotho*" South African National Biodiversity Institute and Endangered Wildlife Trust
- ⁴² Dalerum *et al* (2016), *op. cit.*
- ⁴³ Dalerum *et al* (2016), *op. cit.*
- ⁴⁴ Kingdon and Hoffman (2013), *op. cit.*
- ⁴⁵ Dalerum *et al* (2016), *op. cit.*
- ⁴⁶ Kingdon and Hoffman (2013), *op. cit.*
- ⁴⁷ Pauw, A. (2000) "Parental care in a polygynous group of bat-eared foxes, *Otocyon megalotis* (Carnivora, Canidae)" *African Zoology*, vol. 35 (1), pp. 139-145
- ⁴⁸ Dalerum *et al* (2016), *op. cit.*
- ⁴⁹ Kingdon and Hoffman (2013), *op. cit.*
- ⁵⁰ Kingdon and Hoffman (2013), *op. cit.*
- ⁵¹ Pauw (2000), *op. cit.*
- ⁵² Kingdon and Hoffman (2013), *op. cit.*
- ⁵³ Clark Jr. (2005), *op. cit.*
- ⁵⁴ Dalerum *et al* (2016), *op. cit.*
- ⁵⁵ Kingdon and Hoffman (2013), *op. cit.*
- ⁵⁶ Dalerum *et al* (2016), *op. cit.*
- ⁵⁷ Clark Jr. (2005), *op. cit.*
- ⁵⁸ Clark Jr. (2005), *op. cit.*
- ⁵⁹ Malcolm, J. R. (1986) "Socio-Ecology of Bat-eared Foxes (*Otocyon megalotis*)" *Journal of Zoology*, vol. 208 (3), pp. 457-469
- ⁶⁰ Kingdon and Hoffman (2013), *op. cit.*
- ⁶¹ Clark Jr. (2005), *op. cit.*
- ⁶² Clark Jr. (2005), *op. cit.*
- ⁶³ Dalerum *et al* (2016), *op. cit.*
- ⁶⁴ Malcolm (1986), *op. cit.*
- ⁶⁵ Nowak and Paradiso (1999), *op. cit.*
- ⁶⁶ Kingdon and Hoffman (2013), *op. cit.*
- ⁶⁷ Clark Jr. (2005), *op. cit.*
- ⁶⁸ Clark Jr. (2005), *op. cit.*
- ⁶⁹ Hunter (2018), *op. cit.*
- ⁷⁰ Castello (2018), *op. cit.*
- ⁷¹ Kingdon and Hoffman (2013), *op. cit.*
- ⁷² Clark Jr. (2005), *op. cit.*
- ⁷³ Clark Jr. (2005), *op. cit.*
- ⁷⁴ Kingdon and Hoffman (2013), *op. cit.*
- ⁷⁵ Clark Jr. (2005), *op. cit.*
- ⁷⁶ Nowak and Paradiso (1999), *op. cit.*
- ⁷⁷ Clark Jr. (2005), *op. cit.*
- ⁷⁸ Keiser, J. A. (1995) "Gnathomandibular Morphology and Character Displacement in the Bat-eared Fox" *Journal of Mammalogy*, vol. 76 (2), pp. 542-550
- ⁷⁹ Asahara, M. (2016) "The origin of the fourth lower molar in canids, inferred by individual variation" *Peer J*, vol. 4
- ⁸⁰ Clark Jr. (2005), *op. cit.*
- ⁸¹ Stuart, C. (2013) "*Field Guide to Tracks & Signs of Southern, Central & East African Wildlife*" Penguin Random House

- **4. Provide information on the reproductive biology of the species**

Bat-eared Foxes typically form monogamous pairs, and live either in these pairs or as family groups.^{82,83} Larger groups are normally composed of the pair plus grown young before dispersal, however female offspring may remain with the pair once mature and breed with the male (their father) to form multi-female groups.^{84,85} In some areas high availability of insect prey means that polygyny, allo-suckling, and communal breeding may also occur.⁸⁶

Pairs breed annually (once per year),⁸⁷ with births being timed to coincide with the rainy season when insects are most abundant.^{88,89} Clark gives varying months for births, depending on location: August to October in East Africa, September to November in the Kalahari, and October to December in Botswana.⁹⁰

Denning sites are burrows, either dug by the foxes themselves or utilising the abandoned burrows of other animals.^{91,92} Unrelated pairs may breed in close proximity to one another - for example Kingdon⁹³ notes an instance of six pairs breeding within separate dens in an area covering just 0.5km² in the Kalahari. A pair maintains multiple dens and moves regularly between them with the pups; Pauw records time spent at individual dens being between two days and two weeks.⁹⁴

The gestation period is 60-75 days.^{95,96} Litters contain from one to six pups; Dalerum *et al* additionally says "usually five" pups,⁹⁷ while Pauw gives an average of three per litter.⁹⁸ Pups rely almost entirely on milk, with the parents rarely bringing food to the den.⁹⁹ The male remains almost constantly at the den site to guard the pups. Pauw notes that even when foraging for food himself, the male remains within close proximity to the den.¹⁰⁰

The pups are weaned at 14-15 weeks of age, and disperse from the group at about five to six months old.¹⁰¹ They attain sexual maturity at eight to nine months of age.¹⁰²

As in all canid species, males and females are distinct sexes (i.e. not hermaphroditic; and parthenogenetic births are not possible), and they cannot change sex.^{103,104}

Members of the family Canidae are renowned for hybridisation, although this occurs almost exclusively within the genus *Canis* (wolves and jackals).¹⁰⁵ Probably all members of *Canis* can produce fertile hybrids with one another as this has been demonstrated in almost all species, and based on their genetics some species are regarded as being the product of hybridisation events (e.g. the African Golden Wolf *Canis lupaster*).^{106,107,108,109,110} A 2018 study on the genetics of the genus *Canis* by Gopalakrishnan *et al* produced an additional surprising result of past hybridisation between the Asiatic Dhole (*Cuon alpinus*) and the African Hunting Dog (*Lycaon pictus*), the ranges of which do not meet today but in pre-human times may have done so in the Middle East.¹¹¹ It seems probable that foxes of the genus *Vulpes* can also hybridise with other members of their own genus, although reports on this are usually only suggestions of hybridisation (e.g. Thornton 1971¹¹²) rather than confirmations. However hybrids between Arctic Foxes (*Vulpes lagopus*) and Red Foxes (*Vulpes vulpes*) are produced intentionally on fur farms via artificial insemination.^{113,114}

Apart for the ancient hybridisation event between *Cuon* and *Lycaon* inferred from the genetic studies by Gopalakrishnan *et al*, there are no records of hybridisation between canid genera.¹¹⁵ The Arctic Fox was formerly placed in the genus *Alopex*, in which case hybrids between that species and the Red Fox (*Vulpes vulpes*) would be considered intergeneric, but the genetics show conclusively that the Arctic Fox is in fact a member of the genus *Vulpes*.¹¹⁶

The chromosome counts for canids are extremely variable, which probably accounts for the high incidences of hybridisation amongst *Canis* (all species of *Canis*, as well as *Cuon* and *Lycaon*, have counts of 78) but few or no cases amongst other canids (which, depending on genus and species, have chromosome counts varying from as low as 34 up to 76).¹¹⁷ The Bat-eared Fox has a chromosome count of 72 which appears to be unique amongst the Canidae,¹¹⁸ and it is the sole member of the genus *Otocyon* which is basal to all other Canidae genera,¹¹⁹ so hybridisation would not be expected to occur with other canid species. It is also considerably smaller than any member of the genus *Canis* and in the wild the larger canids (e.g. Black-backed Jackals *Canis mesomelas* and African Hunting Dogs *Lycaon pictus*) are active predators of Bat-eared Foxes, rather than perceiving the foxes as potential mates.¹²⁰

The only native mammal in Australia with which there could be a possibility of Bat-eared Foxes hybridising, is the Dingo (variously *Canis dingo* or *Canis lupus dingo* or *Canis familiaris dingo*). All other native placental mammals in Australia are rodents, bats, pinnipeds and cetaceans.¹²¹ Although introduced to Australia by humans at some point in the past few thousand years, the Dingo is generally treated as a native species due to the length of time it has been in the country. Given that intergeneric canid hybrids have not been recorded, that the two species have different chromosome counts, the physical size difference between the two species (i.e. roughly cat-sized versus dog-sized), and that Dingos would be more likely to consider Bat-eared Foxes as prey than mates, the chance of hybridisation seems remote.

⁸² Kingdon, J., and M. Hoffman (eds) (2013) "*Mammals of Africa*" (Volume 5), A & C Black

⁸³ Dalerum F., A. Le Roux, J. L. de Vries, J. F. Kamler, S. Page-Nicholson, C. Stuart, M. Stuart, B. Wilson, and E. Do Linh San (2016) "A conservation assessment of *Otocyon megalotis*", in Child, M. F., L. Roxburgh, E. Do Linh San, D. Raimondo, and H. T. Davies-Mostert (eds) "*The Red List of Mammals of South Africa, Swaziland and Lesotho*" South African National Biodiversity Institute and Endangered Wildlife Trust

⁸⁴ Clark Jr., H. O. (2005) "*Otocyon megalotis*" in *Mammalian Species* no.766, pp. 1-5

⁸⁵ Dalerum *et al* (2016), *op. cit.*

⁸⁶ Kingdon and Hoffman (2013), *op. cit.*

⁸⁷ Dalerum *et al* (2016), *op. cit.*

⁸⁸ Clark Jr. (2005), *op. cit.*

⁸⁹ Dalerum *et al* (2016), *op. cit.*

⁹⁰ Clark Jr. (2005), *op. cit.*

⁹¹ Nowak, R.M., and J.L. Paradiso (1999) "*Walker's Mammals of the World*" John Hopkins University Press

⁹² Clark Jr. (2005), *op. cit.*

⁹³ Kingdon and Hoffman (2013), *op. cit.*

⁹⁴ Pauw, A. (2000) "Parental care in a polygynous group of bat-eared foxes, *Otocyon megalotis* (Carnivora, Canidae)" *African Zoology*, vol. 35 (1), pp. 139-145

⁹⁵ Dalerum *et al* (2016), *op. cit.*

⁹⁶ Nowak and Paradiso (1999), *op. cit.*

⁹⁷ Dalerum *et al* (2016), *op. cit.*

⁹⁸ Pauw (2000), *op. cit.*

⁹⁹ Clark Jr. (2005), *op. cit.*

¹⁰⁰ Pauw (2000), *op. cit.*

¹⁰¹ Clark Jr. (2005), *op. cit.*

¹⁰² Clark Jr. (2005), *op. cit.*

¹⁰³ Castello, J. R. (2018) "*Canids of the World*" Princeton University Press

- ¹⁰⁴ Nowak and Paradiso (1999), *op. cit.*
- ¹⁰⁵ Castello (2018), *op. cit.*
- ¹⁰⁶ Gopalakrishnan, S., M. S. Sinding, J. Ramos-Madrigal, J. Niemann, J. A. S. Castruita, F. G. Vieira, C. Caroe, M. de Manuel Montero, L. Kuderna, A. Serres, V. M. Gonzalez-Basallote, Y. Liu, G. Wang, T. Marques-Bonet, S. Mirarab, C. Fernandes, P. Gaubert, K. Koepfli, J. Budd, E. K. Rueness, C. Sillero, M. P. Heide-Jorgensen, B. Petersen, T. Sicheritz-Ponten, L. Bachmann, O. Wiig, A. J. Hansen, M. Thomas, and P. Gilbert (2018) "Interspecific Gene Flow Shaped the Evolution of the Genus *Canis*" *Current Biology*, vol. 28 (21), pp. 3441-3449
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- ¹¹¹ Gopalakrishnan *et al* (2018), *op. cit.*
- ¹¹² Thornton, W. A. (1971) "Hybridization in the Fox Genus *Vulpes* in West Texas" *The Southwestern Naturalist*, vol. 15 (4), pp. 473-484
- ¹¹³ Makinen, A. and I. Gustavsson (1982) "A comparative chromosome-banding study in the Silver Fox, the Blue Fox, and their hybrids" *Hereditas*, vol. 9, pp. 289-297
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- ¹¹⁵ Gopalakrishnan *et al* (2018), *op. cit.*
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- **5. Provide information on whether the species has established feral populations**

The Bat-eared Fox has never established wild populations outside of its natural range, and it has never been deliberately introduced to the wild in countries outside of its natural range. There is no mention of the species in Lever (1985),¹²² and the only account in Long (2003) regarding artificial movements of animals is of a reintroduction to the Mountain Zebra National Park in South Africa (within the species' natural range).¹²³

The Bat-eared Fox is largely insectivorous and is not considered to be a pest of livestock or agriculture, but it is persecuted by farmers in some parts of its natural range such as South Africa¹²⁴ and Namibia.¹²⁵ Generally this is stated to be due to a mistaken belief that the foxes kill livestock (through observation of the foxes feeding on insects from animal carcasses),¹²⁶ or simply through ignorance of / confusion with other canid species (notably the Black-backed Jackal *Canis mesomelas*).^{127,128}

¹²² Lever, C. (1985) "*Naturalized Mammals of the World*" Longman

¹²³ Long, J.L. (2003) "*Introduced Mammals of the World*" CSIRO

¹²⁴ Dalerum F., A. Le Roux, J. L. de Vries, J. F. Kamler, S. Page-Nicholson, C. Stuart, M. Stuart, B. Wilson, and E. Do Linh San (2016) "A conservation assessment of *Otocyon megalotis*", in Child, M. F., L. Roxburgh, E. Do Linh San, D. Raimondo, and H. T. Davies-Mostert (eds) "*The Red List of Mammals of South Africa, Swaziland and Lesotho*" South African National Biodiversity Institute and Endangered Wildlife Trust

¹²⁵ Kurberg, L. (2005) "The effect of grazing on Bat-eared foxes, and how farmers in Namibia perceive Bat-eared foxes" *Uppsala Universitet*

¹²⁶ Hunter, L. (2018) "*Carnivores of the World*" (2nd edition) Princeton University Press

¹²⁷ Dalerum *et al* (2016), *op. cit.*

¹²⁸ Kurberg (2005), *op. cit.*

- **6. Environmental risk assessments of the species**

The Bat-eared Fox is not listed in the Vertebrate Pests Committee's "List of Exotic Vertebrate Animals in Australia" and hence has no assessment in that document.¹²⁹

Importation and quarantine requirements for live exotic Canidae to Australia have been covered in the "Interim Quarantine Requirements For The Importation Of Zoo Carnivores", and would cover Bat-eared Foxes if these were allowed to be imported.¹³⁰

Five species of Canidae are already included on the list of exotic zoo animals allowed to be imported into Australia, namely Dingo (*Canis lupus dingo*), Maned Wolf (*Chrysocyon brachyurus*), Dhole (*Cuon alpinus*), African Hunting Dog (*Lycaon pictus*), and Fennec Fox (*Vulpes zerda*).¹³¹

¹²⁹ Vertebrate Pests Committee "List of Exotic Vertebrate Animals in Australia":

<https://www.pestsmart.org.au/wp-content/uploads/2010/03/VPCListJuly2007.pdf>

¹³⁰ Australian Government "Interim Quarantine Requirements for the Importation of Zoo Carnivores":

<https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/ba/memos/2003/animal/2003-20a.pdf>

¹³¹ Australian Government "List of Specimens Taken to be Suitable for Live Import":

<https://www.legislation.gov.au/Series/F2006B01053>

- **7. Assess the likelihood that the species could establish a breeding population in Australia**

The likelihood of Bat-eared Foxes establishing a breeding population in Australia outside effective human control is low if based on historical and global data. Despite the species being held in zoos throughout the world there are no wild populations of Bat-eared Foxes established outside their natural range, via accidental or deliberate releases, and the only record of a deliberate re-introduction to any area of former range appears to be to the Mountain Zebra National Park in South Africa.^{132,133}

Fennec Foxes (*Vulpes zerda*), a canid of similar size to Bat-eared Foxes and likewise adapted to arid environments, have been kept in Australian zoos for most of the 20th Century, and are still kept in Australian zoos today,¹³⁴ and this species has never established wild populations in the country.^{135,136,137} The Red Fox (*Vulpes vulpes*), a larger species and one which is much more versatile in habitat use and diet than the Bat-eared Fox,¹³⁸ is established in the wild in Australia but only through deliberate releases with the specific aim of creating a wild population.^{139,140}

A) Ability to find food sources. Is the species a generalist feeder or does it have specific food needs? What is the likelihood of it finding food in Australia if it was released or escaped? Describe the feeding characteristics of the species, including whether it has a similar diet to any Australian native species.

The Bat-eared Fox is typically described in books and on websites as being a specialist termite-feeder, although results from studies on the diets of wild animals are rather variable. Partly this is due to differing methods of measuring the contents of the diet of study animals, partly due to varying importance or availability of food items through the year, and partly to the location and habitat of study animals.¹⁴¹

The distribution of the Bat-eared Fox overlaps almost exactly (95%) with that of harvester termites of the genera *Hodotermes* and *Microhodotermes*, which form the basis of the species' diet according to most sources.^{142,143,144,145} Clark Jr. states that 80-90% of the species' diet is composed of these termites,¹⁴⁶ while Malcolm gives a total of 90% of the species' diet being composed of termites for his specific Kenyan study-site.¹⁴⁷ A two-year study in the Kalahari by Jumban *et al* found that termites formed 69.79% of the diet across the year, being most important in autumn (81.5%) and least important in summer (57.33%).¹⁴⁸

A wide range of other invertebrates are also taken, although mostly in low quantity.^{149,150} The study by Jumban *et al* found that after termites (69.79% of the diet across the year), the next highest prey items were beetles (10.64% of the diet), ants (8.16%), and grasshoppers (4.72%). The very high ratio of termites to other invertebrate groups within the diet of these study animals led Jumban *et al* to state "Our data support bat-eared foxes as obligate termite specialists but highlight that they appear to have the ability to show dietary flexibility based on both temporal and spatial variations in food abundance".¹⁵¹

In contrast to studies which show a dependence on termites, others have shown a marked preference for fruit. One study in South Africa found that while termites were found in 90% of scats, they composed only 12-40% of the total mass of the diet - in this study fruit formed the bulk of the diet's mass, with 63% in summer and 74% in autumn.¹⁵² A separate study in the Karoo found that at a natural site (a national park) fruit formed 64% of the diet in winter and 36% in the summer, and in a human-influenced site (farmland, which had a greater abundance of termites) fruit formed 38% of the diet in the winter and 16% in the summer.¹⁵³

Bat-eared Foxes are also recorded as feeding on carrion and small vertebrates, although this appears to be relatively rare and taken opportunistically rather than by preference.¹⁵⁴ In the two-year study by Jumban *et al*, vertebrates (reptiles, frogs, rodents) formed only 0.4% of the diet over the course of a year.¹⁵⁵ In the Kalahari, the male fox of a polygynous breeding group brought lizards to the den for the pups, although the adults of this group rarely ate lizards themselves.¹⁵⁶

Most (but not all) studies show that termites form a large to predominant part of the diet of Bat-eared Foxes. The termite species they feed upon belong to the genera *Hodotermes* and *Microhodotermes*, of the African family Hodotermitidae.¹⁵⁷ These termites are grass-feeding "harvester termites" which forage for food above ground, and live in underground tunnel systems rather than in concreted mounds.¹⁵⁸ Bat-eared Foxes are largely nocturnal in the wild and use their extremely large ears to find their prey by sound while walking - they do not excavate termite mounds as do, for example, anteaters or aardvarks.¹⁵⁹

The termite family Hodotermitidae does not occur in Australia, but there are five other termite families here (Mastotermitidae, Termopsidae, Kalotermitidae, Rhinotermitidae, and Termitidae), containing about thirty genera collectively and at least 350 species. These include species which are mound-builders and species which are groundtunnel-nesters.¹⁶⁰ It is likely that Bat-eared Foxes could feed on the ground-dwelling Australian termites although, as a possible opposition to this likelihood, it has been shown that captive animals refuse to eat African termites of the genus *Trinervitermes* (of the family Termitidae), probably due to their chemical defences.¹⁶¹

Wild studies also show that Bat-eared Foxes feed on a wide variety of other invertebrates (albeit, generally to a much lesser extent than on termites) and on fruit, so would easily be able to find additional food sources in the wild in Australia.

In Australia, Numbats (*Myrmecobius fasciatus*) and Short-beaked Echidnas (*Tachyglossus aculeatus*) feed entirely or largely on termites. Various species of small marsupials such as bandicoots and dasyurids may occur in similar habitats (arid or semi-arid country) and feed on the same non-termite food items (invertebrates and small vertebrates).¹⁶²

B) Ability to survive and adapt to climatic conditions. Describe the characteristics or behaviour that would enhance its ability to survive extreme climatic conditions (e.g. drought) and its ability to adapt to different environments.

In the wild Bat-eared Foxes are restricted to arid and semi-arid (xeric) environments, predominantly in areas of short grassland. They are not found in true desert or in forest.^{163,164} Temperatures may vary through the seasons from extremely hot by day to below freezing at night; Pauw gives extremes of temperature in his study area (in the Kalahari) of 39°C by day in summer and -7°C at night in winter.¹⁶⁵ Bat-eared Foxes seek shade either below ground in their dens or under trees to escape high day-time temperatures, and huddle in groups to combat cold temperatures.¹⁶⁶ Their large ears are suggested to aid in thermoregulation (cooling the fox during high temperatures).^{167,168} In eastern Africa the species is largely nocturnal and/or crepuscular year-round, but in southern Africa they are active mainly by day during the winter to avoid freezing night-time temperatures.^{169,170} Lourens and Nel recorded effective temperatures of between 1.5°C and 27°C during the daytime in winter at their study site in South Africa, during which the foxes were less active at the low temperatures and more active at the higher temperatures.¹⁷¹ The species lives in xeric environments and wild animals have not been observed to drink from free-standing water sources, instead obtaining all necessary moisture from their diet.¹⁷²

C) Ability to find shelter. Can the species live in modified habitats? Identify if this species can live in habitats that have been modified by humans, either directly or indirectly.

Bat-eared Foxes are notable for being able to survive well in human-modified landscapes if they are not persecuted, and - most importantly - so long as the environment is suited to their requirements (i.e. dry farmland where livestock keep the grass heavily-grazed, and where termites and other invertebrates are abundant).^{173,174} Within these landscapes they shelter in burrows which are either dug themselves or are the abandoned burrows of other animals.¹⁷⁵ Dalerum *et al* suggest that ranching has a positive effect on Bat-eared Fox populations because moderate to heavy grazing increases termite populations: "Because this species focuses on termite consumption, it is compatible with a broad range of habitats and management strategies".¹⁷⁶ Kurberg notes various opposing studies where Bat-eared Foxes are negatively or positively affected by livestock ranching, with the results likely to be related to how intensely the landscape is grazed.¹⁷⁷

There appear to be no situations within their natural range where Bat-eared Foxes occur in other forms of cultivation than ranching (e.g. in gardens, orchards, plantations, etc): e.g. in Dalerum *et al* which covers the IUCN conservation assessment of the species for South Africa,¹⁷⁸ there is no mention of interaction in any human-dominated habitats other than livestock farming. This is most likely due to the species being naturally restricted to arid and semi-arid environments which are not suited for crops or fruit production.

D) Reproduction. Could factors such as longevity, birth rates and numbers of offspring increase the likelihood of the species to establish?

Bat-eared Foxes form monogamous pair-bonds and breed only once per year. Litters consist of 1-6 pups which remain with the parents until they are about five to six months old. They attain sexual maturity at eight to nine months of age.^{179,180,181,182}

Wild animals have fairly short lifespans, probably in the average range of five or six years although there seem to be no proper studies on wild lifespan. A nine-year-old wild animal recorded by Kamler and Macdonald was regarded by them as being "unusually old".¹⁸³

If a pair lived to six years of age and had a maximum number of pups per litter, they would produce only thirty pups over the course of their life. However, the young mature at a relatively young age (8-9 months) and have a high dispersal ability.¹⁸⁴

Mortality is also quite high in wild animals due to predation by larger Carnivores such as Black-backed Jackals (*Canis mesomelas*) and disease. Hunter quotes a percentage of 25-30% adult mortality in South Africa.¹⁸⁵ In Australia an equivalent predator would be the Dingo.

E) Are there any limiting influences on the species' natural range? Predator/prey relationships, competition, availability of resources etc. Assess what similar population constraints might exist in Australia.

Bat-eared Foxes are naturally restricted to arid and semi-arid (xeric) landscapes in eastern and southern Africa, a distribution which is generally regarded as having a direct connection to that of the Hodotermitidae termites upon which they feed (although they are known to also feed on a wide range of additional invertebrate species).^{186,187} Their particular foraging behaviour of walking across open ground, nose down, while listening for active insects (as opposed to finding hidden prey by sight or smell) also requires habitats that are open.¹⁸⁸

Large areas of inland Australia would probably be suitable habitat for Bat-eared Foxes.

Hodotermitidae termites are not found in Australia which may be a limiting factor for the species; however, there are at least 350 species of termites in other families within the country¹⁸⁹ and it is likely that some of these would be suitable prey for Bat-eared Foxes.

Larger species of Carnivores kill or prey on Bat-eared Foxes in the wild in Africa, with the most important one being the Black-backed Jackal (*Canis mesomelas*).^{190,191} In some studies up to 32% of monitored Bat-eared Foxes were killed by jackals, and others by domestic Dogs (*Canis familiaris*).^{192,193} In Australia the Dingo (*Canis dingo*), a similar large canid, would be an equivalent wild predator. Bat-eared Foxes are also preyed upon by eagles and pythons,¹⁹⁴ of which there are equivalent native species in Australia.

F) Address the issue of increased potential for feral population establishment if more individuals of the species were present in Australia.

Bat-eared Foxes in Australia would be legally restricted to licenced holders (i.e. zoos) and thus the importation of additional animals past an initial import would likely not result in any increase in risk as the containment requirements of all individuals would be the same.

¹³² Lever, C. (1985) "*Naturalized Mammals of the World*" Longman

¹³³ Long, J.L. (2003) "*Introduced Mammals of the World*" CSIRO

¹³⁴ Australian zoo census data from Zoo and Aquarium Association (ZAA)

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¹³⁶ Lever (1985), *op. cit.*

¹³⁷ Long (2003), *op. cit.*

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¹⁴⁰ Long (2003), *op. cit.*

¹⁴¹ Jumban, K. R., S. Periquet, F. Dalerum, and A. Le Roux (2019) "Spatial and temporal variation in the use of supplementary food in an obligate termite specialist, the bat-eared fox" *African Zoology*, vol. 54 (1), pp. 63-71

¹⁴² Kingdon, J., and M. Hoffman (eds) (2013) "*Mammals of Africa*" (Volume 5), A & C Black

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¹⁴⁴ Clark Jr., H. O. (2005) "*Otocyon megalotis*" in *Mammalian Species* no.766, pp. 1-5

¹⁴⁵ Nowak, R.M., and J.L. Paradiso (1999) "*Walker's Mammals of the World*" John Hopkins University Press

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- ¹⁵¹ Jumban *et al* (2019), *op. cit.*
- ¹⁵² Klare, U., J. F. Kamler, and D. W. Macdonald (2011) "The bat-eared fox: A dietary specialist?" *Mammalian Biology*, vol. 76 (5), pp. 646-650
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- ¹⁵⁵ Jumban *et al* (2019), *op. cit.*
- ¹⁵⁶ Pauw, A. (2000) "Parental care in a polygynous group of bat-eared foxes, *Otocyon megalotis* (Carnivora, Canidae)" *African Zoology*, vol. 35 (1), pp. 139-145
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- ¹⁶¹ Clark Jr. (2005), *op. cit.*
- ¹⁶² Menkhorst and Knight (2010), *op. cit.*
- ¹⁶³ Clark Jr. (2005), *op. cit.*
- ¹⁶⁴ Kingdon and Hoffman (2013), *op. cit.*
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- ¹⁷⁴ Kingdon and Hoffman (2013), *op. cit.*
- ¹⁷⁵ Kingdon and Hoffman (2013), *op. cit.*
- ¹⁷⁶ Dalerum *et al* (2016), *op. cit.*
- ¹⁷⁷ Kurberg, L. (2005) "The effect of grazing on Bat-eared foxes, and how farmers in Namibia perceive Bat-eared foxes" *Uppsala Universitet*
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- ¹⁹² Kamler, J. F., N. F. Jacobsen, D. W. Macdonald, U. Stenkewitz, and U. Klare (2012) "Resource partitioning among Cape Foxes, Bat-eared Foxes, and Black-backed Jackals in South Africa" *Journal of Wildlife Management*, vol. 76 (6), pp. 1241-1253
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- **8. Provide a comprehensive assessment of the potential impact of the species should it become established in Australia**

A. Does the species have similar niche/living requirements to native species?

The diet of Bat-eared Foxes is composed primarily of insects and fruit, with termites making up a larger part of the diet. In this regard they may compete with certain native mammals, in particular the endangered Numbat (*Myrmecobius fasciatus*) and the widespread Short-beaked Echidna (*Tachyglossus aculeatus*) which also feed primarily on termites and other soil-dwelling insects.^{195,196} While these species all feed predominantly on termites there may be a low probability of actual competition because they have contrasting feeding behaviours, with the two native mammals finding termites by digging into either the ground or into termite nests (e.g. within logs)^{197,198} whereas the Bat-eared Fox locates termites on the surface. The feeding behaviours are relative to the specific foraging techniques of the different species of termite - Bat-eared Foxes feed on harvester termites which are active above ground,¹⁹⁹ while the Numbat and Echidna feed on subterranean termite species.

Bat-eared Foxes also feed on other invertebrates, especially on beetles. In this respect they may compete with arid-dwelling bandicoot species of which there are several species, some of which are endangered and localised.²⁰⁰

Bat-eared Foxes shelter in burrows, but they either dig their own burrows or utilise the abandoned burrows of other animals; they are not known to evict other animals in order to make use of a burrow.^{201,202} (In an Australian context, an example might be an abandoned wombat burrow as this is probably the only native mammal which would construct a burrow large enough to accommodate the foxes). Bat-eared Foxes live in arid habitats which may include shrubland or the edges of arid woodland, but they are entirely terrestrial and do not climb trees.^{203, 204}

B. Is the species susceptible to, or capable of transmitting any pests or diseases?

Bat-eared Foxes can be carriers of external parasites such as ticks and fleas, and internal parasites such as nematodes, all of which can be easily and effectively treated/removed before undergoing quarantine.

There are a number of zoonoses (including protozoal, fungal, bacterial, and viral species) which can be carried by and transferred between Bat-eared Foxes and other carnivore species (including the domestic dog). Some of these are also transferrable to humans, notably (in the case of Bat-eared Foxes) rabies. All diseases which affect domestic dogs will also affect Bat-eared Foxes. In wild Bat-eared Foxes the most dangerous diseases are rabies, canine distemper, and canine parvovirus. These three diseases are transmitted from and to other canid species (including the domestic dog) and are responsible for regular population crashes in Bat-eared Foxes.^{205,206}

A study by Murray *et al* (1999), covering the research of diseases in large carnivores, found 52 diseases, of which 44% were viral, 31% bacterial, and the rest fungal or protozoal.²⁰⁷

Zoonoses can be tested for, and generally be effectively treated, before undergoing quarantine.

Quarantine requirements for live exotic Canidae to Australia have been covered in the "Interim Quarantine Requirements For The Importation Of Zoo Carnivores".²⁰⁸ Five species of Canidae are already included on the list of exotic zoo animals allowed to be imported into Australia, namely Dingo (*Canis lupus dingo*), Maned Wolf (*Chrysocyon brachyurus*), Dhole (*Cuon alpinus*), African Hunting Dog (*Lycaon pictus*), and Fennec Fox (*Vulpes zerda*).²⁰⁹

C. Probable prey/food sources.

The distribution of the Bat-eared Fox in the wild overlaps almost exactly (95%) with that of harvester termites of the genera *Hodotermes* and *Microhodotermes*, which form the basis of the species' diet according to most sources.^{210,211,212,213}

A wide range of other invertebrates are also taken, although mostly in low quantity.^{214,215} A study by Jumban *et al* found that after termites (69.79% of the diet across the year), the next highest prey items were beetles (10.64% of the diet), ants (8.16%), and grasshoppers (4.72%). The very high ratio of termites to other invertebrate groups within the diet of these study animals led Jumban *et al* to state "Our data support bat-eared foxes as obligate termite specialists but highlight that they appear to have the ability to show dietary flexibility based on both temporal and spatial variations in food abundance".²¹⁶

Fruit from wild plants also forms a part of the diet in some areas.^{217,218}

Bat-eared Foxes are also recorded as feeding on carrion and small vertebrates, although this appears to be relatively rare and taken opportunistically rather than by preference.²¹⁹ In the two-year study by Jumban *et al*, vertebrates (reptiles, frogs, rodents) formed only 0.4% of the diet over the course of a year.²²⁰ In the Kalahari, the male fox of a polygynous breeding group brought lizards to the den for the pups, although the adults of this group rarely ate lizards themselves.²²¹

Within Australia, vertebrate animals which may be prey items for Bat-eared Foxes would be frogs, small lizards, and rodent-sized mammals (e.g. native and introduced rodents, and native mouse-sized dasyurids). However, as noted above, the wild diet is predominantly composed of insects.

Bat-eared Foxes have not been recorded as preying on domestic animals.²²²

D. Impacts on habitat and local environments.

If a wild population should become established there would be little or no physical impact on the habitats in which they live. Bat-eared Foxes dig burrows as shelters, and typically have several such shelters in separate locations within their home-ranges, but these are individual burrows (i.e. the species does not have subterranean habits or create extensive tunnel systems).²²³ They do not dig to obtain food, but rather use auditory signals to find prey on the surface as they walk.^{224, 225} They do not live or dig burrows near waterways as they are adapted for life in arid environments.²²⁶

There appear to be no reports of damage caused by Bat-eared Foxes to wildlife or habitats within their native range. In southern Africa they are commonly found on livestock ranches where their presence causes no damage.²²⁷

The species inhabits arid or semi-arid environments and avoids well-treed areas such as woodlands and plantations.²²⁸

Bat-eared Foxes could transport plant seeds attached to their fur, and also in their droppings as fruit from wild plants forms part of their natural diet. In one study in South Africa fruit formed the bulk of the diet's mass, with 63% in summer and 74% in autumn.²²⁹ A separate study in the Karoo found that at a natural site (a national park) fruit formed 64% of the diet in winter and 36% in the summer, and in a human-influenced site (farmland, which had a greater abundance of termites) fruit formed 38% of the diet in the winter and 16% in the summer.²³⁰

E. Discuss any control/eradication programs that could be applied in Australia if the species escaped or were released.

Bat-eared Foxes typically inhabit open country with little to no ground-cover.²³¹ In cases where they are active diurnally (in the wild, during winter in some parts of their range²³²) they are readily visible. When active nocturnally they would be much more difficult to detect individually, however they have regular home burrows at which they could be trapped.²³³ They live in monogamous pairs or in larger family groups,²³⁴ which would make eradication from the wild more attainable than for solitary species. In the event that a wild population became established it would most likely be in an area of low human activity (given the species' habitat of arid or semi-arid country) and so control programmes as used for the introduced Red Fox (*Vulpes vulpes*) and feral dogs (*Canis familiaris*) could be used for Bat-eared Foxes. In Australia foxes and dogs are most commonly controlled using poison baits and trapping, as well as by shooting.²³⁵ Poison baits would likely not be very effective for Bat-eared Foxes as carrion is a minimal part of their diet.²³⁶ Trapping at home-burrows would probably be the more effective strategy.

F. Behaviours that cause environmental degradation.

Bat-eared Foxes do not cause any environmental damage other than by digging individual burrows for shelter. They typically have several such shelters in separate locations within their home-ranges, but the species does not have subterranean habits or create extensive tunnel systems.²³⁷ They do not dig to obtain food, but rather use auditory signals to find prey on the surface as they walk.²³⁸ They do not live in or near waterways as they are adapted for life in arid environments.²³⁹

G. Impacts on primary industries.

Bat-eared Foxes are notable for being able to survive well on livestock ranches so long as the environment is suited to their requirements (i.e. dry farmland where livestock keep the grass heavily-grazed, and where termites and other invertebrates are abundant).²⁴⁰ They have not been recorded as causing damage to or competing with livestock in these situations.²⁴¹

There appear to be no situations within their natural range where Bat-eared Foxes occur in any other forms of cultivation than ranching (e.g. they do not occur in gardens, orchards, plantations, etc): e.g. in Dalerum *et al* which covers the IUCN conservation assessment of the species for South Africa, there is no mention of interaction in any human-dominated habitats other than livestock farming.²⁴² This is most likely due to the species being naturally restricted to arid and semi-arid environments which are not suited for crops or fruit production.

Bat-eared Foxes do feed on fruit from wild arid-adapted plants,^{243,244} and so potentially could also affect commercial fruit production, although this seems unlikely given that the habitat of the foxes does not align with that of commercial orchards. They do not feed on other plant material (e.g. seedlings, leaves, etc).

H. Damage to property.

Bat-eared Foxes have not been recorded as causing damage to physical properties. In their native range they do inhabit farmland and ranches, where they do not cause issues for humans.²⁴⁵

I. Is the species a social nuisance or danger?

Bat-eared Foxes have not been recorded as being a danger to or creating a nuisance for humans. In their native range they do inhabit farmland and ranches, where they do not cause issues for humans.²⁴⁶

J. Describe any potentially harmful characteristics of the species.

Bat-eared Foxes are very small and inoffensive canids. They have the most reduced tooth-size of any canid (although possessing the most individual teeth of any canid due to the presence of additional molars).²⁴⁷ The teeth also have less shearing surfaces than is typical for canids and an undeveloped carnassial blade, due to the adaptations for an insectivorous diet.^{248, 249} They do retain larger incisors and can bite effectively, but because of their small muzzle size the length of each tooth-row, exclusive of the incisors, measures only 4-5cm.²⁵⁰ They also have long blunt claws on the front paws, for digging, which project 1.8cm beyond the pad.²⁵¹ Their teeth and claws could cause minor injuries to a person, in the same manner as bites or scratches from a domestic Cat or other small carnivorous mammal.

In captivity they should be treated with the same safety measures as other small carnivorous mammals (e.g foxes, small felids, the larger dasyurids, etc).

Bat-eared Foxes can carry and transmit the same zoonoses as domestic dogs or any other wild canid, including rabies. Wild Health Australia lists the zoonoses of canids and felids which have been recorded within Australia.²⁵²

Biosecurity Australia has existing quarantine requirements for the importation of live exotic Carnivora for zoos, which covers disease control.

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²⁰⁹ Australian Government "List of Specimens Taken to be Suitable for Live Import":

<https://www.legislation.gov.au/Series/F2006B01053>

²¹⁰ Kingdon and Hoffman (2013), *op. cit.*

²¹¹ Dalerum *et al* (2016), *op. cit.*

²¹² Clark Jr. (2005), *op. cit.*

²¹³ Nowak and Paradiso (1999), *op. cit.*

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²¹⁷ Klare, U., J. F. Kamler, and D. W. Macdonald (2011) "The bat-eared fox: A dietary specialist?" *Mammalian Biology*, vol. 76 (5), pp. 646-650

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²¹⁹ Clark Jr. (2005), *op. cit.*

²²⁰ Jumban *et al* (2019), *op. cit.*

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- ²²⁹ Klare *et al* (2011), *op. cit.*
- ²³⁰ Kuntzsch and Nel (1992), *op. cit.*
- ²³¹ Kingdon and Hoffman (2013), *op. cit.*
- ²³² Kingdon and Hoffman (2013), *op. cit.*
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- ²³⁴ Malcolm, J. R. (1986) "Socio-Ecology of Bat-eared Foxes (*Otocyon megalotis*)" *Journal of Zoology*, vol. 208 (3), pp. 457-469
- ²³⁵ PestSmart, European Fox: <https://pestsmart.org.au/pest-animal-species/european-fox/>
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- ²³⁹ Kingdon and Hoffman (2013), *op. cit.*
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- **9. What conditions or restrictions could be applied to reduce any potential for negative impacts of the species?**

Importation and transfer of Bat-eared Foxes would be limited exclusively to recognised zoological facilities as licensed by their respective states and territories. As a containment species, Bat-eared Foxes would be specifically excluded from import by or transfer to private individuals to keep as private pets.

Measures to prevent breeding such as limiting importation to a single sex or to de-sexed individuals would prevent imported specimens being used to conserve the species in Australian zoos in the future.

- **10. Summary of proposed activity**

The importation of Bat-eared Foxes would be for the purposes of starting a captive population within Australian zoos as a part of the overall global captive population, intended to enhance the educational programmes within zoos, especially in relation to illustrating the diversity of life and of the Canidae and African habitats in particular. As the species is not endangered in the wild state, the global captive population serves primarily as ambassadors for their species and habitat, but also serves as a precautionary "safety net" in the event of future conservation threats.

The Darling Downs Zoo initially intends to import two unrelated males and two unrelated females to establish the nucleus of a genetically diverse breeding population.

All of these animals will be held at the Darling Downs Zoo.

Further animals will need to be imported in the future to ensure the genetic diversity of the Australian population.

All imported animals will be from licensed overseas zoos which are eligible to export zoo animals to zoos in Australia.

Males will need to be separated to avoid negative conspecific interaction and to ensure sound genetic management.

Canids such as Bat-eared Foxes are capable of producing annual litters. Thus, breeding will be controlled by periodically contracepting the females to manage the frequency of litters.

Facilities for this species will be provided to permit the separate holding of two adult pairs plus nursing bitches and any progeny awaiting dispersal to other zoos.

Genetic viability will be maintained by the careful management of the original pairs and then the management of subsequent progeny. At some time in the future it will be necessary to import unrelated bloodlines.

This species will only be used for display, education and breeding to institutional and industry requirement in licensed zoos.

It has no pet potential nor are there any research projects designed for this species.

Only captive-bred animals, or rehab animals deemed to be unreleaseable in their range state, will be obtained from licensed zoos.

- **11. Guidelines on how species should be kept**

Transport of imported Bat-eared Foxes will comply with current IATA Live Animal Regulations.

The proposed enclosure size has been determined following the applicant's study tour of captive facilities in Europe. The proposed size of each enclosure, and the number of enclosures provided, conform with the information gleaned during that tour and comply with the Standards for Keeping Carnivores in NSW.

The Standards for Keeping Carnivores in NSW provide for a minimum size enclosure of 200 square metres for a pair of canids of similar size to Bat-eared Foxes.

Each Bat-eared Fox enclosure at the Darling Downs Zoo will be double that size.

Each enclosure is to be 2.5 metres high and have an in-hang of 700mm at 45 degrees to the perpendicular.

Enclosures are to be constructed of 75 x 50 x 3mm galvanised wire mesh. The enclosures will be locked at all times.

Each enclosure will have a 900mm-wide apron of wire mesh, buried beneath the substrate, internally around the complete perimeter fence of the enclosure.

This species will be kept in pairs or in groups of compatible juveniles awaiting dispersal.

Each enclosure for this species will have adequate shade – either from existing surrounding vegetation or artificially provided by shade cloth.

Enclosure furniture such as large logs and rocks will provide shelter in the enclosure from prevailing bad weather. Additionally, all animals will have full time access to their dens.

Keeper access to the enclosure will be through a lockable air-lock.

There will be no visitor access to these enclosures.

Visitor viewing will be from one side of the enclosure only, and visitors will be kept back from the enclosure by a 1200mm stand-off fence.

The zoo premises have 24 hour live-in security presence and, at night, guard dogs patrol the grounds.

The entire zoo property is enclosed with a security fence with lockable access gates.

These enclosures will be sufficiently large enough for the humane containment of the animals, and provide sufficient depth and length.

This is a social canid species not suited to holding as singletons. Progeny may be held as single sex groups awaiting dispersal to other zoos. Breeding will be controlled by contracepting females when required.

The Standards for Keeping Carnivores in NSW are the best Standards worldwide that we have found. In Australia the Standards are applied by State Governments: in the case of Darling Downs Zoo, the Queensland Government department – Biosecurity Queensland Exhibited Animals division applies these Standards as secondary legislation.

The environmental welfare for this species will be addressed by the provision of suitable substrate, non-toxic plants, logs, rocks and areas in which to hide from conspecifics as well as zoo visitors.

The nutritional welfare of this species will be catered for by the provision of a wide variety of meat items – including whole carcasses of small prey items.

The social and behavioural welfare of this species will be catered for by the keeping of them in socially appropriate pairs, dam with offspring, or single sex groups of juveniles awaiting dispersal.

The health of this species will be managed by veterinary professionals with canid experience and will include regular vet checks, worming, body scoring and weighing.

If all the foregoing are positive then the Five Domains Animal Welfare model guarantees that the animals' affective state will also be positive.

- **12. State/Territory controls**

*The Australian Government's "List of Specimens Taken to be Suitable for Live Import" does not currently include Bat-eared Fox. Five other species of wild Canidae are currently on the list as being allowed to be imported into Australia, namely Dingo (*Canis lupus dingo*), Maned Wolf (*Chrysocyon brachyurus*), Dhole (*Cuon alpinus*), African Hunting Dog (*Lycaon pictus*), and Fennec Fox (*Vulpes zerda*).

<https://www.legislation.gov.au/Series/F2006B01053>

Because Bat-eared Foxes have not been kept in Australian zoos before, they are not specifically covered by state legislations. A total of eleven other Canidae species are covered by the laws of the combined states, inclusive of Red Fox (*Vulpes vulpes*), Dingo (*Canis lupus / familiaris / dingo*) and Domestic Dog (*Canis familiaris*). The eight exotic canid species restricted to zoos in the state legislations are Wolf (*Canis lupus*), Coyote (*Canis latrans*), Black-backed Jackal (*Canis mesomelas*), Maned Wolf (*Chrysocyon brachyurus*), Dhole (*Cuon alpinus*), African Hunting Dog (*Lycaon pictus*), Raccoon Dog (*Nyctereutes procyonoides*), and Fennec Fox (*Vulpes zerda*).

*In Queensland the *Exhibited Animals Act 2015* does not cover the Bat-eared Fox (or any species specifically) but allows a licence holder to "Exhibit and deal with animals listed on this authority in accordance with information assessed and approved in deciding the application and details listed on this authority".

<https://www.legislation.qld.gov.au/view/pdf/inforce/current/act-2015-005>

*In New South Wales the *Non-Indigenous Animals Regulation 2012* does not list the Bat-eared Fox but does currently list eight other species of wild Canidae under Categories 2 and 3a (species which are restricted to licenced facilities). This regulation allows these species to be kept in zoos with a permit to be issued by the relevant state authority for possession of the species.

<https://www.legislation.nsw.gov.au/regulations/2012-405.pdf>

*In Victoria the *Catchment and Land Protection Act 1994* does not list the Bat-eared Fox but does currently list four other species of wild Canidae under Schedule 2 as Controlled Pest Animals. Species listed in Schedule 2 are allowed to be kept in zoos with a permit to be issued by the relevant state authority for possession of the species.

<http://www.gazette.vic.gov.au/gazette/Gazettes2010/GG2010S399.pdf>

*In South Australia the *Natural Resources Management Act 2004* does not list the Bat-eared Fox but does currently list eight other species of wild Canidae under Category 1 of Schedule 1. Species listed as such are allowed to be kept in zoos with a permit to be issued by the relevant state authority for possession of the species.

https://www.pir.sa.gov.au/_data/assets/pdf_file/0003/137460/Declaration_of_Animals_and_Plants_Jan_2015.pdf

*In Western Australia the *Biosecurity and Agricultural Management Act 2007* does not list the Bat-eared Fox as a species allowed to be kept in that state.

The *Biosecurity and Agricultural Management (Prohibited Organisms) Declaration 2013* is available at the following link (species arranged alphabetically by genus rather than taxonomically):

<https://www.agric.wa.gov.au/sites/gateway/files/BAM%20Decl%20s22%20%28Prohibited%20Organisms%29.pdf>

The Western Australian Organism List is searchable online at the following link for the most current results: <https://www.agric.wa.gov.au/organisms>

*In Tasmania the Bat-eared Fox has not been risk-assessed for the State.

<https://www.legislation.tas.gov.au/view/html/inforce/current/act-2002-063>

List of species which have been risk-assessed for Tasmania, which currently includes only one species of wild canid: <http://dpiwwe.tas.gov.au/wildlife-management/management-of-wildlife/wildlife-imports/species-risk-assessments>

*In the Northern Territory all non-native wildlife is classed as a "Prohibited Entrant" and applications for keeping these species (which would include the Bat-eared Fox) are assessed on a case-by-case basis.

<https://nt.gov.au/environment/animals/wildlife-permits/prohibited-wildlife>

*In the Australian Capital Territory there doesn't appear to be any specific legislative status of exotic zoo species.

Importation and quarantine requirements for live exotic Canidae to Australia have been covered in the "Interim Quarantine Requirements For The Importation Of Zoo Carnivores", and would cover Bat-eared Foxes if these were allowed to be imported.

<https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/ba/memos/2003/animal/2003-20a.pdf>

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Australian Government

**Department of Agriculture,
Water and the Environment**

Assessment of the Relevant Impacts of *Otocyon megalotis* (Bat-eared Fox) on the Environment (Assessment Report)

**Consideration of an application under the Environment Protection
and Biodiversity Conservation Act 1999 *List of Specimens taken to be
Suitable for Live Import***

February 2021

INTRODUCTION

Purpose of the proposed import

Darling Downs Zoo seeks to import an unspecified number of Bat-eared Fox (*Otocyon megalotis*) into Australia for public exhibition and to start a captive population.

The proposed import would initially be of 4 individuals, 2 male and 2 female which will be kept at Darling Downs Zoo. Importing 2 pairs, with each individual from separate bloodlines, will help achieve and maintain genetic diversity for the species in the Australasian region. Further imports may be undertaken to provide additional genetic stock.

The imported animals will all have been captive bred in licenced overseas zoos eligible to export animals to Australia.

Background

Under section 303EC of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the responsible Minister may amend the *List of Specimens taken to be suitable for live import* (Live Import List) by, relevantly, including a specimen on the list. Section 303EB of the EPBC Act dictates two parts to the Live Import List:

- Part 1 comprises specimens that can be imported without a permit under the EPBC Act and
- Part 2 comprises specimens that require a permit under the EPBC Act to be imported. For each specimen included in Part 2 of the list there is to be a notation regarding whether the inclusion is subject to restrictions or conditions. Restrictions or conditions may relate to a quantitative limit, the circumstances of import, the source of the specimen or the circumstances in which it was taken. Additional conditions may also be applied when the permit for import is issued.

Before amending the Live Import List, the Minister must consult with appropriate State and Commonwealth Ministers and may consult other appropriate persons, and consider a report assessing the potential environmental impacts of the proposed amendment (section 303EC of the EPBC Act). When submitting an application to the department to amend the Live Import List, all applicants are required to provide an accompanying draft assessment report that addresses specific terms of reference published on the department website.

The department undertakes an assessment of the potential environmental impacts of the proposed amendment using the information in the applicant's draft report and any other sources of relevant information. The department also considers comments and information received through the public consultation process (including states and territories). The application and accompanying draft report for the proposed import of Bat-eared Fox was released for public comment between 7 July and 28 August 2020. This assessment report was prepared in accordance with Section 303EE of the EPBC Act on the potential environmental impacts of listing the species. Under Section 303EC(5)(a) the Minister must consider this report before amending the list.

BIOLOGY AND ECOLOGY

Introduction

The Bat-eared Fox, (*Otocyon megalotis*) is a small grey brown canid native to 12 countries of southern and eastern Africa. It is distinguished by large ears which are used for thermoregulation as well as hunting its preferred prey, termites, and other insects.

Taxonomy

Kingdom: Animalia

Phylum: Chordata

Class: Mammalia (mammals)

Order: Carnivora (Carnivores)

Suborder: Caniformia (dogs, bears, mustelids, procyonids, and pinnipeds)

Family: Canidae (dogs)

Genus: *Otocyon*

Species: *megalotis*

There are two subspecies of Bat-eared Fox:

1. The South African subspecies, *Otocyon megalotis megalotis* which inhabits the southern area which includes southern Angola, southern Zambia, Namibia, Botswana, South Africa, Mozambique and Zimbabwe and includes *O.m. auritus*, *caffer*, *landii* and *steinhardtii*. (Castello, 2018), and
2. The East African subspecies, *Otocyon megalotis virgatus* - occurs from Ethiopia and southern Sudan to Kenya and Tanzania (Castello, 2018). The applicant refers to a third subspecies, *Otocyon megalotis canescens* of Ethiopia and Somalia, which Castello, (2018) places within *Otocyon megalotis virgatus*.

Description

The Bat-eared Fox is a small canid with average head-to-body length, excluding the tail, of 46-66cm (Castello, 2018); the tail adds another 23-34cm (Clarke Jr, 2005). Adults weigh between 3-5.4kg and the reported lifespan is 9 years (Castello, 2018) in the wild and up to 17 years in captivity (Weigl, 2005 - in application).

The Bat-eared Fox has a fluffy greyish-brown body, long black legs, racoon-like facial markings, bushy black tipped tail and very large alert ears that can be up to 13cm long. Females in some areas are larger than males but this is not consistent across the fox's range.

Bat-eared Foxes breed once a year – usually in the wet season when insects are most abundant. One to 6 pups are born in underground dens. The male protects the pups when in the den (Pauw, 2000). A pair may have several dens and move the litter to a new den every 2 to 14 days. Pups rely entirely on milk until weaning at 14-15 weeks of age and disperse

from the group at 5 to 6 months of age, attaining sexual maturity at 8 to 9 months (Clarke Jr, 2005).

Habitat/ Special adaptations

Bat-eared Foxes inhabit grasslands and shrublands in the semi-arid and arid parts of southern and eastern Africa. These animals are not known to live near waterholes and have never been observed drinking from freestanding waterholes (Clark Jr, 2005). They are not found in forests or deserts.

In the wild Bat-eared Foxes do not migrate, hibernate or aestivate and are active year-round. Bat-eared Foxes have adapted to extremely hot days and freezing nights by sleeping underground or in the shade during the heat of the day and huddling together for warmth at night. Bat-eared Foxes may have several burrows within their home range. As well as digging their own, Bat-eared Foxes use abandoned burrows. They are thought to base their activity on times when termites are most active rather than being physically restricted by the temperature (Pauw, 2000).

Diet

The Bat-eared Fox is mainly insectivorous feeding on mostly harvester termites (*Hodotermes mossambicus*). It has been estimated that 1.15 million termites can be eaten each year by a single Bat-eared Fox. Other insects are also included in the Bat-eared Fox's diet including beetles, grasshoppers, scorpions, solifugids (an arachnid that is described as a cross between a spider and scorpion) and myriapods (such as centipedes and millipedes), as well as rodents, and a small proportion of wild fruits, reptiles and birds (Stuart et al, 2003, Smithers, Nowak and Paridiso, 1999). Stuart (2003) records the presence of domestic stock hair in his scat research however states that this 'is probably a result of feeding on maggots in decomposing carcasses'. Seasonal variation in food availability at different sites is reflected in the dietary flexibility of this species, with the greatest variety of prey items being consumed in the summer (Jumbam et al, 2019). Vegetation is a very small part of the diet of Bat-eared Foxes.

Home range and social structure

Home ranges for individual groups of Bat-eared Foxes are between 0.3 and 8 km² depending on the availability and distribution of foods due to rainfall and season (Clarke Jr, 2005 and Hunter, 2018). Each home range includes several dens which are used for 2 days to 2 weeks at a time. The dens are burrows that are either dug by the foxes or created by other animals. Each den may be up to 3 metres in length and have multiple chambers and exits (Kingdon and Hoffman, 2013).

Bat-eared Foxes form monogamous pairs (Wright et al, 2010) and live in pairs or groups with their offspring. Mature young females may remain with their parents and breed with the male (their father) to form multi female groups (Clark Jr, 2005 and Dalerum et al, 2016). In some areas where food is plentiful communal breeding and polygyny can occur more often than monogamous breeding (Kingdon and Hoffman, 2013). In captivity records on a family group living harmoniously at a zoo in Germany show the original breeding pair continuing to produce litters each year whilst their adult offspring have never shown any mating attempts

and have even been recorded guarding and protecting their younger siblings (Göbel et al., 2020).

Home ranges of pairs and families may be discrete or overlap depending on the season and food sources. Interactions with neighbouring pairs or groups are generally reported as amicable (Malcolm, 1986) although contact between members of the same sex may be aggressive (Nowak and Paradiso, 1999). Up to 6 groups may amicably inhabit overlapping territory if the availability of termites is high enough.

Bat-eared Foxes ignore larger herbivores, avoid larger carnivores who may prey on them, and have been known to attack mongooses as a pack to protect their young (Clark Jr, 2005). They are hunted for their skins and killed by farmers who mistakenly perceive them as a predator of livestock in some areas of their home range (IUCN, 2014).

Environmental tolerances

Bat-eared Foxes can live in a large range of climates and are successfully bred in zoos in the US and Germany. In the wild they are only restricted to arid and semi-arid regions by the availability of their preferred food source, harvester termites of the genera *Hodotermes* and *Microhodotermes* (Kingdon and Hoffman, 2013).

In the wild Bat-eared Foxes are preyed upon by larger carnivores including black-backed jackals (*Canis mesomelas*) which are not only a dominant predator but can be a vector for diseases including rabies, canine distemper, and canine parvovirus (Dalerum et al, 2016). In Australia escaped Bat-eared Foxes would potentially be prey to dingoes and wild dogs.

Characteristics that may cause harm to humans or any other species

Due to their small size and insect eating adaptations such as reduced tooth size and small muzzle (Clarke, 2005), Bat-eared Foxes are not considered a threat to humans. They have blunt digging claws which are considered unable to do any more damage to a person or livestock than any other small carnivore – namely scratches and small bites.

Distribution and endemism (as regard conservation status)

Range Description:

The range of the Bat-eared Fox covers 7.5 million km² and is broken into 2 distinct areas 1000km apart in southern Africa and eastern Africa (Fig. 1). The southern subspecies, *Otocyon megalotis megalotis* inhabits the southern area which includes southern Angola, southern Zambia, Namibia, Botswana, South Africa, Mozambique and Zimbabwe.

The eastern population – the subspecies *Otocyon megalotis vergatus* - occurs from Ethiopia and southern Sudan, Kenya and Tanzania.



Fig.1:

Distribution map from IUCN (International Union for Conservation of Nature) 2008. Bat-eared Fox (Otocyon megalotis). The IUCN Red List of Threatened Species. Version 2019-1

Reason for import (captive breeding program etc.)

The proponent wishes to import 2 unrelated male and 2 unrelated female Bat-eared Foxes to develop a captive breeding population, in conjunction with other licenced zoos in Australia. The application states 'as the species is not endangered in the wild state, the global captive population serves primarily as ambassadors for their species and habitat, but also serves as a precautionary "safety net" in the event of future conservation threats'. Future importations will be necessary to ensure the introduction of unrelated bloodlines.

The animals would also be displayed to 'enhance the educational programmes within zoos, especially in relation to illustrating the diversity of life and of the Canidae and African habitats in particular'.

The department notes that there is no international conservation breeding program for Bat-eared Fox and that the applicant's use of the term 'conservation' means to introduce and maintain a breeding population of the species in Australia rather than the protection of the species from extinction.

There have never been Bat-eared Foxes in Australia (IPAC, 2015).

Below is a list of 7 canine species currently recorded as being present (kept in zoos and other facilities in accordance with State/Territory legislation) in Australia. No other canine species have ever been kept in Australia (IPAC 2015).

Scientific Name	Common Name (Synonyms)	Number currently being in kept Australian and New Zealand Zoos
<i>Vulpes vulpes</i>	Red Fox	2
<i>Vulpes zerda</i>	Fennec Fox	10
<i>Canis lupus familiaris</i>	Wild Dog	15
<i>Canis lupus dingo</i>	Dingo	129
<i>Chrysocyon brachyurus</i>	Maned Wolf	28
<i>Cuon alpinus</i>	Asiatic Wild Dog; Dhole; Indian Dhole; Red Dog	0
<i>Lycaon pictus</i>	African Hunting Dog; African Wild Dog; Wild Dog	87

There are currently approximately 250 animals of 6 species of canine held in Australian zoos as (contained) breeding populations (Australian zoo census data from Zoo and Aquarium Association (ZAA)).

Importation of Bat-eared Foxes would also be subject to an importation approval by the department under the *Biosecurity Act 2015* (Commonwealth).

Related Live Import List listings

There are currently 6 canids on the Live Import List. The domestic dog (*Canis lupus familiaris*) is listed on Part 1 of the Live Import List allowing importation without a permit. There are 5 canines on Part 2 of the Live Import List which are listed as 'eligible non-commercial purposes only, excluding household pets', namely:

Taxon	Common Name
<i>Canis lupus dingo</i>	Dingo
<i>Chrysocyon brachyurus</i>	Maned Wolf
<i>Cuon alpinus</i>	Asiatic Wild Dog, Indian Wild Dog, Dhole
<i>Lycaon pictus</i>	African Hunting Dog
<i>Vulpes zerda</i>	Fennec Fox

The Global Invasive Species Database (GISD, 2020) does not include any records of these species forming feral populations or having any detrimental environmental impacts anywhere in the world.

Conservation status

The Bat-eared Fox is not listed on any of the Convention on International Trade in Endangered Species of Wild Fauna and Flora Appendices (CITES, 2018).

The IUCN Red List has listed the Bat-eared Fox as 'Least Concern' as this species is relatively wide ranging and adaptable, and although habitat loss is taking place within its range, there is no reason to believe that it is declining at a rate that would warrant listing in a threatened category (Hoffman, 2014).

RISK ASSESSMENT

The department used the Australian Bird and Mammal Risk Assessment Model developed by Mary Bomford (2008) to assess the risks posed by the importation of the Bat-eared Fox (**Appendix A**). The results indicate that the species has:

- a moderate risk of establishing a wild population in the Australian environment if released.
- a moderate risk of becoming a pest if it were to establish.
- poses no danger to the public from either captive or released individuals.
- a theoretical Environment and Invasive Committee (formerly Vertebrate Pest Committee) threat category of **MODERATE** (using Australian Bird and Mammal Risk Assessment Model and Table 2.3 in Bomford, 2008).

The climate match, comparing the native range of the species to Australian climates using Climatch software, indicates that the Bat-eared Fox has an extreme climate match to Australia (**Appendix B**). This species has a highest Climatch class of '9' (out of 10) and 98% in the highest 5 classes, indicating that 98% of Australia is climatically similar to their natural habitat.

In their native distribution the Bat-eared Fox lives in semi-arid and arid open plains and shrublands and are often found in rangelands used for agricultural grazing. The species appears to be restricted to arid and semi-arid regions by the availability of their preferred food source, harvester termites of the genera *Hodotermes* and *Microhodotermes* (Kingdon and Hoffman, 2013). There are 350 species of termites in the Australian semi-arid and arid zones of which some are ground dwelling with similar habits and may be suitable primary food source for the Bat-eared Fox. If sufficient numbers of Bat-eared Fox escaped or were released into the appropriate parts of Australia it is likely the Bat-eared Fox could establish a feral population due to their high reproductive rate, the high level of care they give to their cubs and the predicted lack of predators. It is unlikely that this population could be self-sustaining however, due to the low numbers of animals likely to be held in zoos in Australia at any one time, and the resulting lack of genetic diversity.

The application states that Bat-eared Foxes have been successfully held and bred in zoos worldwide and there have been no reports of them establishing feral populations in any of these countries to date.

The only successful establishment of a wild breeding population was the deliberate reintroduction of Bat-eared Foxes into the Mountain Zebra National Park in South Africa. In this case the species was being returned to a place where they had previously been found (Lever, 1985 and, Long 2003).

There is no risk of the Bat-eared Fox hybridising with native Australian animals as the dingo (*Canis lupus dingo*) is the only canine native to Australia and it would see a Bat-eared Fox more as prey than a mate. Dingoes and wild domestic dogs (*Canis lupus familiaris*) have a different number of chromosomes (78) than Bat-eared Foxes who are the only canidae to have a chromosome count of 72 (Wayne et al, 1987). The Bat-eared Fox would also not be able to produce offspring with the red fox (*vulpes vulpes*) which have 34 chromosomes. Whilst there is evidence of crossbreeding occurring between species with minor differences in chromosome number, such as a horse (64 chromosomes) and a donkey (62 chromosomes) breeding to create a mule/hinny (63 chromosomes), the offspring are rarely fertile as chromosomes must be able to pair with a corresponding chromosome in order to create reproductive cells. There is major incompatibility between Bat-eared fox chromosomes and those of Dingoes or red foxes, so the necessary pairs will not be able to form. These animals will be unable to create viable offspring and a hybrid line will not be able to establish.

The Bat-eared Fox is not included in the Environment and Invasives Committee's 2018 'Australian List of Threat Categories of Non-indigenous Vertebrates' (EIC, 2018). Of the 6 canid species listed in the document, see below, all are assigned a threat category rating of "extreme" see below:

Order/Family	Scientific Name	Common Name	Threat category
Carnivora/ Canidae	<i>Canis lupus familiaris</i>	Dog (feral/wild form)	Extreme (P)
Carnivora/ Canidae	<i>Chrysocyon brachyurus</i>	Maned Wolf,	Extreme (P)
Carnivora/ Canidae	<i>Cuon alpinus</i>	Asiatic Wild Dog; Dhole; Indian Wild Dog; Red Dog	Extreme (P)
Carnivora/ Canidae	<i>Lycaon pictus</i>	African Hunting Dog; African Wild Dog; Wild Dog	Extreme
Carnivora/ Canidae	<i>Vulpes vulpes</i>	Red Fox	Extreme
Carnivora/ Canidae	<i>Vulpes zerda</i> (Synonym is <i>Fennecus</i>)	Fennec Fox	Extreme (P)

The rating of 'extreme' is qualified as 'These animals should not be allowed to enter, nor be kept in any State or Territory unless sufficient risk management measures exist to reduce the potential risks to an acceptable level.... If a species has not been assessed or if there is too little information to be able to properly adopt a risk analysis approach, the precautionary approach will be adopted, that is the species will be assigned to an Extreme (P) [Where 'P' stands for Precautionary]'. The Bat-eared Fox has not been assessed as it has never been recorded in Australia and is not on the Live Import List.

The plentiful availability of termites in the arid and semi-arid zones may provide suitable food sources for Bat-eared Foxes in Australia, however, unless sufficient numbers of individuals were available to establish a wild population, vulnerability to inbreeding as a result of genetic isolation reduces the probability that Bat-eared Foxes would be able to establish feral populations in Australia.

Potential impacts of established feral populations

Within its natural range Bat-eared Foxes are not considered a pest in any economic way (IUCN 2019) although some farmers mistakenly blame them for killing stock. The Global Invasive Species Database (2018) lists the following 5 members of the Canidae family as being invasive – that is, a species occurring, as a result of human activities, beyond its accepted normal distribution and which threatens valued environmental, agricultural or other social resources by the damage it causes (DAWE, 2021):

Species name	Common Name
<i>Canis latrans</i>	American Jackal, Brush Wolf, Coyote, Prairie Wolf
<i>Canis lupus familiaris</i>	Domestic dog
<i>Lycalopex griseus</i>	Argentinean grey fox
<i>Vulpes chama</i>	Cape Fox, Silver Jackal
<i>Vulpes vulpes</i>	Red fox

Likelihood of significant impacts on the environment,

As Bat-eared Foxes feed largely on termites, other insects and to a lesser extent, opportunistically on reptiles, fruit and birds, they would find food in most semi-arid and arid habitats in Australia. They would compete with numbats and echidnas for termite resources and may impact on ground dwelling species such as lizards, tunnelling spiders and ground nesting birds. In sufficient number they may impact on native species.

The Bat-eared Fox's use of abandoned burrows of other animals as den sites would reduce the impact on soil structure or the natural landscape. In Australia only the burrow of the wombat would be considered a suitable size for Bat-eared Foxes. Land degradation from burrow digging would only be a problem if there were extremely large numbers of Bat-eared Foxes.

Bat-eared Foxes in the wild are susceptible to external and internal parasites, and zoonoses. They can also be affected by all diseases that affect domestic dogs. Individuals will be vet checked prior to departure and arrival and will be subject to Department of Agriculture, Water and the Environment quarantine procedures.

RISK MITIGATION

The risk assessment (see Appendix A) indicates that the species has a **moderate** potential for establishing in Australia and a **moderate** chance it will become a pest if it were released.

Table 1: Summary of risks and mitigation measures

Risk	Likelihood	Impact	Mitigation measures	Overall risk
1. Release or escape of adult specimens	Very low	Moderate	Only kept in secure cages in zoos	very low risk
2. Release or escape of immature specimens	Very low	Moderate	Only kept in secure cages in zoos	very low risk
3. Disease transmission to native species populations	Very low	Low	Only kept in secure cages in zoos. Individuals will be vet checked prior to arrival and will be subject to Department of Agriculture, Water and the Environment quarantine procedures.	Negligible risk
4. Theft and deliberate release	Very low	Low	There are no recorded instances of theft of Bat-eared Foxes.	Negligible risk

The department considers that any risks posed by this species establishing a feral population and impacting on the environment would be adequately mitigated by listing the species with conditions limiting the import of live animals for zoo exhibitions.

Concerns raised and responses

The department undertook consultation with relevant ministers (or their delegates), government agencies and the public from 7 July – 28 August 2020. The department received responses from the NSW government and the Animal Justice Party – neither were supportive of the application. Below is a summary of the concerns raised and the department's response in *italics*:

1. The NSW government advised that the Bat-eared Fox is classed as 'prohibited dealings' under the NSW Biosecurity Act 2015 and is thereby prohibited from being kept in NSW. The NSW government is concerned that the species represents a biosecurity risk and has potential to be a vector of disease which could impact on trade, community and the Australian environment. Also noted was the fact the species is listed of 'least concern' by IUCN and 'therefore there is no justification for import to support international conservation efforts'.

While the status of animals under state or territory law is provided in the application Terms of Reference for the assessment of species for listing, being a prohibited dealing in NSW would not preclude the Bat-eared Fox from being listed. Once a species is placed on the Live Import List any imports would need to comply with the relevant state or territory laws. Individuals will be vet checked prior to arrival and will be subject to Department of Agriculture, Water and the Environment quarantine procedures.

2. The Animal Justice Party also questioned the need for conservation breeding of the species and called for larger enclosures to reduce the Bat-eared Fox's psychological stress.

This risk assessment examines the potential environmental impacts of importing Bat-eared Foxes. If the species is listed every import would require a permit from the department, during this phase the specifics of each importation regarding animal welfare, cage size and adequacy of the facilities would be determined before a permit was granted. The application provides details in section 11 of the conditions in which the animals will be transported in order to comply with current IATA Live Animal Regulations and kept according to state permitting standards.

In September 2020 the department sought comment and clarification on the status of the Bat-eared Fox for conservation breeding from the Zoo and Aquarium Association Australasia (ZAA).

1. ZAA states that the Bat-eared Fox is not a priority species for conservation breeding. The ZAA Carnivore and Small Exotic Mammal Taxon Advisory Group state that the Bat-eared Fox is not a priority Canid for formal management in the Australasia region under the ZAA Species Management Program and would not be entering Australia to participate in a ZAA-administered Species Management Program.

Based on the IUCN listing as Least Concern and the ZAA response, the listing of Bat-eared Foxes for the purposes of a species conservation breeding program is not justified.

A second consultation round was undertaken from 20 October to 9 November 2020 with state and territory government agencies only, via the GovTEAMS website. **No comments were received.**

Conclusion

Having undertaken an analysis and reviewed the available information, the department considers that the Bat-eared Fox has a low probability of establishing feral populations in Australia, and therefore low risk of having impacts on the environment in Australia, provided imports are restricted to exhibition purposes only and individuals are kept securely at zoos. Further, the department considers that listing the Bat-eared Fox for conservation purposes is unwarranted.

Consequently, the department recommends listing *Otocyon megalotis* (Bat-eared Fox) on Part 2 of the Live Import List with the condition, as per section 303FB(b): **Import for the purposes of exhibition only.**

Appendix A: Australian Bird and Mammal Risk Assessment Model

Australian Bird and Mammal Risk
Assessment Model

Australian Government
**Department of Agriculture,
Water and the Environment**

Species identification and sources

Common name	Bat-eared Fox
Scientific name	<i>Otocyon megalotis</i>
Date assessed	22-Jun-20
Literature Search Type and Date:	IUCN Red List of Threatened Species, Google,

Risks posed by captive or released individuals

	Value	Comment
A1. Risk to people from individual escapees (0–2)	0	Bat-eared Foxes have small sharp claws and sharp teeth and are capable of inflicting minor wounds on humans. However, the very small size of the animals prevents serious injuries.
A2. Risk to public safety from individual captive animals (0–2)	0	Nil or low risk to humans.
A. Risk posed by captive or released individual (= Sum of A 1 to 2).	0	Not dangerous

Risk of establishment

	Value	Comment
B1. Climate Match Score (1–6)	6	Suitable habitat found over the majority of the Australian continent and northern Tasmania.
B2. Exotic Population Established Overseas Score (0–4)	0	No exotic populations ever established.
B3. Overseas Range Size Score (0–2)	1	The species has never established or been released outside its natural range. Current natural range is 7.5 million km ² , previously 10 million km ² .
B4. Taxonomic Class Score (0–1)	1	Mammal
B5. Diet Score (0–1)	1	Bat-eared Foxes are dependent on a restricted range of food - mainly termites and other insects with some fruits.
B6. Habitat Score (0–1)	1	Bat-eared Foxes are only found in arid and semi-arid grasslands - some of which are used by humans for grazing livestock.
B7. Migratory Score (0–1)	1	Not migratory.
Model	2	
B. Risk of Establishment (Model 1 = Sum of B1 to B4; Model 2 = Sum of B1 to B7).	11	Moderate

Risk of becoming a pest

	Value	Comment
C1. Taxonomic group (0–4)	2	Bat-eared Fox is a 'Mammal in one of the orders that have been demonstrated to have detrimental effects on prey abundance and/or habitat degradation (Carnivora)'.
C2. Overseas range size including current and past 1000 years, natural and introduced range (0–2)	0	The extent of occurrence is approximately 7.5 million km ² .
C3. Diet and feeding (0–3)	1	Bat-eared Fox is a mammal that eats a mixture of animal and plant matter.

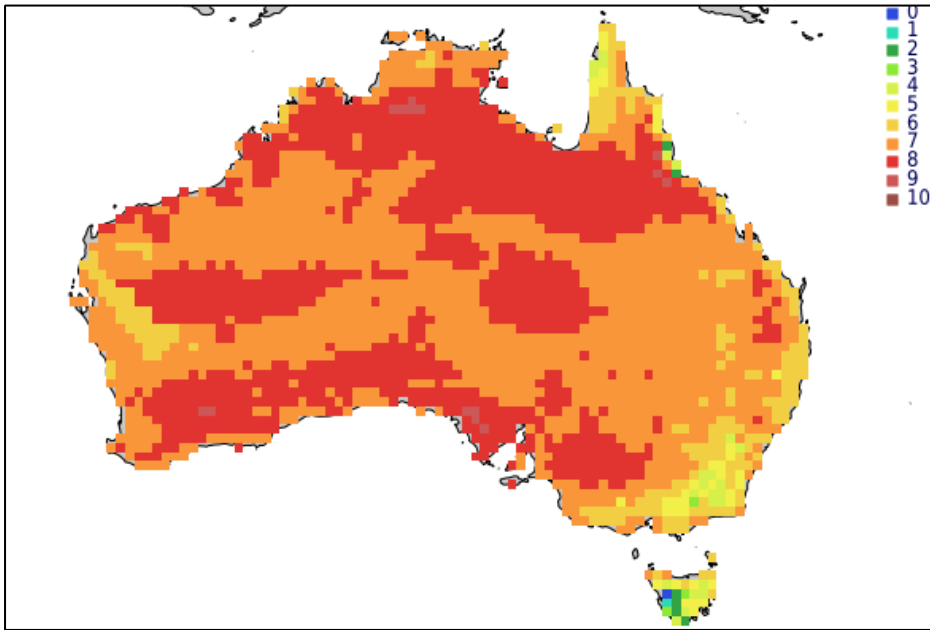
C4. Competition with native fauna for tree hollows (0–2)	0	The Bat-eared Fox does not use tree hollows.
C5. Overseas environmental pest status (0–3)	0	The Bat-eared Fox has never been reported as an environmental pest in any country or region.
C6. Climate match to areas with susceptible native species or communities (0–5)	4	The species has 2500 grid squares within the highest four climate match classes (ie in classes 10, 9, 8 and 7) that overlap the distribution of any susceptible native species or communities, and has 2750 grid squares within the highest six climate match classes that overlap the distribution of any susceptible native species or ecological communities.
C7. Overseas primary production pest status (0–3)	0	The Bat-eared Fox has not been identified in the literature as a primary production pest.
C8. Climate match to susceptible primary production (0–5) Hint: Use the "commodity" sheet created when a CLIMATCH grid is opened.	1	Low (species has attributes making it capable of damaging this or similar commodities and has had the opportunity but no reports or other evidence that it has caused damage in any country or region)
C9. Spread disease (1–2)	2	Species is mammalian. Score of 2 is predetermined.
C10. Harm to property (0–3)	1	Bat-eared Foxes have small sharp claws and sharp teeth, however the focus on termites and insects lowers the expected ability to inflict damage to property or ecosystems. The large potential range of this species within Australia, according to the Climatch modelling, indicates the opportunity for interaction between this species and the environment or property. This interaction is likely to be minor - hence the score of 1.
C11. Harm to people (0–5)	2	Bat-eared Foxes have small sharp claws and sharp teeth and are capable of inflicting minor wounds on humans. However, the very small size of the animals prevents serious injuries.
C. Pest Risk Score (= Sum of C 1 to 11).	13	Moderate

Summary	Value	
A. Risk to public safety posed by captive or released individuals	0	Not dangerous
B. Risk of establishing a wild population	11	Moderate
C. Risk of becoming a pest following establishment	13	Moderate

Disclaimer This risk assessment does not account for everything that is likely to affect to the risk of establishment.

It should be interpreted in the light of any other information you may have.

APPENDIX B: CLIMATCH PREDICTED RANGE.



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COMMONWEALTH OF AUSTRALIA*Environment Protection and Biodiversity Conservation Act 1999***List of Specimens taken to be Suitable for Live Import Amendment (Bat-eared Fox)
Instrument 2021**

I, Sussan Ley, Minister for the Environment, pursuant to subparagraph 303EC(1)(a)(i) and 303EC(1)(a)(iii) of the *Environment Protection and Biodiversity Conservation Act 1999*, and having considered a report prepared for the purposes of paragraph 303EC(5)(a) of that Act, make the following amendment to Part 2 to the *List of Specimens Taken to be Suitable for Live Import (29/11/2001)* under the heading Vertebrate Animals, Mammals (Mammalia) in the appropriate alphabetic position:

Add:

<i>Taxon</i>	<i>Common Name</i>	<i>Conditions for import</i>
<i>Otocyon megalotis</i>	Bat-eared Fox	Import for the purposes of exhibition only.

This instrument commences the day after registration.

Dated / /2021

SUSSAN LEY
Minister for the Environment

EXPLANATORY STATEMENT

Environment Protection and Biodiversity Conservation Act 1999

List of Specimens taken to be Suitable for Live Import Amendment (Bat-Eared Fox) Instrument 2021

Instrument under subparagraphs 303EC(1)(a)(i) and 303EC(1)(a)(iii)

Issued under authority of the Minister for the Environment

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), a live specimen is taken to be suitable for import if it is included on the *List of Specimens Taken to be Suitable for Live Import (29/11/2001)* (Live Import List).

The Live Import List was established under section 303EB of the EPBC Act and has two parts. Part 1 comprises a list of unregulated specimens exempt from the requirement for an import permit under the EPBC Act. Part 1 of the list must not contain a CITES specimen. Part 2 comprises a list of allowable regulated specimens that can be imported with a permit issued by the Minister, along with notation of any restrictions or conditions attached to the inclusion of a specimen.

Subsection 303EC(1) of the Act relevantly provides that the Minister may, by legislative instrument, amend the Live Import List by:

- including items in a particular part of the list;
- deleting items from a particular part of the list;
- imposing a restriction or condition to which the inclusion of a specimen in Part 2 of the list is subject;
- varying or revoking a restriction or condition to which the inclusion of a specimen in Part 2 of the list is subject; or
- correcting an inaccuracy or updating the name of a species.

Amendments to include an item can be made either on the initiative of the Minister, under section 303ED of the EPBC Act, or by application from a person made under section 303EE of the EPBC Act.

Subsection 303EC(3) of the EPBC Act provides that before amending the list referred to in section 303EB as mentioned in paragraph 303EC(1)(a), the Minister:

- must consult each other Minister or Ministers as the Minister considers appropriate; and
- must consult each other Minister or Ministers of each State and self-governing Territory as the Minister considers appropriate; and
- may consult such other persons and organisations as the Minister considers appropriate.

Further, subsection 303EC(5) of the EPBC Act provides that the Minister must not amend the list referred to in section 303EB by including an item in the list unless:

- the amendment is made following consideration of a relevant report under section 303ED or section 303EE; or
- the amendment is made following consideration of a relevant review under section 303EJ.

The *List of Specimens taken to be Suitable for Live Import Amendment (Bat-eared Fox) Instrument 2021* (the Amendment Instrument) amends the Live Import List to include *Otocyon megalotis* (Bat-eared Fox) in Part 2 with the condition: “Import for the purposes of exhibition only”.

This amendment to the list to add *Otocyon megalotis* was initiated by an application made to the Minister under section 303EE of the EPBC Act. An assessment of the potential impacts on the environment of the proposed amendments was reported to the Minister, in accordance with subsection 303EE(3).

In accordance with paragraph 303EF(2)(b) of the EPBC Act, the draft assessment report was published on the Department of Agriculture, Water and the Environment’s website and public comments sought between 7 July and 28 August 2020. Two responses were received, and neither were supportive of the amendment.

The concerns raised in the responses included that the species were not a priority species for conservation purposes; they may be vectors for disease, and possible animal welfare issues related to limited opportunities for social interaction.

The department concluded that any risks of the species establishing a feral population and impacting on the environment would be adequately mitigated by limiting import of this species for exhibition purposes only.

Comment and clarification were sought in September 2020 from the Zoo and Aquarium Association Australasia (ZAA) who confirmed that internationally the Bat-eared Fox is not a priority species for conservation breeding.

Consultation concerning the amendment to Part 2 of the Live Import List was also carried out, in accordance with paragraph 303EC(3)(c) of the EPBC Act. In this case, the Department of Agriculture, Water and the Environment consulted with relevant Commonwealth, state and territory agencies for the environment, conservation and agriculture. No comments were received.

The final assessment report was provided to the Minister. In accordance with paragraph 303EC(5)(a) of the EPBC Act, the Minister considered the report before deciding to amend the list to include *Otocyon megalotis* in Part 2 of the Live Import List.

This instrument is a legislative instrument for the purposes of the *Legislation Act 2003*. It commences the day after registration.

Statement of Compatibility with Human Rights

Prepared in accordance with Part 3 of the Human Rights (Parliamentary Scrutiny) Act 2011

Environment Protection and Biodiversity Conservation Act 1999

List of Specimens taken to be Suitable for Live Import Amendment (Bat-eared Fox) Instrument 2021

This Legislative Instrument is compatible with the human rights and freedoms recognised or declared in the international instruments listed in section 3 of the *Human Rights (Parliamentary Scrutiny) Act 2011*.

Overview of the Legislative Instrument

The purpose of this instrument is to amend Part 2 of the *List of Specimens taken to be Suitable for Live Import (29/11/2001)* to include *Otocyon megalotis* (Bat-eared Fox) in accordance with section 303EC of the *Environment Protection and Biodiversity Conservation Act 1999*.

Human rights implications

This Legislative Instrument does not engage any of the applicable rights or freedoms.

Conclusion

This Legislative Instrument is compatible with human rights as it does not raise any human rights issues.

**The Hon Sussan Ley MP
Minister for the Environment**

Attachment E

Comments received on the draft assessment report on proposal to include *Otocyon megalotis* (Bat-eared Fox) for zoo exhibition purposes.

Round 1 - The first comment period for this draft assessment report ran from 7 July – 28 August 2020. A summary of the comments received are as follows, the original comments are included below the table:

Respondant	Summary of Comments	Department's Response
NSW Government	The NSW government advised that the Bat-eared Fox is classed as 'prohibited dealings' under the NSW Biosecurity Act 2015 and is thereby prohibited from being kept in NSW. The NSW government is concerned that the species represents a biosecurity risk and has potential to be a vector of disease which could impact on trade, community and the Australian environment. Also noted was the fact the species is listed of 'least concern' by IUCN and 'therefore there is no justification for import to support international conservation efforts'.	While the status of animals under state or territory law is considered in the assessment of species for listing, being a prohibited dealing in NSW would not preclude the Bat-eared Fox from being listed. Once a species is placed on the Live Import List any imports would need to comply with the relevant state or territory laws. Individuals will be vet checked prior to arrival and will be subject to Department of Agriculture, Water and the Environment quarantine procedures.
Animal Justice Party	The Animal Justice Party also questioned the need for conservation breeding of the species and called for larger enclosures to reduce the Bat-eared Fox's psychological stress.	This risk assessment examines the potential environmental impacts of importing Bat-eared Foxes. If the species is listed every import would require a permit from the department, during this phase the specifics of each importation regarding animal welfare, cage size and adequacy of the facilities would be determined before a permit was granted.



Ms s. 22(1)(a)(ii)

Director

Listings and Threat Abatement, Environmental Biosecurity Office

Department of Agriculture, Water and the Environment

GPO Box 787

CANBERRA ACT 2601

EMAIL: exotic.species@awe.gov.au

Ref: OUT20/10283

Dear s. 22(1)(a)(ii)

Thank you for providing the opportunity to comment on the applications to amend the 'List of Specimens taken to be Suitable for Live Import' (Live Import List) under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) to include Bat-eared fox, *Otocyon megalotis* and Red-bellied tamarin, *Saguinus labiatus*.

Managing the biosecurity risks of non-indigenous species is a key concern for NSW Department of Primary Industries. The Bat-eared fox and the Red-bellied tamarin are both species that represent biosecurity risks to NSW due to their potential negative impacts if they were to establish wild populations, as well as being vectors of diseases with significance to trade, community and the Australian environment. Bat-eared foxes and Red-bellied tamarins are listed by the International Union for the Conservation of Nature as of 'Least Concern' for conservation and therefore there is no justification for import to support international conservation efforts.

Please note that the applications are in error with respect to the legal status of the species in NSW. Both the Bat-eared fox, and the Red-bellied tamarin are classed as prohibited dealings under the *NSW Biosecurity Act 2015*, thereby prohibiting either species from being kept in NSW. We would also have concerns with other jurisdictions keeping these species due to potential future movements of the species within the country if their import was allowed.

For the above reasons, NSW DPI does not support the applications to amend the Live Import List to include Bat-eared fox and Red-bellied tamarin.

I have asked that s. 47F(1) Manager Invasive Species Strategy and Planning, be available, should you need further information or wish to discuss this matter further. s. 47F(1) may be contacted on s. 47F(1)

Yours sincerely

s. 47F(1)

Director Invasive Species Biosecurity



Committee Secretariat
PO Box 6021
Parliament House
Canberra ACT 2600

Submission: Import of Bat-Eared Fox for Zoo Display

This submission has been prepared by the national submissions working group within the Animal Justice Party ('the AJP'). The working group makes this submission on behalf of the AJP with the approval and the endorsement of the Board of Directors. The AJP was established to promote and protect the interests and capabilities of animals by providing a dedicated voice for them in Australia's political system, whether they are domestic, farmed or wild. The AJP seeks to restore the balance between humans, animals and nature, acknowledge the interconnectedness and interdependence of all species, and respect the wellbeing of animals and the environment alongside that of humans and human societies. The AJP advocates for all animals and the natural environment through our political and democratic institutions of government. Above all, the AJP seeks to foster consideration, respect, kindness and compassion for all species as core values in the way in which governments design and deliver initiatives and the manner in which they function. The following submission is underpinned by these fundamental beliefs.

The AJP has a policy position on *zoos* and *animals for entertainment*. The AJP only supports zoos where they function in the service of animals. Functions may include breeding of endangered animals, rescue and rehabilitation and serving as a permanent home for animals where release is not possible or appropriate. Formidable animal welfare challenges exist around Australia with regard to the unnatural use of animals in commercially-operated entertainment enterprises, such as zoos. The Animal Justice Party believes that animals

should be enjoyed, appreciated, respected and cared for in as close to their natural state as possible. They should never be terrified as they perform unnatural behaviours or goaded to provide opportunities for humans to demonstrate 'skills' in taunting and subduing them for audience amusement. Visitors, where allowed, should not adversely impact animals. This submission puts forward commentary in line with this policy position.

THE SUBMISSION

The AJP holds the position that the treatment of all animals, regardless of their origin, should be humane. The AJP argues against the import of Bat-eared Foxes on the grounds that it is purely for zoo entertainment and not for conservation. The Darling Downs Zoo proposes that the Bat-eared Fox application is to import a unique species for:

- 1) captive breeding [ultimately in collaboration with other licensed zoos] to further the conservation of this species in captivity.
- 2) public display as an ambassador for this species.
- 3) facilitating the education of zoo visitors about different members of this taxa.

However, this species is not listed as endangered; the Bat-eared Fox is not included in the CITES Appendices¹ and is only listed by the IUCN² as LC (Least Concern). Conservation should be carried out in the native land of the species in their natural environment or as closely to as possible.

The Standards for Keeping Carnivores in NSW provide for a minimum size enclosure of 200 square metres for a pair of canids of similar size to Bat-eared Foxes. Darling Downs Zoo states each Bat-eared Fox enclosure will, at the least equal that size. However, this enclosure will be unnaturally small and will no doubt cause these Bat-eared Foxes psychological stress.

Instead of importing exotic animals for zoo display, the AJP promotes the creation of government-funded educational initiatives that promote alternative cruelty-free forms of entertainment and allow deductible gift recipient status for approved not-for-profit organisations working in conservation.

Summary of recommendations:

- Prohibiting the import of Bat-eared Foxes to be used in public display
- Increasing the minimum size enclosure of 200 square metres for a pair of canids of similar size to Bat-eared Foxes in zoos.

In conclusion, the AJP argues against the import of the Bat-eared Fox application. The AJP seeks an alternative move towards societal acceptance so that all species are treated in a humane manner which moves society towards the treatment of all animals with respect, dignity, compassion, and kindness. The AJP also advocates for the protection of habitats and ecosystems so that animals can survive and thrive in their natural environments.

s. 47F(1)

National Submissions Manager

Animal Justice Party

Email: submissions@animaljusticeparty.org

References

1. CITES home page: <https://cites.org/eng>
2. IUCN page for "Otocyon megalotis":
<https://www.iucnredlist.org/species/15642/46123809>

Round 2 - A second consultation round seeking comment from state and territory government agencies on the applicants' reports and the department's updated Risk Assessment Report was undertaken from 20 October to 9 November 2020 via the GovTEAMS website.

No comments were received.

Additional consultation - In September 2020 additional comment was sought from the Zoo and Aquarium Association Australasia (ZAA), the summary and original response are below:

Respondant	Summary of Comments	Department's Response
Zoo and Aquarium Association Australasia (ZAA)	The Zoo and Aquarium Association states that the Bat-eared Fox is not a priority species for conservation breeding. The ZAA Carnivore and Small Exotic Mammal Taxon Advisory Group state that the Bat-eared Fox is not a priority Canid for formal management in the Australasia region under the ZAA Species Management Program and would not be entering Australia to participate in a ZAA-administered Species Management Program.	Based on the IUCN listing as Least Concern and the ZAA response, the listing of Bat-eared Foxes as part of a species conservation breeding program is not justified.

From: s. 47F(1) ZAA Executive Office [s. 47F\(1\)@zooaquarium.org.au](mailto:s.47F(1)@zooaquarium.org.au)
 Sent: Thursday, 10 September 2020 3:12 PM
 To: s. 22(1)(a)(ii) [s. 22\(1\)\(a\)\(ii\)@environment.gov.au](mailto:s.22(1)(a)(ii)@environment.gov.au)
 Cc: Exotic Species <Exotic.Species@environment.gov.au>; s. 22(1)(a)(ii) [s. 22\(1\)\(a\)\(ii\)@environment.gov.au](mailto:s.22(1)(a)(ii)@environment.gov.au) | ZAA Executive Office [s. 47F\(1\)@zooaquarium.org.au](mailto:s.47F(1)@zooaquarium.org.au)
 Subject: RE: ZAA feedback on application to List new species [SEC=OFFICIAL]

Dear s. 22(1)(a)(ii)

Thank you for the invitation to provide advice on the potential listing and importation of Red-bellied Tamarin (*Saguinus labiatus*) and Bat-eared Fox (*Otocyon megalotis*) for conservation breeding.

Red-bellied Tamarin

The Zoo and Aquarium Association oversees the formal management of three Callitrichid species (Cotton-top Tamarin, Golden Lion-tamarin and Pygmy Marmoset) with plans to formally manage an additional one species (Emperor Tamarin). These four species have been identified and agreed by the ZAA Primate Taxon Advisory Group (Primate TAG) as the priority Callitrichids for formal management in the Australasia region under the ZAA Species Management Program (ZAA SMP, formerly ASMP). The Primate TAG has representation from all ZAA Members with an interest in primates. Red-bellied Tamarin is not currently a Primate TAG-identified priority and would not be entering Australia to participate in a ZAA-administered Species Management Program.

Bat-eared Fox

The Zoo and Aquarium Association oversees the formal management of one Canid species (African Wild Dog). This species has been identified and agreed by the ZAA Carnivore and Small Exotic Mammal TAG as the priority Canid for formal management in the Australasia region under the ZAA SMP. The Carnivore and Small Exotic Mammal TAG has representation from all ZAA Members with an interest in Carnivores and Small Exotic Mammals. Bat-eared Fox is not currently a Carnivore and Small Exotic Mammal TAG-identified priority and would not be entering Australia to participate in a ZAA-administered Species Management Program.

In instances where ZAA Members wish to care for a species with a point of difference to the ZAA TAG-identified priority species', Members are encouraged to support other recognised zoo and aquarium associations administering a program for that species.

It is understood that there is a studbook kept for Red-bellied Tamarin under the European Association of Zoos and Aquariums (EAZA), however a formal program (with provision of recommendations for transfer and breeding) is not managed by EAZA. Similarly, the North American Association of Zoos and Aquaria (AZA) does not formally manage a program for Red-bellied Tamarin.

Both EAZA and AZA formally manage a program for Bat-eared Fox.

Please feel free to get in touch if you require additional information.

Best,

s. 47F(1)

Manager, Conservation & Australasian Species Management Program

ASMP SSC Southern Cassowary, Tasmanian Devil, Sumatran Tiger, Southern White Rhinoceros (co-acting)
 ICGV SSC Australasian Marsupial & Monotreme SG Member
 Zoo and Aquarium Association (ZAA)

In office: Monday – Friday

s. 47F(1)

NZ Toll-free to AU office: 0800 453 155

s. 47F(1) [s. 47F\(1\)@zooaquarium.org.au](mailto:s.47F(1)@zooaquarium.org.au)

www.zooaquarium.org.au

PO Box 538, Mosman NSW 2088 Australia

DEPARTMENT OF AGRICULTURE, WATER AND THE ENVIRONMENT

MS21-000562

To: Minister for the Environment (For Decision)

INSTRUMENT TO AMEND THE LIST OF SPECIMENS SUITABLE FOR LIVE IMPORT UNDER SECTION 303EC OF THE *ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999* (THE LIVE IMPORT LIST) TO INCLUDE *SAGUINUS LABIATUS* (RED-BELLIED TAMARIN)**Timing:** Decision about whether to make the instrument is required within 30 business days of the Minister receiving the Report (section 303EG of the EPBC Act).**Recommendation/s:**

1. That having considered the report (**Attachment B**), prepared in accordance with paragraph 303EC (5)(a) of the *Environment Protection and Biodiversity Conservation Act 1999* (the Act), you agree to include *Saguinus labiatus* (Red-bellied Tamarin) to **Part 2** of the Live Import List.

Agreed / Not agreed

2. That you give effect to your decision by signing the Legislative Instrument at **Attachment C**.

Signed / Not signed

3. That you approve the Explanatory Statement, with the Statement of Compatibility with Human Rights, for the Legislative Instrument at **Attachment D**.

Approved / Not approved**Minister:**

Date:

Comments:

Clearing Officer: Sent: 27/04 /2021	Robyn Cleland	Chief Environmental Biosecurity Officer	Ph: s. 47F(1) Mob: s. 47F(1)
Contact Officer:	s. 22(1)(a)(ii)	Listings and Threat Abatement	Ph: s. 22(1)(a)(ii) Mob: s. 22(1)(a)(ii)

Key Points:

1. This brief seeks your decision to amend the *List of Specimens Taken to be Suitable for Live Import (29/11/2001)* (Live Import List) made under section 303EB of the *Environment Protection and Biodiversity Conservation Act 1999* (the Act) to include *Saguinus labiatus* (Red-bellied Tamarin).

2. Under subsection 303EC (1) of the Act you may amend the Live Import List by including or deleting items, as well as varying or revoking restrictions to which the inclusion of a specimen on Part 2 of the Live Import List is subject. This power is exercisable by you personally and has not been delegated.
3. In May 2020, Darling Downs Zoo made an application to include *Saguinus labiatus* on the Live Import List to start a captive population and for public display and education purposes (**Attachment A**).
4. The department has made an assessment of the potential impacts on the environment of listing of *Saguinus labiatus* as required under paragraph 303EE(3)(b) of the Act. The department has prepared a report on those impacts in accordance with section 303EF of the Act (**Attachment B**), finding:
 - a. the species has a low potential for establishing in Australia if released;
 - b. the species poses a low risk to native wildlife, livestock and the public; and
 - c. as the species is CITES listed it could only be held in Zoos.
5. The department concludes that any risks of the species establishing a feral population and impacting on the environment would be mitigated by limiting import of this species for exhibition purposes only.
6. For the reasons set out in the Report at **Attachment B**, the department recommends that *Saguinus labiatus* be included on Part 2 of the Live Import List with the following conditions: **Import for the purposes of exhibition only.**
7. The Legislative Instrument necessary to make the recommended changes is at **Attachment C** for your signature. The Legislative Instrument is disallowable for a period of 15 sitting days after being tabled in Parliament. The associated Explanatory Statement, including a Statement of Compatibility with Human Rights, is at **Attachment D**.
8. Under Australia's regulatory regime, consideration for importing live animals requires the assessment of risks under the:
 - a. EPBC Act (environmental impacts); and
 - b. *Biosecurity Act 2015* (pests and diseases).

While the two Acts have different requirements, they both assess and manage the risk of pests entering Australia and causing harm to the environment. A species must be eligible for importation under the EPBC Act before an assessment of biosecurity risks and the development of import conditions is finalised. Once both these processes are finalised, live import of the species is permitted.

Sensitivities and Handling: Nil

Consultation: YES

9. In accordance with paragraph 303EF(2)(b), the department published the applicant's draft assessment report for public comment between 7 July and 28 August 2020. In addition, consultation was undertaken with the relevant states and territories between 7 July and 28 August 2020. The NSW Government and one non-government organisation responded (**Attachment E**):
 - a. The NSW Government did not support the amendment on the grounds the species is listed as of "least concern" for conservation purposes, may act as a vector for disease and is classed as prohibited dealings under the NSW *Biosecurity Act 2015*.
 - b. The Animal Justice Party does not support the listing on the grounds the species is not conservation breeding dependent and questioned the conditions for keeping the animals in captivity.
10. In September 2020 comment and clarification was sought from the Zoo and Aquarium Association Australasia (ZAA) who confirmed that the Red-bellied Tamarin is not a priority species for conservation breeding.
11. A second consultation round was undertaken between 20 October and 9 November 2020 with state and territory government agencies only, via the GovTEAMS website. No comments were received.
12. The Legislation Practice in the Legal Division was consulted in finalising the briefing package.

Attachments:

- A:** Applicant's assessment report
- B:** Report prepared in accordance with section 303EC(5)(a) of the Act
- C:** Legislative Instrument
- D:** Explanatory Statement
- E:** Comments received

Draft Terms of Reference – Red-bellied Tamarin

- **Provide information on the taxonomy of the species**

Kingdom: Animalia

Phylum: Chordata

Class: Mammalia (mammals)

Order: Primates (monkeys and apes)

Suborder: Haplorrhini (New World primates)

Family: Cebidae (New World monkeys)

Subfamily: Callitrichinae (marmosets and tamarins)

Genus: *Saguinus*

Species: *labiatus*

Subspecies: *labiatus*, *rufiventer*, *thomasi*

Synonyms (disused): *Midas elegantulus* Slack 1862, *Midas erythrogaster* Reichenbach 1862, *Midas griseovortex* Goeldi 1907

Common name: Red-bellied Tamarin

Alternative common names: White-lipped Tamarin; Red-chested Tamarin; Red-chested Moustached Tamarin; Geoffroy's Tamarin.

Note that "Geoffroy's Tamarin" is also the common name for a separate species, *Saguinus geoffroyi*, and there is also the similarly-named Geoffroy's Marmoset *Callithrix geoffroyi*.

Note also that the common name "Moustached Tamarin" is more often used for the species *Saguinus mystax*, and so this is sometimes modified (for *S. mystax*) to "Black-chested Moustached Tamarin" while *Saguinus labiatus* is then known as the "Red-chested Moustached Tamarin".

The Red-bellied Tamarin was first described by Etienne Geoffroy Saint-Hilaire in 1812 as *Midas labiatus*.¹

The subfamily Callitrichinae (marmosets and tamarins) has usually been subsumed into Cebidae as a subfamily, as in Wilson & Reeder (2005)² and Garbino (2015).³ CITES also still includes the callitrichid species under Cebidae.⁴ Equally commonly it is elevated to a full family, Callitrichidae, as in e.g. Rylands *et al* (2016)⁵ and Buckner *et al* (2015).⁶

There are three currently-recognised subspecies of Red-bellied Tamarin: *S. l. labiatus* (Geoffroy's Red-bellied Tamarin), *S. l. rufiventer* (Gray's Red-bellied Tamarin), and *S. l. thomasi* (Thomas' Red-bellied Tamarin).^{7,8} They can be distinguished through relatively minor differences in colouration, in particular by the patterning on the top of the head. All three subspecies are depicted in, e.g., Rylands *et al* (2016)⁹ for comparison with one another.

The animals kept in zoos worldwide are listed on ZIMS as either being of unknown/unconfirmed origin/subspecies, or as the nominate subspecies *Saguinus labiatus labiatus*.¹⁰

- ¹ Groves, C. (2001) "*Primate Taxonomy*" Smithsonian Institution
- ² Wilson, D.E., and D.M. Reeder (eds) (2005) "*Mammal Species of the World: a taxonomic and geographic reference*" (3rd edition), John Hopkins University Press
- ³ Garbino, G.S.T. (2015) "How many marmoset (Primates: Cebidae: Callitrichinae) genera are there? A phylogenetic analysis based on multiple morphological systems" *Cladistics* vol. 31 (6), pp. 652-678
- ⁴ CITES species list for "Cebidae": <https://cites.org/eng/taxonomy/term/5882>
- ⁵ Rylands, A.B., E.W. Heymann, J.L. Alfaro, J.C. Buckner, C. Roos, C. Matauschek, J.P. Boubli, R. Sampaio, and R.A. Mittermeier (2016) "Taxonomic review of the New World tamarins (Primates: Callitrichidae)" *Zoological Journal of the Linnean Society* vol. 177, pp. 1003-1028
- ⁶ Buckner, J.C., J.W. Lynch Alfaro, A.B. Rylands, and M.E. Alfaro (2015) "Biogeography of the marmosets and tamarins (Callitrichidae)" *Molecular Phylogenetics and Evolution* vol. 82, pp. 413-425
- ⁷ Wilson and Reeder (2005), *op. cit.*
- ⁸ Rylands *et al* (2016), *op. cit.*
- ⁹ Rylands *et al* (2016), *op. cit.*
- ¹⁰ *Species360* Zoo Aquarium Animal Management Software (ZIMS)

- **Provide information on the status of the species under CITES**

CITES Listing: Appendix II

IUCN Red List Status: LC (Least Concern)

The Red-bellied Tamarin is listed by CITES on Appendix II¹¹ which permits trade when issued with an export permit. The species is listed by the IUCN as LC (Least Concern).¹²

The species has a fairly wide distribution in central Amazonia, within the countries of Brazil, Bolivia and Peru.¹³

Total population figures appear to be unknown but the Red-bellied Tamarin is considered common within its range. The IUCN states that "much of the range of species occurs in one of the least disturbed areas of the Brazilian Amazon, and there are currently no major threats to the species".¹⁴

¹¹ CITES page for "Saguinus labiatus": <https://cites.org/eng/node/24620>

¹² IUCN page for "Saguinus labiatus": <http://www.iucnredlist.org/details/41524/0>

¹³ IUCN page for "Saguinus labiatus": <http://www.iucnredlist.org/details/41524/0>

¹⁴ IUCN page for "Saguinus labiatus": <http://www.iucnredlist.org/details/41524/0>

- **Provide information about the ecology of the species.**

Callitrichids have short lifespans if compared to other of the higher Primates, with averages of less than ten years (with shorter average lifespans in marmosets than in tamarins).¹⁵ In captivity animals live longer than in the wild, often two or three times as long, with longevity records of over twenty years being available for many species.¹⁶ The oldest Red-bellied Tamarin on record was a captive animal which died aged 20.5 years.¹⁷ Contrasting with this is the observation that in the wild Red-bellied Tamarins are "old" at around eight years of age based on tooth-wear.¹⁸

Petter and Desbordes (2010)¹⁹ give the measurements of the Red-bellied Tamarin as a head-body length of 26cm and tail length of 39cm. Weight is given in the same source as 460 grams. The sexes of all species of callitrichids can be easily determined by examination of the external genitalia.²⁰ In

general appearance all callitrichids are monomorphic (male and female are similar in colour and size).²¹

The Red-bellied Tamarin is largely blackish in colour with silvered streaking on the back. The underparts are bright orange or reddish, hence the common name. There is a white marking covering the nose and encircling the mouth, somewhat likened to a moustache, giving them their alternative common names of White-lipped Tamarin and (Red-chested) Moustached Tamarin. The species is easily distinguished from all other callitrichids by colouration. No other callitrichid has orange underparts, and the only other tamarin with a white nose and lips is the (Black-chested) Moustached Tamarin *Saguinus mystax* which has black underparts. All callitrichids are easily differentiated from other families and species of monkeys by virtue of their small body-size. All species of marmosets and tamarins are illustrated for comparative purposes in Rylands *et al* (2008)²² and Mittermeier *et al* (2013).²³

The Red-bellied Tamarin is found in south and south-central Amazonia, within the countries of Bolivia, Brazil and Peru, where they are found predominantly in primary and secondary forests.²⁴ They cannot survive in or travel across open grasslands or other habitats with an absence of tree cover. As with many Primate species in South America, distributions are often demarcated by large rivers which act as barriers.^{25,26}

The species is sedentary (non-migratory) and, as with all higher Primates, does not hibernate or aestivate. Their area of distribution is within lowland tropical forest with a seasonally-dry climate. Annual temperatures are between 20 and 30 degrees Celsius, and the annual rainfall varies across their range between 1000-2000mm.²⁷ The species is not dependant on waterways - these in fact act as barriers of distribution - and, as an arboreal species, occur in many different forest types sited away from water bodies. They may utilise seasonally-flooded forests but only in the dry season when the habitat is not inundated.²⁸

Based on captive studies, all callitrichids (marmosets and tamarins) have traditionally been thought to have a broadly-similar social structure, with groups being formed from a single mated pair and their (non-breeding) adult offspring from previous births. Field studies, however, suggest that in the wild callitrichids may actually be highly-variable in social structure. Wild studies have shown that various species may live in social groups that are monogamous (a single mated pair), polyandrous (multiple breeding males), polygynous (multiple breeding females), or polygamous (multiple breeding males and females). These social structures may differ between genera (e.g. *Callithrix* [marmosets] versus *Saguinus* [tamarins]), between species or between geographically-separate populations of the same species, or even change in a single group over time.^{29,30}

For Red-bellied Tamarins specifically, wild animals are recorded as living in family groups composed of a monogamous breeding pair and their non-breeding adult offspring.³¹ Average group size is six or seven individuals (from two to thirteen in specific groups).^{32,33} A group will maintain a territory of between 23 to 41 hectares in size.³⁴ Population densities of wild animals have been estimated in various field studies at 1.7 to 4.6 groups per square kilometre.^{35,36,37,38} Individual densities can be as high as 45 animals per square kilometre.³⁹

Callitrichid groups are territorial towards other groups of conspecifics (members of their own species) but regularly form mixed feeding groups with other species. In the Red-bellied Tamarin mixed groups are commonly formed with the Saddleback Tamarin *Saguinus fuscicollis*, and in Bolivia with the Goeldi's Monkey *Callimico goeldii*.^{40,41,42,43}

Callitrichids have small sharp claws and sharp teeth, and are capable of inflicting minor wounds on humans. However the very small size of the animals prevents serious injuries.⁴⁴

¹⁵ Atsalis, S., S.W. Argulis, and P.R. Hof (eds) (2008) "*Primate Reproductive Aging: Cross-Taxon Perspectives*" Karger Publishers

¹⁶ Atsalis *et al* (2008) *op. cit.*

¹⁷ Weigl, R (2005) "*Longevity of Mammals in Captivity; from the living collections of the world*" Kleine Senckenberg-Reihe 48

¹⁸ Suarez, S. (2007) "*Paternity, Relatedness, and Socio-Reproductive Behavior in a Population of Wild Red-bellied Tamarins (Saguinus labiatus)*" Ann Arbor

¹⁹ Petter, J., and F. Desbordes (2010) "*Primates of the World*" Editions Nathan

²⁰ Hubrecht, R., and J. Kirkwood (2010) "*The UFAW Handbook on the Care and Management of Laboratory and Other Research Animals*" Universities Federation for Animal Welfare

²¹ Mittermeier, R.A., A.B. Rylands, D.E. Wilson (eds) (2013) "*Handbook of the Mammals of the World, volume 3: Primates*" Lynx Edicions

²² Rylands, A., R.A. Mittermeier, A.F. Coimbra-Filho, and E.W. Heymann (2008) "*Marmosets and Tamarins: pocket identification guide*" Conservation International

²³ Mittermeier *et al* (2013), *op. cit.*

²⁴ IUCN page for "Saguinus labiatus": <http://www.iucnredlist.org/details/41524/0>

²⁵ IUCN page for "Saguinus labiatus": <http://www.iucnredlist.org/details/41524/0>

²⁶ Mittermeier *et al* (2013), *op. cit.*

²⁷ Alvares, C.A., J.L. Stape, P.C. Sentelhas, J.L. de Moraes Goncalves, and G. Aparovek (2013) "Koppen's climate classification map for Brazil" *Meteorologische Zeitschrift* vol. 22 (6), pp.711-728

²⁸ IUCN page for "Saguinus labiatus": <http://www.iucnredlist.org/details/41524/0>

²⁹ Ferrari, S.F., and M.A. Lopes Ferrari (1989) "A Re-Evaluation of the Social Organisation of the Callitrichidae, with Reference to the Ecological Differences between Genera" *Folia Primatologica* vol 52: pp. 132-147

³⁰ Dunbar, R.I.M. (1995) "The mating system of callitrichid primates: 1. Conditions for the coevolution of pair bonding and twinning" *Animal Behaviour* vol.50, pp. 1057-1070

³¹ Suarez (2007), *op. cit.*

³² Hardie, S.M. (1998) "Mixed species tamarin groups (*Saguinus fuscicollis* and *Saguinus labiatus*) in northern Bolivia" *Primate Report* vol 5: pp. 39-62

³³ Buchanan-Smith, H.M. (1999) "Tamarin polyspecific associations: Forest utilization and stability of mixed species groups" *Primates* vol 40: pp. 233-247

³⁴ Yoneda, M. (1981) "Ecological studies of *Saguinus fuscicollis* and *Saguinus labiatus* with reference to habitat segregation and height preference" *Kyoto University Overseas Research Report of New World Monkeys* pp. 43-50

³⁵ IUCN page for "Saguinus labiatus": <http://www.iucnredlist.org/details/41524/0>

³⁶ Heltne, P.G., C.H. Freese, and G. Whitesides (1975) "*A field survey of non human primate populations in Bolivia, Final Report*" Pan American Health Organization, USA.

³⁷ Puertas, P., F. Encarnación, and R. Aquino (1995) "Análisis poblacional del pichico pecho anaranjado, *Saguinus labiatus*, en el sur oriente peruano" *Neotropical Primates* vol 3(1): pp. 4-7

³⁸ Yoneda (1981), *op. cit.*

³⁹ Suarez (2007), *op. cit.*

⁴⁰ Buchanan-Smith, H.M. (1990) "Polyspecific association of two tamarin species, *Saguinus labiatus* and *Saguinus fuscicollis*, in Bolivia" *American Journal of Primatology* vol 22(3): pp. 205-214

⁴¹ Pook, A.G. and G. Pook (1982) "Polyspecific association between *Saguinus fuscicollis*, *Saguinus labiatus*, *Callimico goeldii* and other primates in north-western Bolivia" *Folia Primatologica* vol 38: pp. 196-216

⁴² Yoneda (1981), *op. cit.*

⁴³ Hardie (1998), *op. cit.*

⁴⁴ Hubrecht, R., and J. Kirkwood (2010) "*The UFAW Handbook on the Care and Management of Laboratory and Other Research Animals*" Universities Federation for Animal Welfare

- **Provide information on the reproductive biology of the species**

In callitrichids in general, female sexual maturity is attained between 12 and 17 months of age, and in males 13 to 25 months.⁴⁵ However in the wild both sexes of Red-bellied Tamarins are recorded as attaining sexual maturity between two and four years (24 to 48 months) of age.⁴⁶ Reproductive suppression of females other than the dominant female is normal in callitrichid groups.^{47,48} As in all Primates, males and females are distinct sexes (i.e. not hermaphroditic, and parthenogenetic births are not possible), and they cannot change sex.⁴⁹

Uniquely amongst higher Primates, all callitrichids typically produce litters of non-identical twins, although births can also less commonly be of just a single baby, or of three or very occasionally four babies (triplets or quadruplets). However, only in rare circumstances would more than two babies survive.⁵⁰

In the wild Red-bellied Tamarins generally give birth between August and December,⁵¹ but in captivity births can occur at any time of the year.⁵² In captivity they can also produce two litters per year.⁵³ The gestation period is 150 to 170 days.⁵⁴

In captivity nest-boxes are routinely provided for callitrichids, but animals in the wild do not normally use cavities for either sleeping or breeding.⁵⁵

Hybridisation in callitrichids is known to occur in the wild where the distributions of two related species meet, creating "hybrid zones".^{56,57} Possibly all intrageneric hybrids within this family would be fertile.⁵⁸ With regards to Red-bellied Tamarins specifically, a wild individual suggested to be a hybrid between this species and the Emperor Tamarin *Saguinus imperator* was reported by Izawa and Bejarano (1981)⁵⁹

There is no possibility of Red-bellied Tamarins hybridising with native Australian mammals, as there are no Primate species native to Australia.

⁴⁵ Digby, L.J., S.F. Ferrari, and W. Saltzman (2007) "Callitrichines: The Role of Competition in Cooperatively Breeding Species" pp. 91-107, in Campbell, C., A. Fuentes, K.C. MacKinnon, M. Panger, and S. Bearder (eds) "*Primates in Perspective*" Oxford University Press

⁴⁶ Suarez, S. (2007) "*Paternity, Relatedness, and Socio-Reproductive Behavior in a Population of Wild Red-bellied Tamarins (Saguinus labiatus)*" Ann Arbor

⁴⁷ Digby *et al* (2007), *op. cit.*

⁴⁸ Sodaro, V. and N. Saunders (eds) (1999) "Callitrichid Husbandry Manual" AZA Neotropical Primate Taxon Advisory Group: Chicago Zoological Park

⁴⁹ Napier, J.R. and P.H. Napier (1985) "*The Natural History of Primates*" M.I.T. Press

⁵⁰ Digby *et al* (2007), *op. cit.*

⁵¹ Suarez (2007), *op. cit.*

⁵² Coates, A. and T. Poole (1983) "The Behavior of the Callitrichid Monkey, *Saguinus labiatus labiatus*, in the Laboratory" *International Journal of Primatology*, vol. 4 (4), pp. 339-371

⁵³ Coates and Poole (1983), *op. cit.*

⁵⁴ Suarez (2007), *op. cit.*

⁵⁵ Sodaro and Saunders (1999), *op. cit.*

- ⁵⁶ Arnold, M.L. and A. Meyer (2006) "Natural hybridization in primates: One evolutionary mechanism" *Zoology*, vol. 109 (4), pp. 261-276
- ⁵⁷ Malukiewicz, J., V. Boere, L.F. Fuzessy, A.D. Grativol, J.A. French, I de Oliveira e Silva, L.C.M. Pereira, C.R. Ruiz-Miranda, Y.M. Valenca, and A.C. Stone (2014) "Hybridization Effects and Genetic Diversity of the Common and Black-tufted Marmoset (*Callithrix jacchus* and *Callithrix penicillata*) Mitochondrial Control Region" *American Journal of Physical Anthropology* vol. 155 (4), pp. 522-536
- ⁵⁸ Coimbra-Filho, A. F., A. Pissinatti, and A.B. Rylands (1993) "Experimental multiple hybridism among *Callithrix* species from eastern Brazil" pp. 95-120, in Rylands, A.B. (ed) "*Marmosets and Tamarins: Systematics, Behaviour, and Ecology*" Oxford University Press
- ⁵⁹ Izawa, K. and G. Bejarano (1981) "Distribution ranges and patterns of nonhuman primates in Western Pando, Bolivia" *Kyoto University Overseas Research Reports of New World Monkeys* vol. 2, pp. 1-11

- **Provide information on whether the species has established feral populations**

The Red-bellied Tamarin has never established wild breeding populations outside of its natural range.⁶⁰ Within its natural range it is not considered a pest in any economic way.⁶¹

The only callitrichids reported by Long (2003)⁶² as being introduced to the wild in a foreign country or re-introduced within their natural ranges are the Cottontop Tamarin *Saguinus oedipus* and the Golden Lion Tamarin *Leontopithecus rosalia*, both as re-introductions within their natural ranges, and the Common Marmoset *Callithrix jacchus* as introductions within Brazil, to Guanabara in c.1900 and the city of Rio de Janeiro in the mid-20th century. In no cases was damage to humans or the environment noted by Long. Malukiewicz *et al* (2014) note that the introduced population in Rio de Janeiro is actually a hybrid swarm formed from introductions of two species, the Common Marmoset *Callithrix jacchus* and the Black-tufted Marmoset *Callithrix penicillata*.⁶³

⁶⁰ Long, J.L. (2003) "*Introduced Mammals of the World*" CSIRO

⁶¹ IUCN page for "*Saguinus labiatus*": <http://www.iucnredlist.org/details/41524/0>

⁶² Long (2003), *op. cit.*

⁶³ Malukiewicz, J., V. Boere, L.F. Fuzessy, A.D. Grativol, J.A. French, I de Oliveira e Silva, L.C.M. Pereira, C.R. Ruiz-Miranda, Y.M. Valenca, and A.C. Stone (2014) "Hybridization Effects and Genetic Diversity of the Common and Black-tufted Marmoset (*Callithrix jacchus* and *Callithrix penicillata*) Mitochondrial Control Region" *American Journal of Physical Anthropology* vol. 155 (4), pp. 522-536

- **Environmental risk assessments of the species**

The Red-bellied Tamarin is not included in the Vertebrate Pests Committee's 2007 "List Of Exotic Vertebrate Animals In Australia".⁶⁴ Of the callitrichid species listed in the document, the Common Marmoset *Callithrix jacchus* is assigned a threat rating of "2/extreme", while the remaining listed species - the Pigmy Marmoset *Cebuella [Callithrix] pygmaea*, Golden Lion Tamarin *Leontopithecus rosalia*, Black Lion Tamarin *Leontopithecus chrysopygus*, Cottontop Tamarin *Saguinus oedipus*, Red-handed Tamarin *Saguinus midas*, and Emperor Tamarin *Saguinus imperator* - are assigned a threat rating of "2/Serious".

The number "2" in the threat rating is used to denote "limited to statutory zoos or endorsed special collections".

The rating of "serious" is qualified as "These animals may be introduced and/or should be kept only in collections approved by the relevant State/Territory authority as being primarily kept for (1) public display and education purposes, and/or for (2) genuine scientific research approved by the relevant State/Territory authority, and as meeting Best Practice for the purposes of keeping the species concerned".

The rating of "extreme" is qualified as "These animals should not be allowed to enter, nor be kept in any State or Territory. (Special consideration may be given to scientific institutions on a case by case basis.) Any species that has not been assessed previously should be considered to be in the Extreme Threat Category and should be treated accordingly, until a risk assessment is conducted."

It should be noted that almost every species of exotic mammal listed in the document has been categorised as either "extreme" or "serious".

Quarantine requirements for live Primates have been established by Biosecurity Australia, and would cover Red-bellied Tamarins if these were to be imported.⁶⁵

Seven species of callitrichids are already included on the list of exotic zoo animals allowed to be imported into Australia, including the Common Marmoset *Callithrix jacchus* and Pigmy Marmoset *Cebuella pygmaea* (listed as *Callithrix pygmaea*), three species of *Saguinus* tamarins (the Emperor Tamarin *Saguinus imperator*, Red-handed Tamarin *Saguinus midas*, and Cottontop Tamarin *Saguinus oedipus*), and two species of *Leontopithecus* tamarins (the Golden Lion Tamarin *Leontopithecus rosalia* and the Black Lion Tamarin *Leontopithecus chrysopygus*).⁶⁶

⁶⁴ Vertebrate Pests Committee "List of Exotic Vertebrate Animals in Australia":

<https://www.pestsmart.org.au/wp-content/uploads/2010/03/VPCListJuly2007.pdf>

⁶⁵ Australian Government "Captive non-human primates" (2017):

<http://www.agriculture.gov.au/biosecurity/risk-analysis/animal/captive-non-human-primates>

⁶⁶ Australian Government "List of Specimens taken to be Suitable for Live Import" (2017):

<https://www.legislation.gov.au/Details/F2017C00434>

- **Assess the likelihood that the species could establish a breeding population in Australia**

The likelihood of Red-bellied Tamarins establishing a breeding population in Australia outside effective human control is low if based on historical data. There are no wild populations of Red-bellied Tamarins established outside their natural range,⁶⁷ and despite callitrichids being common in zoos, laboratories, and in private trade throughout the world, the only wild-introduced populations of any species are either deliberate re-introductions to their former range for conservation purposes (e.g. the Golden Lion Tamarin *Leontopithecus rosalia*) or, in the cases of the Common Marmoset *Callithrix jacchus* and Black-tufted Marmoset *Callithrix penicillata*, to non-native parts of their native country of origin (Brazil) via a large-scale pet trade in these species.^{68,69}

Numerous species of marmosets and tamarins have been held in Australian zoos and laboratories over the last hundred years. Currently there are over 300 animals of six species of callitrichids held in Australian zoos as (contained) breeding populations.⁷⁰ Despite this long history and the population figures, no species of callitrichid has ever formed a wild population in Australia via escaped or released animals.

Red-bellied Tamarins are omnivorous. Their diet includes plant components such as nectar, flowers and fruits but excluding leaves and bark; and various animal components such as invertebrates and small herptiles (lizards and frogs). In wild animals, up to 70% of the diet is composed of fruit, with nectar becoming more dominant in the dry season when fruit is scarce.^{71,72} Animal prey is predominantly large-bodied insects such as Orthoptera (grasshoppers).⁷³ Like other tamarin species they feed opportunistically on plant exudates (i.e. tree sap and gum), although unlike marmosets they have no dental modifications to allow them to access this food source unless it is already exposed on the trunk, and the gut is not specifically adapted for the digestion of exudates.⁷⁴

Because Red-bellied Tamarins feed largely on fruit and insects they would find food easily in most rainforest habitats of tropical Australia, but would likely find it difficult to survive in non-rainforest habitats (e.g. eucalyptus forest) due to the limited availability of fruit.

In their natural range, Red-bellied Tamarins are found in seasonally-dry lowland tropics.⁷⁵ Annual temperatures range between 20 and 30 degrees Celsius, and the annual rainfall is 1000-2000mm.⁷⁶ As with all callitrichids, they are arboreal and cannot survive in treeless habitats (grasslands, desert, etc). Related species such as the Common Marmoset *Callithrix jacchus* are well-documented as being able to live easily in human environments such as gardens and city parks⁷⁷ but the Red-bellied Tamarin occurs only in natural forest.⁷⁸ Although in the wild state all callitrichids are tropical, in captivity they display no discomfort to cold weather, even coping with snowy conditions so long as they have dry and warm retreats.⁷⁹ Wild-living animals do not necessarily utilise cavities for shelter, however, so would likely not be able to survive low temperatures or the lack of fruit and invertebrate prey during winters in temperate climates.

Callitrichids have a very different reproductive strategy than that of other higher Primates (monkeys and apes), having evolved a high birth-rate combined with a relatively short lifespan. For the higher Primates a single offspring is the norm, with a long rearing period, meaning births occur only at periods of once a year to once every several years; and the lifespan of individual animals is typically many decades long.⁸⁰ In contrast, marmosets and tamarins typically produce litters of two offspring which are weaned and become independent quickly, with two litters per year being normal for a breeding female.^{81,82} The lifespan of individuals is also relatively short compared to other higher Primates, usually less than ten years on average.⁸³

These factors potentially could increase the likelihood for callitrichids such as the Red-bellied Tamarin to establish wild populations if escaped or released, if compared to other species of Primates.

In the wild state, callitrichids including the Red-bellied Tamarin are preyed upon by birds of prey, snakes, and predatory mammals (Felidae, Mustelidae, Procyonidae).⁸⁴ Because of their very small size they are a potential prey item for more predatory species than is the case for the larger Primates. Partly this is combated by group-living and a relatively high reproductive output.⁸⁵ In Australia a similar suite of predators is available in terms of birds of prey and large snakes, although the number of mammalian predators is much more restricted (primarily quolls and feral cats; foxes are terrestrial and would have no impact on wild-living tamarins).

Red-bellied Tamarins in Australia would be legally restricted to licenced holders (i.e. zoos) and thus importation of additional animals past an initial import would likely not result in any increase in risk

of the establishment of wild populations via escape or release. Numerous species of marmosets and tamarins have been held in Australian zoos and laboratories over the last hundred years, and currently there are over 300 animals of six species of callitrichids held in Australian zoos as (contained) breeding populations.⁸⁶ Despite this long history and the population figures, no species of callitrichid has ever formed a wild population in Australia via escaped or released animals.

⁶⁷ Long, J.L. (2003) "*Introduced Mammals of the World*" CSIRO

⁶⁸ Long (2003), *op. cit.*

⁶⁹ Malukiewicz, J., V. Boere, L.F. Fuzessy, A.D. Grativol, J.A. French, I de Oliveira e Silva, L.C.M. Pereira, C.R. Ruiz-Miranda, Y.M. Valenca, and A.C. Stone (2014) "Hybridization Effects and Genetic Diversity of the Common and Black-tufted Marmoset (*Callithrix jacchus* and *Callithrix penicillata*) Mitochondrial Control Region" *American Journal of Physical Anthropology* vol. 155 (4), pp. 522-536

⁷⁰ Australian zoo census data from Zoo and Aquarium Association (ZAA)

⁷¹ Porter, L. (2001) "Dietary Differences Among Sympatric Callitrichinae in Northern Bolivia: *Callimico goeldii*, *Saguinus fuscicollis* and *S. labiatus*" *International Journal of Primatology*, vol 22 (6): pp. 961-992

⁷² Buchanan-Smith, H. (1991) "A Field Study on the Red-Bellied Tamarin, *Saguinus labiatus labiatus*, in Bolivia" *International Journal of Primatology* vol 12 (3): pp. 259-276

⁷³ Porter (2001), *op. cit.*

⁷⁴ Buchanan-Smith (1991), *op. cit.*

⁷⁵ IUCN page for "*Saguinus labiatus*": <http://www.iucnredlist.org/details/41524/0>

⁷⁶ Alvares, C.A., J.L. Stape, P.C. Sentelhas, J.L. de Moraes Goncalves, and G. Aparovek (2013) "Koppen's climate classification map for Brazil" *Meteorologische Zeitschrift* vol. 22 (6), pp.711-728

⁷⁷ Malukiewicz, J., V. Boere, L.F. Fuzessy, A.D. Grativol, J.A. French, I de Oliveira e Silva, L.C.M. Pereira, C.R. Ruiz-Miranda, Y.M. Valenca, and A.C. Stone (2014) "Hybridization Effects and Genetic Diversity of the Common and Black-tufted Marmoset (*Callithrix jacchus* and *Callithrix penicillata*) Mitochondrial Control Region" *American Journal of Physical Anthropology* vol. 155 (4), pp. 522-536

⁷⁸ IUCN page for "*Saguinus labiatus*": <http://www.iucnredlist.org/details/41524/0>

⁷⁹ Mallinson, J.C.C. (1971) "Observations on the Breeding of Red-handed Tamarin, *Saguinus (=Tamarin) midas* (Linnaeus, 1758) with comparative notes on other species of Callithricidae (=Hapalidae) breeding in captivity" *Annual Report 1971: Durrell Wildlife Conservation Trust*, pp. 19-31

⁸⁰ Napier, J.R. and P.H. Napier (1985) "*The Natural History of Primates*" M.I.T. Press

⁸¹ Dunbar, R.I.M. (1995) "The mating system of callitrichid primates: 1. Conditions for the coevolution of pair bonding and twinning" *Animal Behaviour* vol.50, pp. 1057-1070

⁸² Sodaro, V. and N. Saunders (eds) (1999) "Callitrichid Husbandry Manual" AZA Neotropical Primate Taxon Advisory Group: Chicago Zoological Park

⁸³ Sodaro and Saunders (1999), *op. cit.*

⁸⁴ Digby, L.J., S.F. Ferrari, and W. Saltzman (2007) "Callitrichines: The Role of Competition in Cooperatively Breeding Species" pp. 91-107, in Campbell, C., A. Fuentes, K.C. MacKinnon, M. Panger, and S. Bearder (eds) "*Primates in Perspective*" Oxford University Press

⁸⁵ Digby *et al* (2007), *op. cit.*

⁸⁶ Australian zoo census data from Zoo and Aquarium Association (ZAA)

- **Provide a comprehensive assessment of the potential impact of the species should it become established in Australia**

A. Does the species have similar niche/living requirements to native species?

Red-bellied Tamarins are small, arboreal, group-living, diurnal mammals which feed primarily on plant material (fruit, flowers, nectar, and plant exudates), and insects. They are restricted to areas with extensive tree cover (i.e. continuous forest or within forest strips/patches).⁸⁷ Although they utilise nest-boxes in captivity, in the wild they generally sleep on branches or amongst epiphytes rather than in tree holes.⁸⁸ Insect prey is obtained mostly by searching amongst plants and leaves for hidden insects.⁸⁹

In Australia almost all the native mammals are nocturnal or crepuscular,⁹⁰ so would not be directly in competition for living space with Red-bellied Tamarins should a wild population become established. Arboreal mammal species native to Australia are largely folivorous (leaf-eaters), nectivorous (nectar-feeders), or exudativorous (sap-feeders).⁹¹ Red-bellied Tamarins do not feed on leaves; they feed on nectar mainly when fruit is unavailable; and they feed on tree saps only opportunistically.⁹²

B. Is the species susceptible to, or capable of transmitting any pests or diseases?

Red-bellied Tamarins can be carriers of external parasites such as ticks and internal parasites such as nematodes, all of which can be easily and effectively treated/removed before undergoing quarantine. There are a number of Zoonoses (protozoal, fungal, and bacterial infections) transferrable in either direction between humans and non-human Primates, and these are well-covered in the medical literature due to the widespread use of Primates - including tamarins - in laboratories where they are used for studies into human diseases. Few zoonoses are of concern in non-wild (i.e. captive-bred) animals. New World Primates do not carry or transmit Herpes B which is of a concern in Old World macaques (*Macaca spp*). The Princeton University datasheet here briefly covers those Zoonoses associated with callitrichids: <https://ehs.princeton.edu/laboratory-research/animal-research-health-and-safety/zoonotic-disease-information/zoonoses-associated-new-world-monkeys>

Biosecurity Australia has an existing comprehensive set of quarantine requirements for the importation of live Primates, which covers disease control.

C. Probable prey/food sources.

Red-bellied Tamarins feed largely on fruit and large-bodied insects. In studies of wild Red-bellied Tamarins, up to 70% of the diet is made up of fruit, with the rest composed of nectar and invertebrate prey.⁹³ Callitrichids in general have been recorded as feeding on small vertebrates (lizards and frogs) and birds' eggs^{94,95} although these items do not seem to have been recorded for Red-bellied Tamarins - in fact Porter (2007)⁹⁶ specifically noted that vertebrate prey was never recorded in her wild study groups.

Red-bellied Tamarins are found in continuous natural forest and do not utilise human habitats (i.e. orchards and plantations).⁹⁷ They will not damage or feed upon commercial animal species, but do eat fruit/buds from fruiting plants. In their native range callitrichids are not considered a pest in any regard.⁹⁸

D. Impacts on habitat and local environments.

If a wild population should become established there would be little impact on the local environment. Red-bellied Tamarins do not destroy vegetation or dig burrows. Callitrichids are not considered a pest in any respect in their native country, even when living in human habitats (e.g. plantations or gardens).⁹⁹ As fruit-eaters they can spread seeds via their faeces or potentially on their fur, which could include those of invasive or unwanted plant species. In the wild state they are known to be important seed dispersers of many fruiting species.¹⁰⁰

E. Discuss any control/eradication programs that could be applied in Australia if the species escaped or were released.

If a wild population were to become established, detection and capture in continuous forest would probably be extremely difficult due to their small size and arboreal nature, although this may be offset somewhat by the species being group-living, noisy, and active by day. In human habitats (e.g. plantations or orchards) or in isolated forest patches they would probably be quite noticeable.

Wild callitrichids for scientific studies are captured using elevated live-traps, although this is only of use for small individual numbers of live-captures. Shooting and trapping would likely be the most appropriate options if a wild population needed to be controlled or eradicated.

F. Behaviours that cause environmental degradation.

The Red-bellied Tamarin does not have any behaviours or physical attributes which could cause environmental degradation. Based on the known ecology of callitrichids, they do not impact the ground, dig burrows, or damage or pollute waterways.^{101,102,103}

G. Impacts on primary industries.

An established wild population of Red-bellied Tamarins would have little or no impact on primary industries such as farming or agriculture. In their native ranges callitrichids are not considered to be pests in any regard, even when living in commercial tree areas (plantations and orchards).¹⁰⁴ They do feed on fruit and buds/flowers as part of their diet, which could bring conflict with orchardists although this seems to not be the case in South America even with those species which can be found in human habitats.

H. Damage to property.

The Red-bellied Tamarin is a very small arboreal Primate, and does not damage property.

I. Is the species a social nuisance or danger?

The Red-bellied Tamarin is not a species which would cause a social nuisance. In the native state callitrichids are not considered to be a pest in any regard.¹⁰⁵

J. Describe any potentially harmful characteristics of the species.

All callitrichids (marmosets and tamarins) have small sharp claws and sharp teeth, and are capable of inflicting minor wounds on humans. However the very small size of the animals prevents serious injuries. The wearing of gloves as protection is recommended if the handling of live animals is required.¹⁰⁶

There are numerous Zoonoses capable of being transmitted in either direction between humans and non-human Primates. The Princeton University datasheet here briefly covers Zoonoses associated with callitrichids: <https://ehs.princeton.edu/laboratory-research/animal-research-health-and-safety/zoonotic-disease-information/zoonoses-associated-new-world-monkeys>

Hubrecht and Kirkwood (2010)¹⁰⁷ also covers Primate diseases in a wider scope.

Some common airborne human diseases such as measles and tuberculosis are easily spread to, and may be lethal to, callitrichids. Zoonoses which can be spread from callitrichids to humans under captive conditions are usually via the animals' faecal matter, such as *Shigella*, *Salmonella*, *Campylobacter* and *Yersinia* bacteria. Viruses such as Monkey Pox can also be carried by callitrichids, although the Princeton datasheet notes that "it is unusual for these and other viruses to be present in purpose-bred animals." Further, Hubrecht and Kirkwood¹⁰⁸ state that "Captive-bred animals of known health status are less of a risk" [than wild-caught animals].

Most transmittable Zoonoses are not specific to tamarins (or, indeed, to Primates) but can be carried by any or many mammals.

Biosecurity Australia has an existing comprehensive set of quarantine requirements for the importation of live Primates, which covers disease control.

⁸⁷ Mittermeier, R.A., A.B. Rylands, D.E. Wilson (eds) (2013) "*Handbook of the Mammals of the World, volume 3: Primates*" Lynx Edicions

⁸⁸ Sodaro, V. and N. Saunders (eds) (1999) "Callitrichid Husbandry Manual" AZA Neotropical Primate Taxon Advisory Group: Chicago Zoological Park

⁸⁹ Mittermeier *et al* (2013), *op. cit.*

⁹⁰ Menkhorst, P. and F. Knight (2010) "*A Field Guide to the Mammals of Australia*" Oxford University Press

⁹¹ Menkhorst and Knight (2010), *op. cit.*

⁹² Porter, L. (2001) "Dietary Differences Among Sympatric Callitrichinae in Northern Bolivia: *Callimico goeldii*, *Saguinus fuscicollis* and *S. labiatus*" *International Journal of Primatology*, vol 22 (6): pp. 961-992

⁹³ Porter (2001), *op. cit.*

⁹⁴ Mittermeier *et al* (2013), *op. cit.*

⁹⁵ Digby, L.J., S.F. Ferrari, and W. Saltzman (2007) "Callitrichines: The Role of Competition in Cooperatively Breeding Species" pp. 91-107, in Campbell, C., A. Fuentes, K.C. MacKinnon, M. Panger, and S. Bearder (eds) "*Primates in Perspective*" Oxford University Press

⁹⁶ Porter (2001), *op. cit.*

⁹⁷ IUCN page for "*Saguinus labiatus*": <http://www.iucnredlist.org/details/41524/0>

⁹⁸ Digby *et al* (2007), *op. cit.*

⁹⁹ Digby *et al* (2007), *op. cit.*

¹⁰⁰ Mittermeier *et al* (2013), *op. cit.*

¹⁰¹ Mittermeier *et al* (2013), *op. cit.*

¹⁰² Digby *et al* (2007), *op. cit.*

¹⁰³ Porter (2001), *op. cit.*

¹⁰⁴ Digby *et al* (2007), *op. cit.*

¹⁰⁵ Digby *et al* (2007), *op. cit.*

¹⁰⁶ Hubrecht, R., and J. Kirkwood (2010) "*The UFAW Handbook on the Care and Management of Laboratory and Other Research Animals*" Universities Federation for Animal Welfare

¹⁰⁷ Hubrecht and Kirkwood (2010), *op. cit.*

¹⁰⁸ Hubrecht and Kirkwood (2010), *op. cit.*

- **What conditions or restrictions could be applied to reduce any potential for negative impacts of the species?**

Importation and transfer of Red-bellied Tamarins would be limited exclusively to recognised zoological facilities as licensed by their respective states and territories. As a containment species, Red-bellied Tamarins would be specifically excluded from import by or transfer to private individuals to keep as private pets.

Measures to prevent breeding such as limiting importation to a single sex or to de-sexed individuals would prevent imported specimens being used to conserve the species in Australian zoos in the future.

- **Summary of proposed activity**

The importation of Red-bellied Tamarins would be for the purposes of starting a captive population within Australian zoos as a part of the overall global captive population, intended to enhance the educational programmes within zoos, especially in relation to illustrating the diversity of life and of Primates and rainforests in particular. As the species is not endangered in the wild state, the global captive population serves primarily as ambassadors for their species and habitat, but also serves as a precautionary "safety net" in the event of future conservation threats.

The proposed import would initially be of 3.3.0 individuals for three zoos. The intention of the importing facility is to hold 1.1 while the remaining pairs will be held at the other two facilities. The intention of importing three pairs of Red-bellied Tamarins is to help achieve and maintain genetic diversity for the species in the Australasian region. The intention is for all imported animals to be from separate bloodlines. Further imports may be undertaken to provide additional genetic stock.

The imported animals will all have been captive-bred in licenced overseas zoos eligible to export animals to Australia.

Individual animals will be contracepted to avoid unwanted breeding.

Planned breeding will be undertaken to preserve genetic diversity and in order to avoid producing surplus stock.

- **Guidelines on how species should be kept**

Red-bellied Tamarins are widely kept in zoos in Europe and North America, and captive care information is readily available in specific husbandry manuals for callitrichids (marmosets and

tamarins). In Australia, the Zoo and Aquarium Association (ZAA) has general guidelines governing the well-being of zoo animals.

Transport of imported Red-bellied Tamarins would follow IATA Live Animal Regulations.

With respect to the importing facility, each imported Red-bellied Tamarin pair will be kept in a secure, aviary style mesh enclosure.

Each enclosure will measure a minimum of 20 square metres and be 3 metres high. Enclosures will be constructed of 25 x 25 x 2 galvanised steel weldmesh on a 40 x 40 x 2 galvanised steel frame.

The rear 1/3 of the enclosure [on the prevailing weather end] will be enclosed with a Colourbond® steel roof and walls. Within this area will be located a heated nightbox. Radiant heat lamps will also be located in this area.

The entire enclosure will be vegetated with non-toxic plants. Plentiful horizontal and vertical climbing opportunities will be provided. Drinking water will be provided *ad lib* in an above ground receptacle and there will be separate, elevated feed stations.

Enclosure substrate will be of pine bark and groundcover vegetation.

Keeper access to the enclosure will be through a lockable airlock and there will be no visitor access to the enclosure.

Visitor viewing will be from the front end only and visitors will be kept two metres back from the enclosure by a 1200 high stand-off fence.

The zoo premises have 24-hour live-in human security presence, and at night guard dogs patrol the grounds. The entire zoo property is enclosed within a security fence with lockable access gates.

- **State/Territory controls**

The Red-bellied Tamarin is not currently kept in Australian zoos and with the exception of New South Wales there are no specific assessments for this species under Australian state legislations. However several other callitrichid species (marmosets and tamarins) are covered by all or most states.

*The Australian Government's "List of Specimens taken to be Suitable for Live Import" lists seven species of callitrichids (marmosets and tamarins) which can currently be imported under licence. These seven species do not currently include the Red-bellied Tamarin.

<https://www.legislation.gov.au/Details/F2017C00434>

*In Queensland the *Exhibited Animals Act 2015* does not cover the Red-bellied Tamarin (or any species specifically) but allows a licence holder to "Exhibit and deal with animals listed on this authority in accordance with information assessed and approved in deciding the application and details listed on this authority". Six species of callitrichids (marmosets and tamarins) are currently housed in Queensland under this Act.

<https://www.legislation.qld.gov.au/view/pdf/2017-07-03/act-2015-005>

*In New South Wales the *Non-Indigenous Animals Regulation 2012* lists the Red-bellied Tamarin as a Category 2 species (under the scientific name *Saguinus labiatus* and the common names of Red-bellied Tamarin and White-lipped Tamarin). Three further species of callitrichids (marmosets and tamarins) are also listed as Category 2 species, and five other callitrichid species as Category 3a species. Species in both of these Categories are restricted to licenced facilities. This regulation allows these species to be kept in zoos with a permit to be issued by the relevant state authority for possession of the species.

<https://www.legislation.nsw.gov.au/regulations/2012-405.pdf>

*In Victoria the *Catchment and Land Protection Act 1994* does not cover the Red-bellied Tamarin specifically but six other species of callitrichids (marmosets and tamarins) are listed in Schedule 2 as Controlled Pest Animals, which allows them to be kept in zoos with a permit to be issued by the relevant state authority for possession of the species. Species not specifically listed in Schedule 2 are automatically included in Schedule 1 as Prohibited Pest Animals.

[http://www.legislation.vic.gov.au/domino/Web_Notes/LDMS/LTObject_Store/ltobjst10.nsf/DDE300B846EED9C7CA257616000A3571/1B88C214FAD7CE39CA2581F7000236BB/\\$FILE/94-52aa057%20authorised.pdf](http://www.legislation.vic.gov.au/domino/Web_Notes/LDMS/LTObject_Store/ltobjst10.nsf/DDE300B846EED9C7CA257616000A3571/1B88C214FAD7CE39CA2581F7000236BB/$FILE/94-52aa057%20authorised.pdf)

<http://www.gazette.vic.gov.au/gazette/Gazettes2010/GG2010S399.pdf>

*In South Australia the *Natural Resources Management Act 2004* does not cover the Red-bellied Tamarin specifically but seven other species of callitrichids (marmosets and tamarins) are listed in Category 1 of Schedule 1, which allows them to be kept in zoos with a permit to be issued by the relevant state authority for possession of the species.

http://www.pir.sa.gov.au/_data/assets/pdf_file/0003/137460/Declaration_of_Animals_and_Plants_Jan_2015.pdf

*In Western Australia the *Biosecurity and Agricultural Management Act 2007* does not cover the Red-bellied Tamarin specifically but seven other species of callitrichids (marmosets and tamarins) are listed in Category C1 as Prohibited Organisms, which allows them to be kept in zoos with a permit to be issued by the relevant state authority for possession of the species.

The *Biosecurity and Agricultural Management (Prohibited Organisms) Declaration 2013* is available here:

<https://www.agric.wa.gov.au/sites/gateway/files/BAM%20Decl%20s22%20%28Prohibited%20Organisms%29.pdf>

The Western Australian Organism List is searchable online for the most current results here:

<https://www.agric.wa.gov.au/organisms>

*In Tasmania the *Nature Conservation Act 2002* does not cover the Red-bellied Tamarin specifically, but has two species of callitrichid (the Common Marmoset *Callithrix jacchus* and Cottontop Tamarin *Saguinus oedipus*) as Controlled Animals, which allow those two species to be kept in zoos with a permit to be issued by the relevant state authority for possession of the species.

<https://www.legislation.tas.gov.au/view/html/inforce/current/act-2002-063>

List of species which have been risk-assessed for Tasmania: <http://dpiw.tas.gov.au/wildlife-management/management-of-wildlife/wildlife-imports/species-risk-assessments>

*There is no specific reference to Red-bellied Tamarins, nor apparently to callitrichids in general, in the legislation for the Northern Territory or the Australian Capital Territory.

Biosecurity Australia has an existing comprehensive set of quarantine requirements for the importation of live Primates, which would cover Red-bellied Tamarins should they be imported.

<http://www.agriculture.gov.au/biosecurity/risk-analysis/animal/captive-non-human-primates>

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Australian Government

**Department of Agriculture,
Water and the Environment**

**Assessment of the Relevant Impacts of
Saguinus labiatus (Red-bellied Tamarin) on the
Environment (Assessment Report)**

**Consideration of an application under the Environment Protection
and Biodiversity Conservation Act 1999 *List of Specimens taken to be
Suitable for Live Import***

November 2020

INTRODUCTION

Purpose of the proposed import

Darling Downs Zoo seeks to import an unspecified number of Red-bellied Tamarins (*Saguinus labiatus*) into Australia for public exhibition and to start a captive population.

The proposed import would initially be of six individuals, three males and three females, to be kept in three zoos. Darling Downs Zoo intends to hold one pair while the remaining pairs will be held by another two facilities. Importing three pairs of Red-bellied Tamarin, each individual from separate bloodlines, will help establish and maintain genetic diversity for the species in the Australasian region. Further imports may be undertaken to provide additional genetic stock.

The imported animals will all have been captive bred in licenced overseas zoos eligible to export animals to Australia.

Background

Under section 303EC of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the responsible Minister may amend the *List of Specimens taken to be suitable for live import* (Live Import List) by, relevantly, including a specimen on the list. Section 303EB of the EPBC Act provides there are two parts to the Live Import List:

- Part 1 comprises specimens that can be imported without a permit under the EPBC Act and
- Part 2 comprises specimens that require a permit under the EPBC Act to be imported. For each specimen included in Part 2 of the list there is to be a notation regarding whether the inclusion is subject to restrictions or conditions. Restrictions or conditions may relate to a quantitative limit, the circumstances of import, the source of the specimen or the circumstances in which it was taken. Additional conditions may also be applied when the permit for import is issued.

Before amending the Live Import List, the Minister must consult with appropriate State and Commonwealth Ministers and other persons, and consider a report assessing the potential environmental impacts of the proposed amendment (section 303EC of the EPBC Act). When submitting an application to the department to amend the Live Import List, all applicants are required to provide an accompanying draft assessment report that addresses specific terms of reference published on the department website.

The department undertakes an assessment of the potential environmental impacts of the proposed amendment using the information in the applicant's draft report and any other sources of relevant information. The department also considers comments and information received through the public consultation process (including states and territories). The application and accompanying draft report for the proposed import of Red-bellied Tamarins as released for public comment between 7 July and 28 August 2020. This assessment report was prepared in accordance with Section 303EE of the EPBC Act on the potential environmental impacts of listing the species. Under Section 303EC(5)(a) the Minister must consider this report before amending the list.

BIOLOGY AND ECOLOGY OF *SAGUINUS LABIATUS*

Introduction

The genus *Saguinus* belongs to the Neotropical infraorder Platyrrhini (New World monkeys) (Prescott, 1999; Rylands and Mittermeier, 2009). Red-bellied Tamarins (*Saguinus labiatus*) are small diurnal and arboreal primates native to the south and south-central Amazon, in South America. The species occurs in Bolivia, Brazil (in the states of Acre, Amazonas and Rondônia) and Peru (Kristofik, 2011).

Saguinus labiatus (É.Geoffroy Saint-Hilaire, 1812) was first described by Etienne Geoffroy Saint-Hilaire in 1812 as *Midas labiatus* (Groves, 2001). There are currently three recognised intra-specific taxa: 1) *Saguinus labiatus labiatus* (É. Geoffroy Saint-Hilaire, 1812) (synonyms = *Midas elegantulus* Slack, 1862; *Midas erythrogaster* Reichenbach, 1862; and *Midas griseovertex* Goeldi, 1907) - Geoffroy's Red-bellied Tamarin; 2) *Saguinus labiatus rufiventer* (Gray, 1843) – Gray's Red-bellied Tamarin; and 3) *Saguinus labiatus thomasi* (Goeldi, 1907) - Thomas's Red-bellied Tamarin (Calouro et al, 2018; Catalogue of Life, 2020; GBIF, 2020).

Taxonomy follows Hershkovitz (1977), except for *Saguinus labiatus rufiventer* which was considered a junior synonym of *Saguinus labiatus labiatus*. However, Groves (2001, 2005) considered *S. l. rufiventer* to be a subspecies.

These three Red-bellied Tamarin subspecies can be distinguished through relatively minor differences in colouration, by the patterning on the top of the head. Alternative common names for the Red-bellied Tamarin include White-lipped Tamarin; Red-chested Tamarin; Red-chested Mustached Tamarin; Geoffroy's Tamarin (Calouro et al, 2018).

Description

Marmosets and tamarins are distinguished from the other monkeys of the New World by their small size, modified claws rather than nails on all digits except the big toe and the presence of two as opposed to three molar teeth in either side of each jaw (Calouro et al, 2018). Tamarins are monomorphic - females and males are similar in colour and size - exhibiting only minor differences in body and canine size (Calouro et al, 2018). Yoneda (1981) reported female Red-bellied Tamarins to weigh on average 495 g, while males weighed 491 g. The head-body length for females was measured as 23.2 cm, with a tail length of 38.3 cm, while males measured 23.5 and 38.6 cm respectively (Yoneda, 1981).

Red-bellied Tamarins are also known as Red-chested Mustached Tamarins and White-lipped Tamarins because of their appearance. They are mostly dark brown or black in colour, have distinguishing red markings on their stomachs and chests and have a patch of white fur surrounding their nose and mouth, giving the appearance of a mustache (Hershkovitz, 1977).

New World monkeys of the subfamily Callitrichids have short lifespans if compared to other higher primates, with averages of less than ten years. While Red-bellied Tamarins are thought to live approximately eight years in the wild, in captivity these primates often live two or three times as long. The oldest Red-bellied Tamarin on record was a captive animal which died aged 20.5 years (Kristofik, 2011; Weigl, 2005, in application).

Habitat/ Special adaptations

Red-bellied Tamarins occur in primary and secondary rainforest (Yoneda, 1981), and generally avoid seasonally flooded forest, however, they enter it in the absence of flooding (Calouro et al, 2018). Individuals of this species tend to inhabit mid to upper forest canopy (Rehg, 2010), at a height ranging from 11-20 m (Yoneda, 1981). Porter (2011) noted that this species prefers foraging at 10-15 m 40 per cent of the time, and higher canopy levels 30 per cent of the time. Individuals used this layer of forest for moving, fruit-feeding and resting (Yoneda, 1981).

Diet

Callitrichids are omnivorous and opportunistic feeders (Hershkovitz, 1977). Red-bellied Tamarins are classified as insectivore-frugivores (Rylands et al, 1993). In captivity Callitrichids consume a high caloric diet, rich in protein and calcium. Vitamin D₃ is an important component for avoiding osteomalacia or softening of the bones (Hershkovitz, 1977). In the wild, the type of food consumed varies according to the season and includes fruits, flowers, nectar, plant exudates (gums, saps and latex), arthropods (Porter, 2001; Rehg, 2010), and even small vertebrates (Hershkovitz, 1977). In the wet season – from October to March – fruit comprises 70 per cent of their diet, whereas in the dry season, as fruit becomes scarce, they decrease fruit consumption to less than 12 per cent and increase their consumption of flower nectar, exudates and arthropods (Porter, 2001). In the wet season, they primarily eat fruits of the family Moraceae, such as *Pseudolmedia rigida*, however, they are also known to feed on the fruit of *Cecropia sciadophylla* and *Pourouma cecropiaefolia* (amazon grapes) (Urticaceae) (Buchanan-Smith, 1991). During the dry season (from June to August), the main species of flower exploited for nectar are *Symphonia globuliferae* and *Ochroma pyramidale* (Porter, 2001). The peak arthropod consumption happens in June, when 35 per cent of their diet comprises foraged insects, primarily from the order Orthoptera (crickets and grasshoppers) (Porter, 2001). Red-bellied Tamarins do not have large, procumbent incisors, so their consumption of most exudates is likely opportunistic (Buchanan-Smith, 1991; Porter, 2001).

Home range and social structure

Red-bellied Tamarins live in extended family groups of usually 5 to 10 individuals (Buchanan-Smith, 1991), but can be from 4 to 15. Each group contains one breeding male and one breeding female. The rest of the group is composed of offspring and helper males which are usually related to one of the breeding individuals (Kristofik, 2011). In the wild, only one female per group breeds once during the breeding season, which begins in October and peaks in November (Calouro et al, 2018). In captivity, however, this species can breed twice a year during any season. Gestation lasts between 150 to 170 days (Kristofik, 2011). Although females usually give birth to fraternal (non-identical) twins (Calouro et al, 2018), the litter size just after parturition averages 1.5 (Yoneda, 1981), with infants weighing approximately 84 g (Nakamichi & Yamada, 2009). Helper males, usually a sibling or half-sibling to one of the breeding individuals share the responsibility of looking after the offspring. Young Red-bellied Tamarins wean at approximately 16 weeks of age, become independent when they are one to two years of age and sexually mature between two and four years of age. Breeding females chemically inhibit the first ovulation of their daughters, as females not related to the primarily breeding female are rarely tolerated (Kristofik, 2011).

The Red-bellied Tamarins travel approximately 1.3 to 1.7 km each day (Buchanan-Smith, 1991). Their territory size can vary from 15 to 40 hectares (Kristofik, 2011; Yoneda, 1981), and individual densities vary from 3.78 to 22 individuals/km², with the number of groups varying from 0.63 to 2.9 (Encarnación and Castro, 1990; Yoneda, 1981). Large overlaps of the home ranges of adjacent groups have been observed for this species (Yoneda, 1981).

Red-bellied Tamarins may form mixed-species groups with the smaller, sympatric Saddleback Tamarins *Leontocebus fuscicollis* (formerly *Saguinus fuscicollis*) and Goeldi's Monkeys (*Callimico goeldii*) (Garber and Leigh, 2001; Yoneda, 1981). This single, large and multi-species troop travels together during much of the year; feeding, foraging, and resting together (Garber and Leigh, 2001). Several foraging strategy differences between the three species appear to reduce competition for food resources, allowing their coexistence and association (Porter, 2001). These differences include positional behavior, vertical ranging, forelimb and hindlimb anatomy, foraging technique, and diet. These important behavioral and anatomical differences reduce feeding competition and promote niche partitioning (Garber and Leigh, 2001), while allowing for increased vigilance and home-range defence, without increased competition for mates (Garber and Leigh, 2001; Hardie and Buchanan-Smith, 1997).

Callitrichid monkeys have been reported to hybridise (Malukiewicz et al, 2014). Successful and well documented crosses and backcrosses between representatives of species and subspecies of this family have been performed in captivity, including for the genus *Saguinus* (Hershkovitz, 1977). In 1977 in the left bank of Rio Acre, five monkeys were reported to have physical characteristics that suggested them to be hybrids between Red-bellied Tamarins (*Saguinus labiatus*) and Emperor Tamarins (*Saguinus imperator*), however, this information has not been confirmed (Izawa and Bejarano, 1981).

Environmental tolerances

Red-bellied Tamarins are arboreal, occurring mainly in primary and secondary types of forests (Yoneda, 1981), usually away from water bodies (Calouro et al, 2018). Their area of distribution is within lowland tropical forest with a seasonally dry climate. In these locations, annual temperatures are between 20 and 30°C, and the annual rainfall varies across their range between 1000-2000 mm (Alvares et al, 2013). This species is generally found in low land in elevations ranging between 90 and 289 m.

In the wild Callitrichid monkeys are preyed on by several animals, including humans, birds of prey, small spotted cats, arboreal mustelids and snakes (Hershkovitz, 1977). In Australia escaped Red-bellied Tamarins would potentially be preyed on by birds of prey and large snakes. Terrestrial predators such as quolls, feral cats and foxes would have little impact on tree-dwelling tamarins.

Characteristics that may cause harm to humans or any other species

Red-bellied Tamarins have small sharp claws and sharp teeth and are capable of inflicting minor wounds on humans. The very small size of the animals prevents serious injuries and so they are not considered a threat to humans.

Distribution and endemism (as regard conservation status)

Range Description:

Red-bellied Tamarins are native to the central and south-central Amazon (Figure 1), occurring in the following Amazonian countries: Bolivia, Brazil (Acre, Amazonas, Rondônia); and Peru (Calouro et al, 2020). More specifically, the species occurs south of the Rio Solimões between the Rios Madeira and Purus. The southernmost part of its range extends along the left bank of the Rio Abunã, crossing the headwaters of the Rio Abunã into the Pando region of northern Bolivia, along both sides of the Rio Acre, and south as far as the Río Tahuamanu, a tributary of the Río Orthon, which is itself a tributary of the Río Beni (Buchanan-Smith et al, 2000). There it occurs in the basin of the Río Acre, extending south as far as the Río Tahuamanu. It also occurs between the Rios Japurá and Solimões, in the region between the left bank of the Tocantins to beyond the Auatí-Paraná.

Geoffroy's Red-bellied Tamarin (*Saguinus labiatus labiatus*) is present in Brazil, Bolivia and Peru. This subspecies occurs south of the Rio Solimões between the Rios Madeira (left bank) and Purus (right bank), and south to the Rio Ipixuna. It extends along the left bank of the Rio Madeira and Abunã, to Bolivia, crossing the headwaters of the Rio Abunã, as far south as both sides of the Rio Acre, limited to the north by the Río Tahuamanú, a tributary of the Río Orton (tributary of the Río Beni). It extends far into south-eastern Peru, north of the Rio Tahuamanú (Rylands, 1993).

Thomas's Red-bellied Tamarin (*Saguinus labiatus thomasi*) is present in Brazil. Its range is well separated from the other two subspecies. It is only known from very few specimens, occurring between the Rios Japurá and Solimões, throughout the region between the left bank of the Tocantins to beyond the Auatí-Paraná (Rylands, 1993). It may extend west as far as the Rio Içá, but there is no record of it occurring in Colombia. In the east, it is probably restricted to "terra firme" (dryland) forest, not inhabiting the extensively inundated forest (várzea) near the confluence of the Rios Japurá and Solimões (Rylands, 1993).

Gray's Red-bellied Tamarin (*Saguinus labiatus rufiventer*) is present in Brazil and occurs in the central Amazon, south from the Rio Solimões between the Rios Madeira and Purus to the Rio Ipixuna, an east bank tributary of the Rio Purus (Groves, 2001; 2005).



Figure 1: Distribution map from IUCN (International Union for Conservation of Nature) 2008. *Saguinus labiatus*. The IUCN Red List of Threatened Species. Version 2020-2

Reason for import (captive breeding program etc.)

The applicant proposes to initially import three female and three male Red-bellied Tamarins with a pair going to each of three zoos. Their goal is to establish a captive breeding program to further conservation of the species in captivity and to maintain genetic diversity of the species in the Australasian region. The department notes that the species are not part of any international conservation breeding program and that the applicant's use of the term conservation means to introduce and maintain the species in Australia rather than protection of the species.

The Red-bellied Tamarins will feature in zoo-based educational displays, serving as ambassadors for their species, facilitating education of zoo visitors.

Planned breeding will be undertaken to preserve genetic diversity of the proposed Australian population and in order to avoid producing surplus stock. Individual animals will be contracepted to avoid unwanted breeding.

There have never been Red-bellied Tamarins in Australia although closely related species of tamarin and marmoset have been held and bred in Australia in zoos and laboratories over the last 100 years (applicant – and IPAC list below).

Below is a list of non-indigenous tamarin and marmoset species recorded as being present (kept in accordance with State/Territory legislation) in Australia. No other tamarin or marmoset species have ever been kept in Australia (IPAC, 2018).

Scientific Name	Common Name (Synonyms)
<i>Callithrix jacchus</i>	Common Marmoset; White-tufted-ear Marmoset
<i>Cebuella pygmaea</i>	Pygmy Marmoset
<i>Leontopithecus rosalia</i>	Golden Lion Tamarin
<i>Saguinus imperator</i>	Emperor Tamarin
<i>Saguinus oedipus</i>	Cotton-top Tamarin

There are approximately 300 animals of six species of Callitrichids held in Australian zoos as (contained) breeding populations (applicant – based on Australian zoo census data from Zoo and Aquarium Association (ZAA)). Despite this long history and the population figures, no species of callitrichid has ever formed a wild population in Australia via escaped or released animals.

Importation of Red-bellied Tamarins would also be subject to an importation approval under the *Biosecurity Act 2015* (Commonwealth). Four related callitrichids have undergone environmental assessments in Australia. The Silvery Marmoset (*Mico argentatus*) was found to be a low risk by the department in 2019. The Cotton-top Tamarin (*Saguinus oedipus*), Common Marmoset (*Callithrix jacchus*) and Pygmy Marmoset (*Callithrix pygmaea*) were assessed as a moderate risk to the Tasmanian environment by the Tasmanian Government. The department could not locate and environmental risk assessments for callitrichids internationally.

Related Live Import List listings

There are eight callitrichids on the Live Import List. All are on Part 2 and listed as 'non-commercial purposes only, excluding household pets', namely:

Taxon	Common Name
<i>Callithrix jacchus</i>	Common Marmoset
<i>Callithrix pygmaea</i>	Pygmy Marmoset
<i>Leontopithecus chrysopygus</i>	Black Lion Tamarin
<i>Leontopithecus rosalia</i>	Golden Lion Tamarin
<i>Saguinus imperator</i>	Emperor Tamarin
<i>Saguinus midas</i>	Red Handed Tamarin
<i>Saguinus oedipus</i>	Cotton-headed Tamarin, Cotton-top Tamarin
<i>Mico argentatus</i>	Silvery Marmoset

There are no reports of any of these species forming feral populations or having any environmental impacts in Australia although *Callithrix geoffroyi* (Geoffroy's Marmoset), *Callithrix jacchus* (Common Marmoset) and *Callithrix penicillata* (Black-pencilled Marmoset) are listed on the Global Invasive Species Database due to them hybridising with other Brazilian marmosets (GISD, 2021).

Conservation status

The Red-bellied Tamarin (*Saguinus labiatus*) is listed by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) on Appendix II (CITES, 2018). Appendix II includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid use incompatible with their survival. These species can be traded when issued with an export permit (CITES, 2020).

Most primates are listed in Appendix II, however, some species are listed in Appendix I. These species are threatened with extinction, and their trade is only permitted under exceptional circumstances (CITES, 2020). Currently there are five tamarin species listed in Appendix I – *Saguinus bicolor*, *Saguinus geoffroyi*, *Saguinus leucopus*, *Saguinus martinsi*, *Saguinus oedipus*.

Total population figures for Red-bellied Tamarins appear to be unknown, however, according to the International Union for the Conservation of Nature's (IUCN) Red List status, the species is listed as Least Concern (LC) (Calouro et al, 2020).

The IUCN states that "much of the range of species occurs in one of the least disturbed areas of the Brazilian Amazon", and there are currently no major threats to the species. However, it may be susceptible to forest destruction in the western Pando region of Bolivia and south-eastern Peru (Calouro et al, 2020).

Risk assessment

The department used the Australian Bird and Mammal Risk Assessment Model developed by Mary Bomford (2008) to assess the risks posed by the importation of Red-bellied Tamarins (**Appendix A**). The results indicate that the species has:

- a low risk of establishing a wild population in the Australian environment if released.
- a low risk of becoming a pest if it were to establish.
- poses no danger to the public from either captive or released individuals.
- a theoretical Environment and Invasive Committee (formerly Vertebrate Pest Committee) threat category of **LOW** (using Australian Bird and Mammal Risk Assessment Model and Table 2.3 in Bomford, 2008).

The climate match, comparing the native range of the species to Australian climates, indicates that the Red-bellied Tamarin has a low climate match to Australia (**Appendix B**). This species has a highest Climatch class of eight indicating that most of Australia is climatically quite different to their natural habitat. All these matches correspond to coastal regions in central and northern Queensland and the far north of the Northern Territory.

Generalist primate feeders such as *Saguinus* spp. have been found to perform well in disturbed areas (Seidler, 2017). Some of the areas identified in the Climatch data would contain suitable habitat for this species to survive, however due to the predicted low

numbers of animals likely to escape and the lack of genetic diversity it would be relatively unlikely to establish a self-sustaining feral population.

The application states that Red-bellied Tamarins have been held in zoos worldwide and there has been no reports of them establishing wild populations in any of these countries to date. In fact, according to Long (2003), this species has never established wild breeding populations outside of its natural range. The only successful establishments of wild breeding populations are deliberate reintroductions of tamarin and marmoset species for conservation purposes (e.g. Golden Lion Tamarin (*Leontopithecus rosalia*)). Wild populations of the Common Marmoset *Callithrix jacchus* and Black-Tufted Marmoset *Callithrix penicillata* have established in non-native parts of Brazil via a large-scale pet trade in these species (Long, 2003). Reintroduction success from captive bred populations of tamarins and marmosets is very low unless animals are taught survival techniques prior to reintroduction (Long, 2003).

As noted above under 'reason for import' the Red-bellied Tamarin is not included in the Environment and Invasives Committee's 2018 "*List of Exotic Vertebrate Animals in Australia*". Of the callitrichid species listed in the document, the Common Marmoset (*Callithrix jacchus*), Pygmy Marmoset (*Cebuella pygmaea*), Emperor Tamarin (*Saguinus imperator*) and the Cottontop Tamarin (*Saguinus Oedipus*) are assigned a threat rating of Extreme (P). The Golden Lion Tamarin (*Leontopithecus rosalia*) has a moderate rating.

A previous version of the list (2007) also included the Black Lion Tamarin (*Leontopithecus chrysopygus*) and the Red-handed Tamarin (*Saguinus midas*) with a threat rating of "Serious. Limited to statutory zoos or endorsed special collections".

The rating of "extreme (P)" is qualified as " If a species has not been assessed or if there is too little information to be able to properly adopt a risk analysis approach, the precautionary approach will be adopted, that is the species will be assigned to an Extreme (P) [Where 'P' stands for Precautionary]. Any species that has not been assessed previously should be in the Extreme Threat Category and should be treated accordingly, until a risk assessment is conducted."

In line with their policy, any species that has not undergone an Environment and Invasives Committee approved Risk Assessment is designated "extreme" as part of their precautionary procedures, as a result, almost every species of exotic mammal listed in the document has been categorised as "extreme (P)".

The EIC list does not define the legal status of species under Commonwealth, State or Territory legislation (EIC, 2018).

Potential impacts of established feral populations

Within its natural range Red-bellied Tamarins are not considered a pest in any economic way (IUCN, 2019). The Global Invasive Species Database (2020) does not list any member of the callitrichid genus as being invasive. As fruit-eaters, Callitrichids are seed dispersers (Garber, 1986), spreading seeds through their faeces and fur. These could potentially include the seeds of invasive and unwanted species.

Red-bellied Tamarins feed largely on fruits, nectar, flowers, exudates, large-bodied invertebrates (such as crickets and grasshoppers) and to a lesser extent on small herptiles (such as lizards and frogs), therefore they would likely find food sources in most forested

habitats in tropical Australia. In terms of competition for food resources, Australian-native arboreal mammal species can display diverse feeding habits, feeding on leaves, fruits, flowers, nectar and exudates, invertebrates and small vertebrates (Menkhorst and Knight, 2010). Red-bellied Tamarins could compete for fruit, nectar, flowers, exudates, invertebrates and small vertebrates with native arboreal mammals. However, their primary food source is fruit. They will feed on alternative food sources when fruit becomes scarce during the dry season. Additionally, their exudate consumption is opportunistic, as they lack procumbent incisors for extracting exudates (Porter et al, 2001).

Red-bellied Tamarins have a high reproductive rate and a short lifespan. Following birth, the offspring are weaned and become independent quickly compared to other primates. These characteristics would potentially allow Red-bellied Tamarins to establish wild populations in Australia if any escaped. However, the low likelihood of individuals escaping and low genetic diversity could prevent this species from establishing. As noted above, there is no record of this species successfully establishing anywhere outside its natural range.

Hybridisation

In callitrichids hybridisation is known to occur in the wild where the distributions of two related species meet, creating "hybrid zones" (Arnold and Meyer, 2006; Malukiewicz et al, 2014). Successful inter and intraspecific hybridisation in the genus *Saguinus* (including crosses and backcrosses) have been reported in captivity (Cheverud, 1993; Hershkovitz, 1977; Soto-Calderón et al, 2018). However, in the wild, despite a speculation that hybrids between Red-bellied Tamarins (*Saguinus labiatus*) and Emperor Tamarins (*Saguinus imperator*) have been found, this has not been confirmed (Izawa and Bejarano, 1981).

The hybridisation of Callitrichid primates can result in fertile offspring, particularly in marmosets (Coimbra-Filho et al, 1993). While there have been reports of fertile hybrids among *Saguinus* species and subspecies produced in captivity (for example, the interspecific cross and backcross of female *Saguinus midas midas* x male (*Saguinus midas midas* x *Saguinus bicolor bicolor*)) (Hick, 1961 (cited in Hershkovitz, 1977)), and the intraspecific cross of *Saguinus fuscicollis lagonotus* x *Saguinus fuscicollis illigeri* (Jaquish, 1994)), other studies found that certain *Saguinus* hybrids may be infertile (for example, *Saguinus leucopus* x *Saguinus oedipus*) (Soto-Calderón et al., 2018). Whether the crossing of *Saguinus labiatus* with other *Saguinus* species will produce fertile offspring is yet to be determined. Nevertheless, there are no primates native to Australia, therefore there is no risk of Red-bellied Tamarins hybridising with Australian native fauna

Risk mitigation

The risk assessment (Appendix A) indicates that the species has a **low** potential for establishing in Australia and a **low** risk of becoming a pest if it were released. As the animals would be restricted to being kept in a secure facility at an approved zoo it is unlikely that they would escape or be released, and it is unlikely that they will be able to find suitable habitat quickly enough to survive. We therefore consider the overall risk of establishing and impacting on the environment is reduced to negligible.

Table 1: Summary of risks and mitigation measures

Risk	Likelihood	Impact	Mitigation measures	Overall risk
Release or escape of adult specimens	Very low	Negligible	Only kept in secure cages in zoos	Negligible
Release or escape of immature specimens	Very low	Negligible	Only kept in secure cages in zoos	Negligible
Disease transmission to native species populations	Very low	Negligible	Only kept in secure cages in zoos. Individuals will be vet checked prior to arrival and will be subject to Department of Agriculture, Water and the Environment quarantine procedures.	Negligible
Theft and deliberate release	Low	Negligible	Previous thefts of marmosets in Australia were for the pet trade – deliberate release is unlikely and survival in the wild unlikely.	Negligible

The department considers that any risks posed by this species establishing a feral population and impacting on the environment would be adequately mitigated by including the species on Part 2 of the Live Import List with conditions limiting the import of live animals for zoo exhibitions.

Concerns raised and responses

The department undertook consultation with relevant ministers (or their delegates), government agencies and the public from 7 July – 28 August 2020. The department received responses from the NSW government and the Animal Justice Party – neither were supportive of the application. Below is a summary of the concerns raised and the department's response in *italics*:

1. The NSW government advised that Red-bellied Tamarins are classed as 'prohibited dealings' under the NSW *Biosecurity Act 2015*, being prohibited from being kept in NSW. The NSW government considers Red-bellied Tamarins a biosecurity risk due to their potential negative impacts as vectors of diseases with significance to trade, community, and the Australian environment.

While the status of animals under state or territory law is considered in the assessment of species for listing, being a prohibited dealing in NSW would not preclude the Tamarins from being listed. Once a species is placed on the Live Import List any imports would need to comply with the relevant state or territory laws. Individuals will be subject to Department of Agriculture, Water and the Environment quarantine procedures.

2. The Animal Justice Party noted that Red-bellied Tamarins are not considered endangered in their native environment, as evidenced by the fact that this species is

listed in the International Union for Conservation of Nature (IUCN) Red List of Threatened Animals as Least Concern (LC). The AJP is concerned about the welfare of the captive Red-bellied Tamarin individuals. The intention of the importing facility is to hold a pair of individuals and send two other pairs to other zoos. Red-bellied Tamarins are social animals living in groups of up to 15 individuals. In their native environment, each group occupy an area ranging from 15 to 40 hectares. The AJP is concerned that a 20 m² cage as proposed in the application would not be enough space for the animals to move around sufficiently. The reduced social interaction and space could lead to possible psychological stress for these animals.

This risk assessment examines the potential environmental impacts of importing Red-bellied Tamarins. If the species is listed every import would require a permit from the department, during this phase the specifics of each importation regarding animal welfare, cage size and adequacy of the facilities would be determined before a permit was granted. The application provides details in section 11 of the conditions in which the animals will be transported in order to comply with current IATA Live Animal Regulations and kept according to state permitting standards.

In September 2020 the department specifically sought comment and clarification on the status of the Red-bellied Tamarin for conservation breeding from the Zoo and Aquarium Association Australasia (ZAA).

3. The Zoo and Aquarium Association confirmed that the Red-bellied Tamarin is not a Primate Taxon Advisory Group-identified priority, and there is no formal conservation breeding program for this species in any country.

Based on the IUCN listing as Least Concern and the ZAA response, the listing of Red-bellied Tamarins as part of a species conservation breeding program is not justified.

A second consultation round was undertaken from 20 October to 9 November 2020 with state and territory government agencies only, via the GovTEAMS website. **No comments were received.**

Conclusion

Having undertaken an analysis and reviewed the available information, the department considers that the listing of Red-bellied Tamarins for conservation purposes is unwarranted. The department considers that the Red-bellied Tamarin has a low probability of establishing in Australia and that restricting imports, to exhibition purposes only requiring individuals are kept securely at zoos reduces the risks further. The Department considers that listing the Red-bellied Tamarin for conservation purposes is unwarranted.

Consequently, the department recommends listing *Saguinus labiatus* () on Part 2 of the Live Import List with the condition, as per section 303FB(c): **Import for the purposes of exhibition only.**

Appendix A: Australian Bird and Mammal Risk Assessment Model



Species identification and sources

Common name	Red-bellied Tamarin
Scientific name	<i>Saguinus labiatus</i>
Date assessed	18-Aug-20
Literature Search Type and Date:	IUCN Red List of Threatened Species, Google

Risks posed by captive or released individuals

	Value	Comment
A1. Risk to people from individual escapees (0–2)	0	Callitrichids have small sharp claws and teeth and are capable of inflicting minor wounds on humans. However, the very small size of the animals prevents serious injuries.
A2. Risk to public safety from individual captive animals (0–2)	0	No risk to humans
A. Risk posed by captive or released individuals (= Sum of A 1 to 2).	0	Not dangerous

Risk of establishment

	Value	Comment
B1. Climate Match Score (1–6)	2	Confined to Northern Australian coastal regions including NT and certain areas of QLD.
B2. Exotic Population Established Overseas Score (0–4)	0	No exotic population ever established.
B3. Overseas Range Size Score (0–2)	0	Overseas range in the Amazon basin in Brazil, Peru, and Bolivia. The extent of occurrence is approximately 213,000.000 km ² . It is found in lowland areas in elevations ranging between 90 and 289 m.
B4. Taxonomic Class Score (0–1)	1	Mammal
B5. Diet Score (0–1)	1	Red-bellied Tamarin eats fruits flowers, nectar, plant exudates and animal prey (including insects such as crickets and grasshoppers, and little frogs and lizards).
B6. Habitat Score (0–1)	1	Red-bellied Tamarins are found in primary and secondary forests.
B7. Migratory Score (0–1)	1	Not migratory
Model	2	
B. Risk of Establishment (Model 1 = Sum of B1 to B4; Model 2 = Sum of B1 to B7).	6	Low

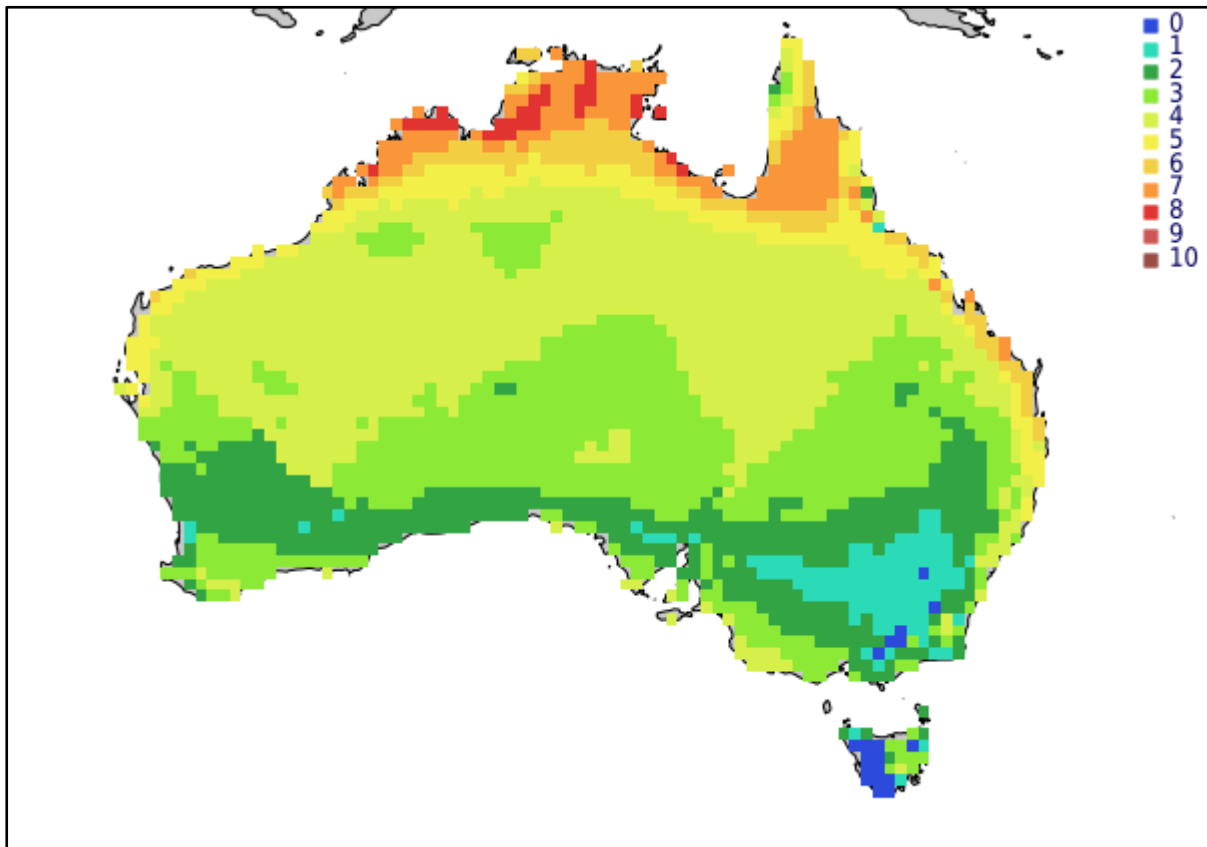
Risk of becoming a pest

	Value	Comment
C1. Taxonomic group (0–4)	0	Red-bellied Tamarin is not a member of any of the identified taxonomic groups.
C2. Overseas range size including current and past 1000 years, natural and introduced range (0–2)	0	The extent of occurrence is approximately 213,000.000 km ² .

C3. Diet and feeding (0–3)	1	Red-bellied Tamarins eat fruits flowers, nectar, plant exudates and animal prey (including insects such as crickets and grasshoppers, and little frogs and lizards).
C4. Competition with native fauna for tree hollows (0–2)	0	In captivity nest boxes are provided to Callitrichids, but animals in the wild do not normally use cavities for either sleeping or breeding.
C5. Overseas environmental pest status (0–3)	0	Red-bellied Tamarin has not been reported as a pest.
C6. Climate match to areas with susceptible native species or communities (0–5)	2	The species has no grid squares within the highest two climate match classes (i.e. in classes 10 and 9) that overlap the distribution of any susceptible native species or ecological communities, and has 1-9 grid squares within the four highest climate match classes, that overlap the distribution of any susceptible native species or ecological communities.
C7. Overseas primary production pest status (0–3)	0	Red-bellied Tamarin has not been identified in the literature as causing damage to any crop or primary production.
C8. Climate match to susceptible primary production (0–5) Hint: Use the "commodity" sheet created when a CLIMATCH grid is opened.	1	Low (species has attributes making it capable of damaging this or similar commodities and has had the opportunity but no reports or other evidence that it has caused damage in any country or region).
C9. Spread disease (1–2)	2	Species is mammalian. Score of 2 is predetermined.
C10. Harm to property (0–3)	1	Callitrichids have small sharp claws and sharp teeth and are capable of digging holes in wooden structure in search for sap. However, the very small size of the animals restricts the amount of damage to property or ecosystems. The limited potential range of this species within Australia, according to the climatic modelling, indicates limited interaction between this species and the environment or property. Hence a score of 1.
C11. Harm to people (0–5)	1	Callitrichids have small sharp claws and sharp teeth and are capable of inflicting wounds on humans. However, the very small size of the animals prevents serious injuries.
C. Pest Risk Score (= Sum of C 1 to 11).	8	Low

Summary	Value	
A. Risk to public safety posed by captive or released individuals	0	Not dangerous
B. Risk of establishing a wild population	6	Low
C. Risk of becoming a pest following establishment	8	Low

Disclaimer This risk assessment does not account for everything that is likely to affect to the risk of establishment. **It should be interpreted in the light of any other information you may have.**

APPENDIX B: CLIMATCH PREDICTED RANGE.**REFERENCES**

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COMMONWEALTH OF AUSTRALIA*Environment Protection and Biodiversity Conservation Act 1999***List of Specimens taken to be Suitable for Live Import Amendment
(Red-bellied Tamarin) Instrument 2021**

I, Sussan Ley, Minister for the Environment, pursuant to subparagraphs 303EC(1)(a)(i) and 303EC(1)(a)(iii) of the *Environment Protection and Biodiversity Conservation Act 1999*, and having considered a report prepared for the purposes of paragraph 303EC(5)(a) of that Act, make the following amendment by including in Part 2 of the *List of Specimens Taken to be Suitable for Live Import (29/11/2001)* under the heading ‘Vertebrate Animals’, ‘Mammals (Mammalia)’ in the appropriate alphabetic position:

Taxon	Common Name	Conditions for import
<i>Saguinus labiatus</i>	Red-bellied Tamarin	Import for the purposes of exhibition only.

This instrument commences the day after registration.

Dated:

.....

SUSSAN LEY

Minister for the Environment

EXPLANATORY STATEMENT

Environment Protection and Biodiversity Conservation Act 1999

List of Specimens taken to be Suitable for Live Import Amendment (Red-bellied Tamarin) Instrument 2021

Instrument under subparagraphs 303EC (1)(a)(i) and 303EC (1)(a)(iii)

Issued under authority of the Minister for the Environment

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), a live specimen is taken to be suitable for import if it is included on the *List of Specimens Taken to be Suitable for Live Import (29/11/2001)* (Live Import List).

The Live Import List was established under section 303EB of the EPBC Act and has two parts. Part 1 comprises a list of unregulated specimens exempt from the requirement for an import permit under the EPBC Act. Part 1 of the list must not contain a CITES specimen. Part 2 comprises a list of allowable regulated specimens that can be imported with a permit issued by the Minister, along with notation of any restrictions or conditions attached to the inclusion of a specimen.

Subsection 303EC(1) of the Act relevantly provides that the Minister may, by legislative instrument, amend the Live Import List by:

- including items in a particular part of the list;
- deleting items from a particular part of the list;
- imposing a restriction or condition to which the inclusion of a specimen in Part 2 of the list is subject;
- varying or revoking a restriction or condition to which the inclusion of a specimen in Part 2 of the list is subject; or
- correcting an inaccuracy or updating the name of a species.

Amendments to include an item can be made either on the initiative of the Minister, under section 303ED of the EPBC Act, or by application from a person made under section 303EE of the EPBC Act.

Subsection 303EC(3) of the EPBC Act provides that before amending the list referred to in section 303EB as mentioned in paragraph 303EC(1)(a), the Minister:

- must consult each other Minister or Ministers as the Minister considers appropriate; and
- must consult each other Minister or Ministers of each State and self-governing Territory as the Minister considers appropriate; and
- may consult such other persons and organisations as the Minister considers appropriate.

Further, subsection 303EC(5) of the EPBC Act provides that the Minister must not amend the list referred to in section 303EB by including an item in the list unless:

- the amendment is made following consideration of a relevant report under section 303ED or section 303EE; or
- the amendment is made following consideration of a relevant review under section 303EJ.

The *List of Specimens taken to be Suitable for Live Import Amendment (Red-bellied Tamarin) Instrument 2021* (the Amendment Instrument) amends the Live Import List to include *Saguinus labiatus* (Red-bellied Tamarin) in Part 2 with the condition: “Import for the purposes of exhibition only”.

This amendment to the list to add *Saguinus labiatus* was initiated by an application made to the Minister under section 303EE of the EPBC Act. An assessment of the potential impacts on the environment of the proposed amendment was reported to the Minister, in accordance with subsection 303EE(3).

In accordance with paragraph 303EF(2)(b) of the EPBC Act, the draft assessment report was published on the Department of Agriculture, Water and the Environment’s website and public comments sought between 7 July and 28 August 2020. Two responses were received, and neither were supportive of the amendment.

The concerns raised in the responses included that the species were not a priority species for conservation purposes; they may be vectors for disease, and possible animal welfare issues related to limited opportunities for social interaction.

The department concluded that any risks of the species establishing a feral population and impacting on the environment would be adequately mitigated by importing of this species with the condition ‘Import for the purposes of exhibition only’.

Comment and clarification were sought in September 2020 from the Zoo and Aquarium Association Australasia (ZAA) who confirmed that *Saguinus labiatus* is not a priority species for conservation breeding.

Consultation concerning the amendment to Part 2 of the Live Import List was also carried out, in accordance with subsection 303EC(3) of the EPBC Act between 20 October and 9 November 2020. In this case the Department of Agriculture, Water and the Environment consulted with relevant Commonwealth, state and territory agencies for the environment, conservation and agriculture. No comments were received.

The final assessment report was provided to the Minister. In accordance with paragraph 303EC(5)(a) of the EPBC Act, the Minister considered the report before deciding to amend the list to include *Saguinus labiatus* on Part 2 of the Live Import List.

This instrument is a legislative instrument for the purposes of the *Legislation Act 2003*. It commences the day after registration.

Statement of Compatibility with Human Rights

Prepared in accordance with Part 3 of the Human Rights (Parliamentary Scrutiny) Act 2011

Environment Protection and Biodiversity Conservation Act 1999

List of Specimens taken to be Suitable for Live Import Amendment (Red-bellied Tamarin) Instrument 2021

This Legislative Instrument is compatible with the human rights and freedoms recognised or declared in the international instruments listed in section 3 of the *Human Rights (Parliamentary Scrutiny) Act 2011*.

Overview of the Legislative Instrument

The purpose of this instrument is to amend Part 2 of the *List of Specimens taken to be Suitable for Live Import (29/11/2001)* to include *Saguinus labiatus* (Red-bellied Tamarin) in accordance with section 303EC of the *Environment Protection and Biodiversity Conservation Act 1999*.

Human rights implications

This Legislative Instrument does not engage any of the applicable rights or freedoms.

Conclusion

This Legislative Instrument is compatible with human rights as it does not raise any human rights issues.

**The Hon Sussan Ley MP
Minister for the Environment**



Comments received on the draft assessment report the import of Red-Bellied Tamarin (*Saguinus labiatus*) into Australia.

The department undertook first comment consultation with relevant ministers (or their delegates), government agencies and the public from 7 July to 28 August 2020. One state government and two non-government organisations responded – summarised as follows:

Respondent	Summary of Comments	Department's Response
NSW Government - Department of Primary Industries (NSW DPI)	<p>The NSW DPI does not support the amendment of Part 2 of the Live Import List to allow for the import of Red-Bellied Tamarins for non-commercial purpose only, excluding household pets. Below is a list of the concerns raised by the NSW DPI:</p> <p>The NSW government considers Red-bellied Tamarins a biosecurity risks due to their potential negative impacts as vectors of diseases with significance to trade, community, and the Australian environment. Red-bellied Tamarins are classed as prohibited dealings under the NSW Biosecurity Act 2015, being prohibited from being kept in NSW.</p>	<p>While the status of animals under state or territory law is considered in the assessment of species for listing, being a prohibited dealing in NSW would not preclude the Tamarins from being listed. Once a species is placed on the Live Import List any imports would need to comply with the relevant state or territory laws.</p> <p>The department considers listing the Red-Bellied Tamarins for non-commercial purpose only, excluding household pets on Part 2 of the Live Import list as the importation of these animals would be restricted to zoos only.</p> <p>Disease and pathogen aspects will be separately assessed by the department under the Biosecurity Act (cwh). The assessment under the EPBC Act will not duplicate this assessment but focuses on the pest and environmental risks of the Tamarin.</p>
Animal Justice Party (AJP)	<p>The AJP does not support the amendment of Part 2 of the Live Import List to allow for the import of Red-Bellied Tamarins for non-commercial purpose only, excluding household pets. Below is a list of the concerns raised by the AJP:</p> <ul style="list-style-type: none"> • Red-bellied Tamarins are not considered endangered in their native environment therefore no conservation breeding program is warranted. 	<p>This risk assessment examines the potential environmental impacts of importing Red-bellied Tamarins. If the species is listed every import would require a permit from the department, during this phase the specifics of each importation regarding animal welfare, cage size and adequacy of the facilities would be determined before a permit was granted.</p>

Respondent	Summary of Comments	Department's Response
	<ul style="list-style-type: none"><li data-bbox="389 188 807 607">• Welfare: Red-bellied Tamarins are social animals living in groups of up to 15 individuals and will not have enough space for the animals to move around sufficiently. The reduced social interaction and space could lead to possible psychological stress for these animals.	



Department of
Primary Industries

[REDACTED]
Director
Listings and Threat Abatement, Environmental Biosecurity Office
Department of Agriculture, Water and the Environment
GPO Box 787
CANBERRA ACT 2601
EMAIL: exotic.species@awe.gov.au

Ref: OUT20/10283

Dear [REDACTED]

Thank you for providing the opportunity to comment on the applications to amend the 'List of Specimens taken to be Suitable for Live Import' (Live Import List) under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) to include Bat-eared fox, *Otocyon megalotis* and Red-bellied tamarin, *Saguinus labiatus*.

Managing the biosecurity risks of non-indigenous species is a key concern for NSW Department of Primary Industries. The Bat-eared fox and the Red-bellied tamarin are both species that represent biosecurity risks to NSW due to their potential negative impacts if they were to establish wild populations, as well as being vectors of diseases with significance to trade, community and the Australian environment. Bat-eared foxes and Red-bellied tamarins are listed by the International Union for the Conservation of Nature as of 'Least Concern' for conservation and therefore there is no justification for import to support international conservation efforts.

Please note that the applications are in error with respect to the legal status of the species in NSW. Both the Bat-eared fox, and the Red-bellied tamarin are classed as prohibited dealings under the *NSW Biosecurity Act 2015*, thereby prohibiting either species from being kept in NSW. We would also have concerns with other jurisdictions keeping these species due to potential future movements of the species within the country if their import was allowed.

For the above reasons, NSW DPI does not support the applications to amend the Live Import List to include Bat-eared fox and Red-bellied tamarin.

I have asked that [REDACTED] Manager Invasive Species Strategy and Planning, be available, should you need further information or wish to discuss this matter further. [REDACTED] may be contacted on [REDACTED]

Yours sincerely

[REDACTED]



Committee Secretariat
PO Box 6021
Parliament House
Canberra ACT 2600

Submission: Import of Red-bellied Tamarin for zoo display

This submission has been prepared by the national submissions working group within the Animal Justice Party ('the AJP'). The working group makes this submission on behalf of the AJP with the approval and the endorsement of the Board of Directors. The AJP was established to promote and protect the interests and capabilities of animals by providing a dedicated voice for them in Australia's political system, whether they are domestic, farmed or wild. The AJP seeks to restore the balance between humans, animals and nature, acknowledge the interconnectedness and interdependence of all species, and respect the wellbeing of animals and the environment alongside that of humans and human societies. The AJP advocates for all animals and the natural environment through our political and democratic institutions of government. Above all, the AJP seeks to foster consideration, respect, kindness and compassion for all species as core values in the way in which governments design and deliver initiatives and the manner in which they function. The following submission is underpinned by these fundamental beliefs.

The AJP has a policy position on *zoos and animals for entertainment*. The AJP only supports zoos where they function in the service of animals. Functions may include breeding of endangered animals, rescue and rehabilitation and serving as a permanent home for animals where release is not possible or appropriate. Formidable animal welfare challenges exist around Australia with regard to the unnatural use of animals in commercially-operated entertainment enterprises, such as zoos. The Animal Justice Party believes that animals

should be enjoyed, appreciated, respected and cared for in as close to their natural state as possible. They should never be terrified as they perform unnatural behaviours or goaded to provide opportunities for humans to demonstrate 'skills' in taunting and subduing them for audience amusement. Visitors, where allowed, should not adversely impact animals. This submission puts forward commentary in line with this policy position.

THE SUBMISSION

The AJP holds the position that the treatment of all animals, regardless of their origin, should be humane. The AJP argues against the import of Red-bellied Tamarins on the grounds that it is purely for zoo entertainment and not for conservation. The unnamed zoo requesting the import proposes the importation of Red-bellied Tamarins would be for the purposes of starting a captive population within Australian zoos as a part of the overall global captive population. However, as the species is only listed by the IUCN¹ as LC (Least Concern), it is not endangered in the wild state, and therefore the proposed captive population serves primarily as zoo attraction for entertainment. Conservation should be carried out in the native land of the species in their natural environment or as closely to as possible.

The proposed import would initially be of 3.3.0 individuals for three zoos. The intention of the importing facility is to hold 1.1 while the remaining pairs will be held at the other two facilities. However, Red-bellied Tamarins are recorded as living in family groups composed of a monogamous breeding pair and their non-breeding adult offspring, with average group size is six or seven individuals² with a group maintaining a territory of between 23 to 41 hectares in size.³ The proposed enclosure, which will measure a minimum of 20 square metres and be 3 metres high, be unnaturally small and will no doubt cause these Red-bellied Tamarins psychological stress.

In place of importing exotic animals of zoo display, the AJP promotes the creation of government funded educational initiatives that promote alternative cruelty-free forms of entertainment and allow deductible gift recipient status for approved not-for-profit organisations working in conservation.

Summary of recommendations:

- Prohibit the import of Red-bellied Tamarins to be used in public display
- Increasing the minimum size of the proposed enclosures in zoos

In conclusion, the AJP argues against the import of the Red-bellied Tamarins application. The AJP seeks an alternative move towards societal acceptance so that all species are treated in a humane manner which moves society towards the treatment of all animals with respect, dignity, compassion, and kindness. The AJP also advocates for the protection of habitats and ecosystems so that animals can survive and thrive in their natural environments.


National Submissions Manager

Animal Justice Party

Email: submissions@animaljusticeparty.org

References

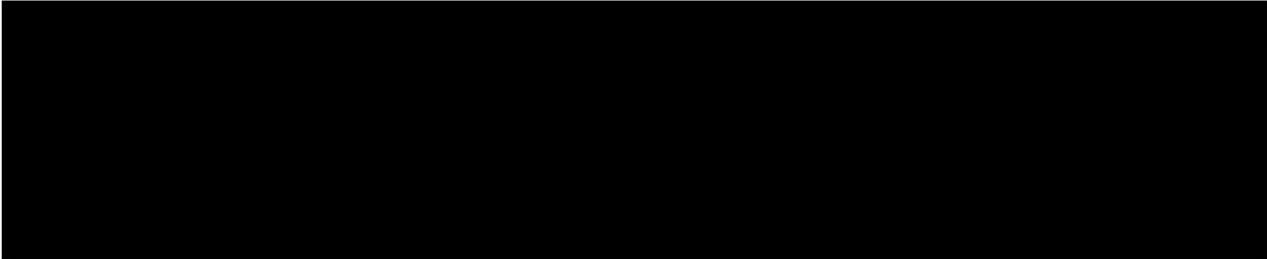
1. IUCN page for "Saguinus labiatus": <http://www.iucnredlist.org/details/41524/0>
2. Hardie, S.M. (1998) "Mixed species tamarin groups (Saguinus fuscicollis and Saguinus labiatus) in northern Bolivia" Primate Report vol 5: pp. 39-62
3. Yoneda, M. (1981) "Ecological studies of Saguinus fuscicollis and Saguinus labiatus with reference to habitat segregation and height preference" Kyoto University Overseas Research Report of New World Monkeys pp. 43-50

Round 2 - A second consultation round seeking comment from state and territory government agencies on the applicants' reports and the department's updated Risk Assessment Report was undertaken from 20 October to 9 November 2020 via the GovTEAMS website.

No comments were received.

Additional consultation - In September 2020 additional comment was sought from the Zoo and Aquarium Association Australasia (ZAA), the summary and original response are below:

Respondent	Summary of Comments	Department's Response
Zoo and Aquarium Association Australasia (ZAA)	The Zoo and Aquarium Association state that the Red-Bellied Tamarin is not a priority species for conservation breeding. The ZAA Primate Taxon Advisory Group state that the Red-Bellied Tamarin is not a priority primate species for formal management in the Australasia region under the ZAA Species Management Program and would not be entering Australia to participate in a ZAA-administered Species Management Program.	Based on the IUCN listing as Least Concern and the ZAA response, the listing of Red-Bellied Tamarin as part of a species conservation breeding program is not justified.



Thank you for the invitation to provide advice on the potential listing and importation of Red-bellied Tamarin (*Saguinus labiatus*) and Bat-eared Fox (*Otocyon megalotis*) for conservation breeding.

Red-bellied Tamarin

The Zoo and Aquarium Association oversees the formal management of three Callitrichid species (Cotton-top Tamarin, Golden Lion-tamarin and Pygmy Marmoset) with plans to formally manage an additional one species (Emperor Tamarin). These four species have been identified and agreed by the ZAA Primate Taxon Advisory Group (Primate TAG) as the priority Callitrichids for formal management in the Australasia region under the ZAA Species Management Program (ZAA SMP, formerly ASMP). The Primate TAG has representation from all ZAA Members with an interest in primates. Red-bellied Tamarin is not currently a Primate TAG-identified priority and would not be entering Australia to participate in a ZAA-administered Species Management Program.

Bat-eared Fox

The Zoo and Aquarium Association oversees the formal management of one Canid species (African Wild Dog). This species has been identified and agreed by the ZAA Carnivore and Small Exotic Mammal TAG as the priority Canid for formal management in the Australasia region under the ZAA SMP. The Carnivore and Small Exotic Mammal TAG has representation from all ZAA Members with an interest in Carnivores and Small Exotic Mammals. Bat-eared Fox is not currently a Carnivore and Small Exotic Mammal TAG-identified priority and would not be entering Australia to participate in a ZAA-administered Species Management Program.

In instances where ZAA Members wish to care for a species with a point of difference to the ZAA TAG-identified priority species', Members are encouraged to support other recognised zoo and aquarium associations administering a program for that species.

It is understood that there is a studbook kept for Red-bellied Tamarin under the European Association of Zoos and Aquariums (EAZA), however a formal program (with provision of recommendations for transfer and breeding) is not managed by EAZA. Similarly, the North American Association of Zoos and Aquaria (AZA) does not formally manage a program for Red-bellied Tamarin.

Both EAZA and AZA formally manage a program for Bat-eared Fox.

Please feel free to get in touch if you require additional information.

Best,



Foi

From: s. 22(1)(a)(ii) @environment.gov.au>
Sent: Monday, 10 May 2021 11:19 AM
To: DLO Ley
Cc: Cleland, Robyn; s. 22(1)(a)(ii)
Subject: RE: Live Import List amendments: decision dates [SEC=OFFICIAL]

Good morning

I note that today is the day by which the Minister must decide either to list the Bat-eared Fox (MS20-001592) or to specify a longer period in which to make her decision.

If a decision is not likely today we would be happy to prepare the paperwork for the Minister to specify a longer period in which to make her decision. If this is the preferred option please advise what that longer period is to inform the paperwork.

Note that, should the Minister decide to specify a longer period, her decision will be provided to the applicant, Mr s. 47F(1) of Darling Downs Zoo, and published on the department's website.

Regards

s. 22(1)(a)(ii)

Director | Listings and Threat Abatement | Environmental Biosecurity Office
s. 22(1)(a)(ii)

Department of Agriculture, Water and the Environment
18 Marcus Clarke Street ACT 2600
GPO Box 858 Canberra City ACT 2601

awe.gov.au

From: s. 22(1)(a)(ii)
Sent: Friday, 30 April 2021 12:08 PM
To: DLO Ley <DLOley@environment.gov.au>
Cc: Cleland, Robyn (Agriculture) <Robyn.Cleland@agriculture.gov.au>; s. 22(1)(a)(ii) @environment.gov.au>
Subject: Live Import List amendments: decision dates [SEC=OFFICIAL]

Good afternoon

s. 22(1)(a)(ii) contacted me on Tuesday and asked about timing for a decision in relation to MS20-001592, a brief requesting her to consider a request to amend the List of specimens suitable for live import established under section 303EC of the EPBC Act by including the Bat-eared Fox.

I note that briefs have now been sent to the Office in relation to s. 22(1)(a)(ii) and Red-bellied Tamarin. Our understanding of the 30 day decision time-frame is:

Brief	Specimen	Received by MO	30 business days
MS20-001592	Bat-eared Fox	24/3/21	10/5/21
MS21-000562	Red-bellied Tamarin	28/4/21	10/6/21

s. 22(1)(a)(ii)

As discussed with ^{s. 22(1)(a)(ii)}, under section 303EG of the Act the Minister must decide whether or not to make the proposed amendment within:

- a. 30 business day or
- b. If the Minister, by writing, specifies a longer period that longer period after the first business day after the day on which the report was received.

If the Minister specifies a longer period she must

- a. If she has received an application to amend the list – give a copy of the specification to the applicant; and
- b. Publish the specification in accordance with the EPBC Regulations.

s. 22(1)(a)(ii)

Regards

s. 22(1)(a)(ii)

Director | Listings and Threat Abatement | Environmental Biosecurity Office
s. 22(1)(a)(ii)

Department of Agriculture, Water and the Environment
18 Marcus Clarke Street ACT 2600
GPO Box 858 Canberra City ACT 2601

awe.gov.au

Foi

From: DLO Ley <DLOLey@environment.gov.au>
Sent: Wednesday, 26 May 2021 8:51 AM
To: Cleland, Robyn; s. 22(1)(a)(ii)
Cc: DLO Ley; DAWE Parliamentary; Stevens, Tia; s. 22(1)(a)(ii)
Subject: Submission Considered - MS21-000562 - Amending the Live Import List to include the Red-bellied Tamarin (*Saguinus labiatus*) [SEC=OFFICIAL]

Hi Robyn and s. 22(1)(a)(ii)

The Minister has considered MS21-000562 - Amending the Live Import List to include the Red-bellied Tamarin (*Saguinus labiatus*).

Recommendation 1: Not agreed
Recommendation 2: Not agreed
Recommendation 3: Not approved.

The hard copy submission will be returned to the department in the next courier run.

Kind regards

s. 22(1)(a)(ii)

Departmental Liaison Officer | Office of the Hon Sussan Ley MP
Minister for the Environment
Office: s. 22(1)(a)(ii)
Mob: s. 22(1)(a)(ii)
E-mail: DLOLey@awe.gov.au

Foi

From: DLO Ley <DLOLey@environment.gov.au>
Sent: Monday, 10 May 2021 6:28 PM
To: Herrald-Woods, Elyse; s. 22(1)(a)(ii)
Cc: Parliamentary Liaison Services - Agriculture; DAWE Parliamentary; tia.stevens@awe.gov.au; s. 22(1)(a)(ii) ; DLO Ley
Subject: Signed Submission – MS20-001592 - Amending the Live Import List to include Bat-eared Fox (Otocyon megalotis) [SEC=OFFICIAL]

Dear Elyse and s. 22(1)(a)(ii)

The Minister has considered the above submission.

Recommendation 1: Not agreed

Recommendation 2: Not signed

Recommendation 3: Not approved

No annotations. The hardcopy will be returned to the department tomorrow for processing.

Kind regards

s. 22(1)(a)(ii)

Departmental Liaison Officer | Office of the Hon Sussan Ley MP
Minister for the Environment
Office: s. 22(1)(a)(ii)
Mob: s. 22(1)(a)(ii)
E-mail: DLOLey@awe.gov.au

Foi

From: s. 22(1)(a)(ii) @environment.gov.au>
Sent: Friday, 30 April 2021 12:08 PM
To: DLO Ley
Cc: Cleland, Robyn; s. 22(1)(a)(ii)
Subject: Live Import List amendments: decision dates [SEC=OFFICIAL]

Good afternoon

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s. 22(1)(a)(ii)

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s. 22(1)(a)(ii)

Regards

s. 22(1)(a)(ii)

Director | Listings and Threat Abatement | Environmental Biosecurity Office
s. 22(1)(a)(ii)

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