

PEST RISK ASSESSMENT

Boa Constrictor

Boa constrictor



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About this Pest Risk Assessment:

This pest risk assessment is developed in accordance with the *Policy and Procedures for the Import, Movement and Keeping of Vertebrate Wildlife in Tasmania* (DPIPWE 2011). The policy and procedures set out conditions and restrictions for the importation of controlled animals pursuant to s32 of the *Nature Conservation Act 2002*. This pest risk assessment is prepared by DPIPWE for use within the Department.

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I. Summary

The Boa Constrictor (*Boa constrictor*) is a large non-venomous snake common to a wide range of habitats in Central and South America. The species is not listed on the IUCN Red List of Threatened Species, and is one of the most common reptiles in the global pet trade.

A previous Australian risk assessment concluded that the Boa Constrictor represents an extreme threat to Australia.

The Boa Constrictor is considered a pest species in the United States. Feral populations have established outside its native range, and its introduction has contributed to the decline of native species. Boa Constrictors are also capable of inflicting serious injury to people, either by wrapping tightly around the body, or by biting.

This risk assessment concludes that there is a moderate likelihood of this species establishing in Tasmania. Anticipated impacts include predation on a range of birds, mammals and reptiles, as well as competition with native predators. A number of species that are listed under the *Threatened Species Protection Act 1995* would potentially be at risk from the establishment of the Boa Constrictor in Tasmania.

All except one member of the Family Boidae are listed in CITES Appendix II. The Argentine subspecies of Boa Constrictor (*B. c. occidentalis*) is included in CITES Appendix I. Under the *Environment Protection and Biodiversity Conservation Act 1999*, only the Argentine subspecies is listed as 'specimens taken to be suitable for live import' and require a permit to import into Australia issued under this Act.

In Tasmania, the species is a 'controlled animal' under the *Tasmanian Nature Conservation Act 2002*.

This risk assessment concludes that the Boa Constrictor is a serious threat to Tasmania and proposes that imports be restricted to those licence holders approved for keeping serious threat species.

2. Introduction

2.1 NAME AND TAXONOMY

Kingdom:	Animalia
Phylum:	Chordata
Class:	Reptilia
Order:	Squamata
Family:	Boidae
Genus:	<i>Boa</i>
Species:	<i>B. constrictor</i>



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Sub-species or variety (if applicable): There are 11 recognised sub-species: *B. c. amarali*; *B. c. constrictor*; *B. c. imperator*; *B. c. longicauda*; *B. c. melanogaster*; *B. c. mexicana*; *B. c. nebulosa*; *B. c. occidentalis*; *B. c. orophias*; *B. c. ortonii*; and *B. c. sabogae* (Price and Russo 1991; Page *et al.* 2008).

Common names (including any industry or trade names): Boa Constrictor, Red-tailed Boa, Ampalagua, Bigoya, Masacuate.

Known hybrids: Naturally occurring hybrids have not been noted. A number of hybrids have been bred in captivity.

Close relatives: The Boa genus comprises four species. Other members of the genus are Duméril's Boa (*B. dumerili*), the Madagascar Ground Boa (*B. madagascariensis*) and the Madagascar Tree Boa (*B. manditra*), all of which live in Madagascar. Dumeril's Boa is also found on Reunion Island (Page *et al.* 2008).

2.2 DESCRIPTION

The Boa Constrictor is one of the world's largest snakes. Adults can reach 5m in length and weigh more than 45kg, although it is rare for wild and captive-bred individuals to reach this size. Individuals are typically about 3m in length (Page *et al.* 2008).

There is clear sexual dimorphism in this species. Females are generally larger in length and girth, and males typically have a proportionately longer tail and larger pelvic spurs (the externally visible remnant of hind legs and pelvis) (Page *et al.* 2008).

Dorsally, the background colour is typically cream or brown but can be tan, green, red or yellow, with dark "saddle-shaped" markings. These markings are more colourful and prominent towards the tail, and are often reddish-brown with black or cream edging. Dark rhomboid-shaped markings are present along the sides of the body, and smaller spots may be present over the entire body. Newborn Boa Constrictors resemble their parents, although young snakes tend to have brighter colours and show a greater contrast between colours (Page *et al.* 2008; Lindemann and Harding 2009).

Extensive morphological variation exists within and between subspecies. Most subspecies have a stripe that runs dorsally from the snout to the back of the head, together with a dark triangle between the snout and the eye. An extension of this triangle occurs behind the eye, where it slants downward towards the jaw. The jaws are lined with small, hooked teeth which are used for catching and holding prey (Page *et al.* 2008; Lindemann and Harding 2009). Boas on islands tend to be dwarfed in size, averaging half the length and one fifth of the mass of mainland boas, and exhibit different head shapes and patterns (Page *et al.* 2008).

The Boa Constrictor sheds its skin periodically as it ages, and an individual may gradually change colour over multiple shedding cycles (Lindemann and Harding 2009).

2.3 CONSERVATION AND LEGAL STATUS

CONSERVATION STATUS

The Boa Constrictor is not listed on the IUCN Red List of Threatened Species (IUCN 2010).

All except one member of the Family Boidae are listed in Appendix II (species that are not necessarily threatened with extinction but may become so unless trade is closely controlled) of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The Argentine Boa Constrictor subspecies (*B. c. occidentalis*) is included in CITES Appendix I, which lists species that are the most endangered among CITES-listed species (CITES 2007) (Page *et al.* 2008).

LEGAL STATUS

Under the *Environment Protection and Biodiversity Conservation Act 1999*, only the Argentine subspecies (*B. c. occidentalis*) is listed as 'specimens taken to be suitable for live import' and require a permit to import issued under this Act. Eligible imports are for non-commercial purposes only (i.e. zoos) and exclude household pets.

Individual states and territories have legislation restricting the importation of Boa Constrictors. Under the *New South Wales Non-Indigenous Animals Regulation 2006*, the Boa Constrictor is classed as a Category 2 animal. Category 2 consists of species of high pest potential or of significant conservation value which may only be kept by holders of a restricted collection licence.

Importing, keeping, breeding and trading exotic reptiles and amphibians is illegal under the *Victorian Catchment and Land Protection Act 1994*.

In Tasmania, the species is a 'controlled animal' under the *Tasmanian Nature Conservation Act 2002*.

3. Biology and Ecology

3.1 LIFE HISTORY

Boa Constrictors are polygynous (an individual may breed with multiple mates). Usually only about half of the female population breeds, and females are only reproductively active when they are in good physical condition (O'Shea 2007, Stafford 1986; cited in Lindemann and Harding 2009). Boa Constrictors typically breed during the dry season from April to August, although the timing of the dry season varies across their range. Depending on local temperatures, gestation lasts for 5-8 months and females may store sperm for 21 months (Smith, 2005).

Boa Constrictors are prolific breeders and litters typically contain several dozen young and may contain up to 80 individuals. At birth, young are 30 - 60cm long, with length varying according to the size of the female parent (Mehrtens 1987, Smith 1999; cited in Lindemann and Harding 2009). Young are born fully developed and are independent within minutes of birth. Growth generally stops at age three in males, and age five in females.

Parthenogenesis (reproduction of viable young without fertilisation) has been reported in this species (Booth *et al.* 2010), although further research may be required to support this finding. The maximum longevity recorded in captivity is 40.4 years (Ernst and Ernst 2003, cited in Lindemann and Harding 2009).

3.2 HABITAT REQUIREMENTS AND PREFERENCES

Boa Constrictors occur in a wide range of habitats from sea level to moderate elevations (GISP 2010). They primarily inhabit lowland, tropical rainforest but also occur in arid pampas grasslands and scrub, mountainous tropical rainforest, coastal scrubs and marshes, and in second-growth forests (Smith 1999, cited in Page *et al.* 2008). The species is commonly found in or along rivers and streams, and is a capable swimmer.

The Boa Constrictor will occupy the burrows of medium-sized mammals, where it can hide from potential predators (Mattison 2007). The species is frequently found close to human habitation and has been observed in urban and agricultural areas, including cultivated fields (Obst *et al.* 1988, Romero-Najera *et al.* 2007; cited in Lindemann and Harding 2009).

This species is unlikely to make long distance movements provided food and shelter are locally available. An individual tagged with a radio transmitter reportedly moved a total of only 135m in 12 days, and spending most of its time underground in mammal burrows (Ernst and Ernst 2003; cited in Lindemann and Harding 2009).

3.3 NATURAL GEOGRAPHIC RANGE

The Boa Constrictor has a wide natural range (shown in Figure 1), estimated at approximately 15 million km² (Page *et al.* 2008). The subspecies occupy distinct and restricted ranges from

northern Mexico, through Central America (Belize, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, Panama), to South America (Colombia, Ecuador, Peru, Venezuela, Guyana, Surinam, French Guiana, Brazil, Bolivia, Uruguay and north-western Argentina) (Davis and Smith 1953, Mehrtens 1987, Greene 1997, McDiarmid *et al.* 1999, Quick *et al.* 2005, The Reptile Database 2007; cited in Page *et al.* 2008).

The Boa Constrictor has successfully naturally colonised at least 43 marine islands throughout its range, including Dominica and St Lucia islands in the Lesser Antilles; San Andres and Providencia Islands (Colombia), Taboga Island (Panama), Trinidad and Tobago, plus many other continental islands along the Atlantic and Pacific coasts of Mexico, Central and South America (McDiarmid *et al.* 1999, Henderson 2004, Boback 2005, Powell and Henderson 2005; cited in Page *et al.* 2008).

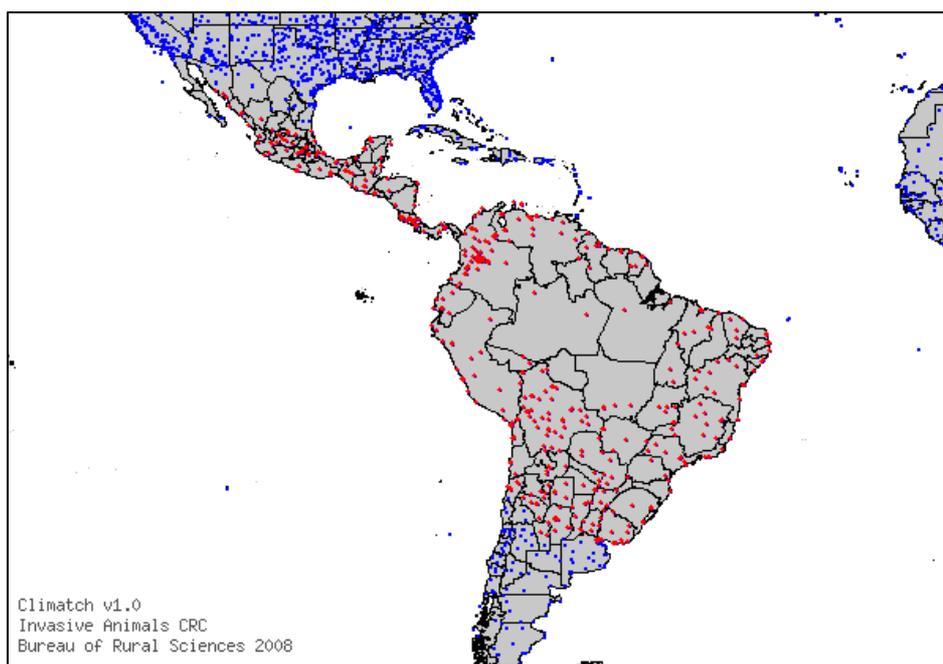


Figure 1. Natural range of the Boa Constrictor (*B. constrictor*) (Distribution source: Global Biodiversity Information Facility <<http://data.gbif.org/species/13494384/>>).

3.4 INTRODUCED GEOGRAPHIC RANGE

The Boa Constrictor is recorded on the Global Invasive Species Database (GISP 2010), and multiple introduced populations have been noted.

In the United States of America, an established breeding population occurs in Dade County, Florida; thought to be a result of released or escaped pet snakes (Ernst and Ernst 2003, Lever 2006; cited in Page *et al.* 2008).

The Boa Constrictor is thought to have been introduced onto Cozumel Island, Mexico, in 1971 after two to six boas were released following a film production on the island. The species is now established and has a wide distribution on the island (Martinez-Morales and Cuaron 1999, Lever 2006, Romero-Najera *et al.* 2007; cited in Page *et al.* 2008).

The species has also established on the island of Aruba in the Caribbean Sea. The first individual was noted in April 1999 and by December 2003, 273 individuals had been captured. It is not certain how the species first reached the island, although likely modes of introduction are stowaways in plant shipments from South America, released pet animals, or natural invasion from South America (Lindemann and Harding 2009). A government eradication program for all captured boas has been ineffective at controlling the population, which now encompasses the entire island (Quick *et al.* 2005, cited in Lindemann and Harding 2009).

3.5 POTENTIAL DISTRIBUTION IN TASMANIA

Using modelling applications by the Australian Bureau of Agricultural and Resource Economics and Sciences (DAFF), climate is compared between the species’ historical distribution and potential distribution throughout Australia (shown in Figure 2). Modelling indicates that northern and central Australia has highly similar climate which may support the establishment of introduced populations. Tasmania’s climate is moderately similar (highest climate match score: 6).

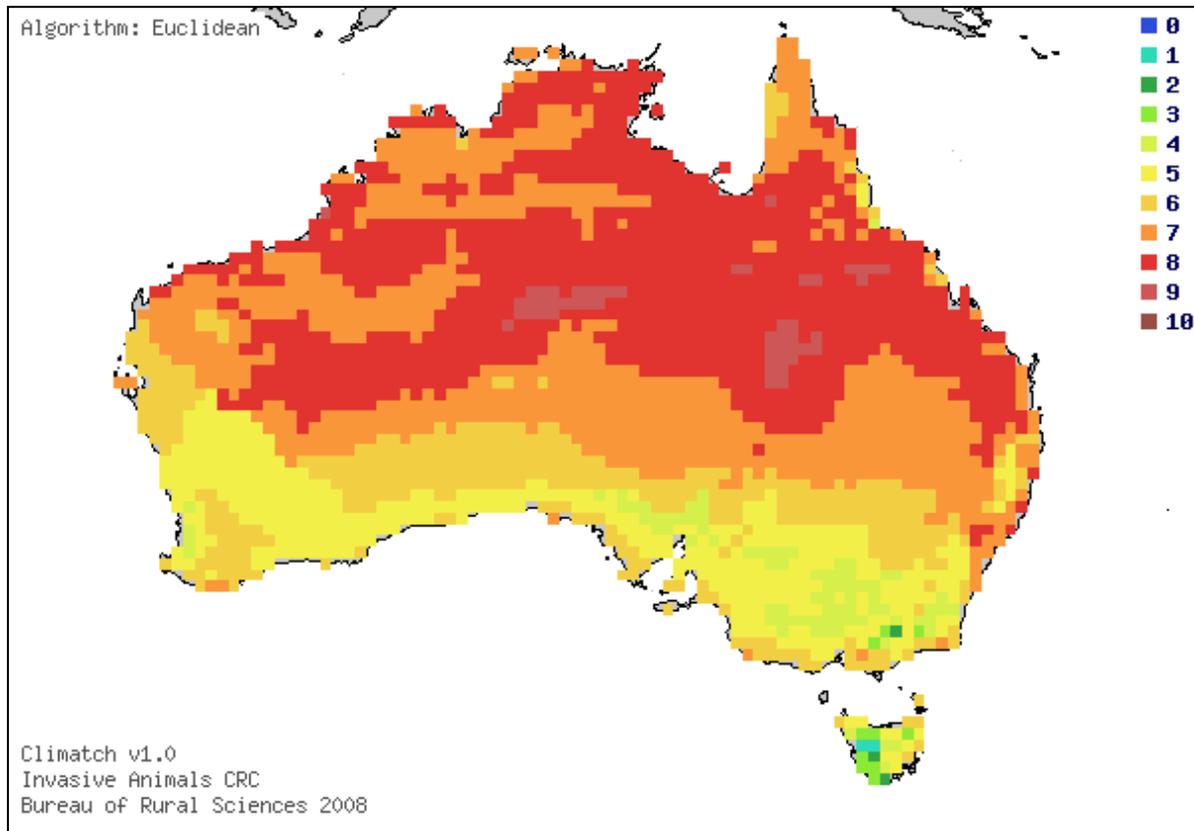


Figure 2. Climate comparison between the historical range of *B. constrictor* and Australia, where 10 is a ‘perfect’ match and 0 is having a very dissimilar climate. Tasmania shows a match between 1 and 6 (Distribution source: Page *et al.* 2008; Global Biodiversity Information Facility <<http://data.gbif.org/species/13494384/>>).

3.6 DIET AND FEEDING BEHAVIOUR

The Boa Constrictor is a non-venomous carnivore. Prey is killed via constriction; creating an intense pressure that prevents both the heart and lungs from functioning. This causes almost instantaneous unconsciousness and death (Montgomery and Rand 1978, Smith 1999, Ernst and Ernst 2003; cited in Lindemann and Harding 2009).

Boa Constrictors are ambush predators that feed on a wide variety of vertebrates. Prey items include small mammals, birds and their eggs, small lizards, and occasionally amphibians. Larger individuals may also feed on mammals such as monkeys, wild pigs, the Central American Agouti, the Cozumel Raccoon and Coati, or the White-tailed Deer (Mehrtens 1987, Obst *et al.* 1988, Greene 1997, Martinez-Morales and Cuaron 1999, Ernst and Ernst 2003, Henderson 2004, Boback 2005, Alves and Filho 2007, National Geographic 2008; cited in Page *et al.* 2008).

Examination of stomach contents of Boa Constrictors on Aruba Island showed that birds comprised 40% of prey taken, lizards 35% and mammals 25%. In the study 52 separate prey items were identified (Quick *et al.* 2005; cited in Lindemann and Harding 2009).

This species may prey on chickens and rabbits (Mattison 1982, cited in Lindemann and Harding 2009). There is potential for this species to prey on small livestock (GISP 2010).

3.7 SOCIAL BEHAVIOUR AND GROUPINGS

Typically, Boa Constrictors are solitary animals that only come together to mate; although populations in some areas occasionally den together. Individuals are most active at night and twilight, and may bask in the sun to warm themselves in cool weather (Lindemann and Harding 2009).

Boa Constrictors occur in a variety of densities. Populations inhabiting islands off the coast of Belize have a density ranging from 0.5 individuals/ha to 16.4 individuals/ha (Boback 2005, cited in Lindemann and Harding 2009). This species is not noted for being territorial, but may be aggressive when protecting young (Greene 1997; cited in Page *et al.* 2008). Aggressive behaviour includes hissing, lunging and biting.

3.8 NATURAL PREDATORS AND DISEASE

Boa Constrictors are vulnerable to predation from a variety of reptilian, avian, and mammalian predators, particularly when they are young (O'Shea 2007; Pough *et al.* 2004; cited in Lindemann and Harding 2009). In Tasmania, potential predators include large birds of prey such as the Wedge-tailed Eagle (*Aquila audax fleayi*) and the White-bellied Sea-Eagle (*Haliaeetus leucogaster*).

Boa Constrictors are susceptible to a wide range of diseases and parasites (see AFFA 2003). One of the most serious diseases commonly found in boas is Body Inclusion Disease, believed to be a fatal retrovirus. Signs of infection include central nervous system disorders such as paralysis, being unable to right itself when turned over, and inability to strike or constrict. Other signs include chronic regurgitation, extreme weight loss, and respiratory infections. The disease is rapidly fatal in

young and juvenile boas, typified by rapid onset of flaccid paralysis (Carlisle-Novak *et al.* 1998). This disease has been shown to be capable of transmission from Boa Constrictors to Australian native pythons in captivity (Carlisle-Novak *et al.* 1998).

3.9 THREAT TO HUMAN SAFETY

Boa Constrictors are capable of causing serious injury by biting. The jaws are lined with small, hooked teeth designed for grabbing and holding. After biting, the snake may let go immediately, or it may clamp down with its jaws and coil tightly around anything available, including peoples' arms and legs. Bites from boas less than 1.5 m in length generally have the severity of a cat scratch, but those from larger specimens can require a stitches if the skin tears when the person or snake pulls back (Greene 1997, Smith 1999, Ernst and Ernst 2003, National Geographic 2008, Woodland Park Zoo 2008; cited in Page *et al.* 2008). As well as damage to skin, there have been several verified records of Boa Constrictors biting their owners' eyes (Kleinman *et al.* 1998, Korn and Korn 2005; cited in Page *et al.* 2008).

Boa Constrictors have the potential to cause fatalities in humans; although there are no verified human fatalities by wild or captive Boa Constrictors (Page *et al.* 2008).

A wide variety of bacterial, fungal, and viral pathogens are known from boas and pythons, in addition to a number of external and internal parasites (Reed 2005). Many reptiles carry salmonella bacteria in their intestinal tract that are easily spread to humans however transmission from reptiles to humans occurs through ingestion of the bacteria; simply touching or handling an infected animal will not result in transmission. Overall, contact with reptiles and amphibians are estimated to account for around 74,000 (6%) of the approximately 1.2 million salmonella infections that occur each year in the United States (Mermin *et al.* 2004, cited in Page *et al.* 2008).

Risk of disease transmission from populations of the Boa Constrictor established in the wild is very low (Page *et al.* 2008).

3.10 HISTORY AS A PEST

The Boa Constrictor is listed on the Global Invasive Species Database. Adults pose a predation threat to endemic vertebrates, and the species has contributed to altered ecosystem dynamics and the decline of native species (GISP 2010). On Mexico's Cozumel Island in the Caribbean Sea, predation by Boa Constrictor has threatened endemic species including the Cozumel Thrasher (*Toxostoma guttatum*) (a bird), rodents (*Reithrodontomys spectabilis*, *Oryzomys couesi cozumelae* and *Peromyscus leucopus cozumelae*) and the Cozumel whiptail (*Cnemidophorus cozumela*) (a lizard) (Martinez-Morales and Cuaron 1999, Romero-Najera *et al.* 2007; cited in Page *et al.* 2008). There is concern that the introduced Boa Constrictors may also out-compete native boa species (GISP 2010).

3.11 POTENTIAL IMPACT IN TASMANIA

Should a population of Boa Constrictors establish in Tasmania, potential impacts include predation on a wide range of birds, mammals and reptiles, as well as competition with native predators. A number of species that are listed under the *Threatened Species Protection Act 1995* would potentially be at risk from predation, such as the New Holland Mouse. Boa Constrictors also pose a threat to human safety and may additionally impact the agricultural industry through the predation of small livestock.

A wide variety of bacterial, fungal, and viral pathogens are known from boas, in addition to a number of external and internal parasites (Reed 2005). Boa Constrictors can harbour salmonella, which could be spread to humans and native snake species (Mermin *et al.* 2004, cited in Page *et al.* 2008). The species is noted for harbouring Ophidian Paramyxo Virus which is an exotic disease that has potential to spread to Tasmanian snake species. The disease is likely to be present in Australia, but its presence has not been confirmed (AWHN 2009). The species may also harbour Inclusion Body Disease, which has been transmitted from Boa Constrictors to Australian native pythons in captivity (Carlisle-Novak *et al.* 1998).

4. Risk Assessment

4.1 PREVIOUS RISK ASSESSMENTS

A risk assessment using the Bomford model (2008) undertaken by the Department of Agriculture and Food, Western Australia, on behalf of the Australian Vertebrate Pest Committee, concluded that the Boa Constrictor poses an extreme threat to Australia (Page *et al.* 2008).

An ecological risk assessment of non-native boas and pythons in the United States found the Boa Constrictor to be the highest-risk snake in the US, based on ecological variables (Reed 2005).

4.2 RISK ASSESSMENT

The following risk assessment determines the risk of the Boa Constrictor (*Boa constrictor*) to Tasmania using the Bomford model (2008) and proposes assigned threat categories and import classifications for the species.

Species:	Boa Constrictor (<i>Boa constrictor</i>)		
Date of Assessment:	November 2011		
Literature search type and date:	See references		
Factor	Score		
A1. Risk posed from individual escapees (0-2)	2	<i>Animal that is capable of causing serious injury (requiring hospitalisation) or fatality.</i> Boa Constrictors have been known to attack people and cause serious injury. No verified fatalities have been noted.	
A2. Risk to public safety from individual captive animals (0-2)	0	<i>Nil or low risk (highly unlikely or not possible).</i> Risk arising from irresponsible use of product is low.	
Stage A. Risk posed by individual animals (risk that a captive or escape animal would harm people)	Public Safety Risk Score	Public Safety Risk Ranking	
	= A1 + A2 = 2	A ≥ 2, Highly Dangerous A = 1, Moderately Dangerous A = 0, Not Dangerous = Highly Dangerous	
B1. Family random effect value	-0.09	<i>Boidae.</i>	
B2. Proportion of introduction events that led to species establishment (Prop.species value)	0.15	<i>3 out of 20 attempts were successful at the species level.</i>	
B3. S(Climate 6 value)	-1.03		

Stage B. Likelihood of establishment (risk that a particular species will establish a wild population in Tasmania)	Establishment Risk Score	Establishment Risk Ranking
	$= 1 / (1 + \exp(0.80 - 2.90 \text{ (Prop. species) - } S(\text{Climate6}) - \text{Family Random Effect}))$ $= 1 / (1 + \exp(0.8 - 2.9 * (0.15) - (-1.03) - (-0.09)))$ $= 0.19$	B = ≥0.86, Extreme B = 0.40-0.85, High B = 0.17-0.39, Moderate B = ≤ 0.16, Low = Moderate
C1. Taxonomic group (0-4)	0	<i>Other group.</i>
C2. Overseas range size (0-2)	1	Range is estimated at 15 million km ² .
C3. Diet and feeding (0-3)	0	<i>Not a mammal.</i>
C4. Competition for native fauna for tree hollows (0-2)	2	<i>Can nest or shelter in tree hollows.</i>
C5. Overseas environmental pest status (0-3)	2	<i>Moderate environmental pest in areas of Mexico.</i>
C6. Climate match to areas with susceptible native species or communities (0-5)	5	<i>More than 25% of the geographic range overlaps with susceptible native species.</i> Approximately 80% of Tasmania's New Holland Mouse population occurs within areas identified as suitable for the Boa Constrictor.
C7. Overseas primary production (0-3)	1	<i>Threat to chickens and young livestock.</i>
C8. Climate match to susceptible primary production (0-5)	1	<i>Low climate match to susceptible primary production.</i>
C9. Spread disease (1-2)	1	<i>Reptile.</i>
C10. Harm to property (0-3)	0	<i><\$100,000 per year.</i>
C11. Harm to people (0-5)	3	<i>Moderate risk to few people.</i>
Stage C. Quantitative Consequence Assessment	Consequence Risk Score	Consequence Risk Ranking
	$= \text{sum of C1 to C11}$ $= 16$	C > 19, Extreme C = 15-19, High C = 9-14, Moderate C < 9, Low = High
Adverse impacts	There is evidence of the species causing adverse impacts to the environment outside its natural range.	
Closes relatives with similar behavioural and ecological strategies that have had adverse impacts elsewhere	No close relatives known to cause adverse impacts; however similar species, e.g. pythons, are known to have a significant adverse impact.	
Dietary generalists	Carnivore	

Stir up sediments to increase turbidity in aquatic habitats	This species does not inhabit aquatic environments.
Occur in high densities in their native or introduced range	Density highly dependent on food availability. High densities occur on some islands.
Have the potential to cause poisoning and/or physical injury	This species has the potential to cause physical injury. A number of attacks or injuries to humans have been noted and injuries requiring hospitalisation are possible.
Harbour or transmit diseases or parasites that are present in Australia	The species can harbour salmonella bacteria and may harbour Ophidian Paramyxo Virus and Body Inclusion Disease which may potentially spread to Tasmanian snake species.
Have close relatives among Australia's endemic reptiles and amphibians	The Boa Constrictor does not have any close relatives endemic to Australia.
Are known to have spread rapidly following their release into new environments	The Boa Constrictor has established populations outside its native range where populations have expanded rapidly. This species is capable of producing multiple young per breeding cycle (up to 80).
Stage C. Qualitative Consequence Assessment	Based on the qualitative consequence assessment, the estimated consequence of Boa Constrictor establishing in Tasmania is Serious.
Stage C. Consequence of Establishment (risk that an established population would cause harm)	Quantitative Consequence: Serious Qualitative Consequence: Serious Highest Consequence Assessment: Serious
ASSIGNED THREAT CATEGORY:	SERIOUS
PROPOSED IMPORT CLASSIFICATION:	IMPORT RESTRICTED TO THOSE LICENCE HOLDERS APPROVED FOR KEEPING SERIOUS THREAT SPECIES

5. Risk Management

This risk assessment concludes that the Boa Constrictor (*Boa constrictor*) is a serious threat to Tasmania. It is recommended that imports should be restricted to those licence holders approved for keeping serious threat species. On the basis of this risk assessment, it is recommended that Boa Constrictor be placed on the list of imports permitted with conditions.

As defined under the *Policy and Procedures for the Import, Movement and Keeping of Vertebrate Wildlife in Tasmania* (DPIPWE 2011), the following mandatory conditions will apply to the import and keeping of this species. Additional conditions may be required.

1. The animal must not be released, or be allowed to escape from effective control.
2. Specimens seized or forfeited as a result of illegal or accidental introductions, where rehousing is not available, will be humanely euthanized.
3. Animal welfare requirements under the *Animal Welfare Act 1993* and any approved Code of Practice or Management Plan must be met.
4. Import only permitted by holders approved to keep the species under licence.
5. Individuals to be micro-chipped or otherwise identified, or treated to allow identification.
6. Facility must meet minimum standards for welfare and security.
7. Facility must be available for inspection at any reasonable time.
8. Audits of facilities and collections.
9. The maximum number of individuals of a species held at the facility to be stipulated on the licence, taking into account relevant factors. Gender may also be stipulated.
10. Written approval prior to movement of animals between facilities and trade of species under licence.
11. Record keeping and reporting to DPIPWE as required by DPIPWE.
12. Collections containing species subject to approval by DPIPWE as meeting best practice for keeping the species concerned.
13. Bonds, insurance or cost recovery systems.
14. Import of serious threat species will generally be prohibited unless there is a clear public benefit and sufficient measures exist for the secure housing and on-going management of the species. Species kept solely for:
 - Public display and education purposes approved by DPIPWE and/or
 - Genuine scientific research approved by DPIPWE.

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7. Appendices

APPENDIX A: CALCULATING TOTAL COMMODITY DAMAGE SCORE

Column 1	Column 2	Column 3	Column 4	Column 5
Industry	Commodity Value Index (CVI)	Potential Commodity Impact Score (PCIS, 0-3)	Climate Match to Commodity Score (CMCS, 0-5)	Commodity Damage Score (CDS columns 2 x 3 x 4)
Cattle (includes dairy and beef)	11	N/A		
Timber (includes native and plantation forests)	10	N/A		
Aquaculture	6	N/A		
Sheep (includes wool and meat)	5	1	2	10
Vegetables	5	N/A		
Fruit (includes wine grapes)	5	N/A		
Poultry (including eggs)	1.5	1	2	3
Cereal grain (includes wheat, barley, sorghum etc)	1	N/A		
Other crops and horticulture (includes nuts and flowers)	1	N/A		
Pigs	1	1	2	2
Bees (includes honey, beeswax, and pollination)	0.5	N/A		
Oilseeds (includes canola, sunflower etc)	0.5	N/A		
Grain legumes (includes soybeans)	0.3	N/A		
Other livestock (includes goats and deer)	0.3	1	2	0.6
Total Commodity Damage Score (TCDS)				15.6

APPENDIX B: ASSIGNING SPECIES TO THREAT CATEGORIES

A: Danger posed by individual animals (risk a captive or escaped individual would harm people)	B: Likelihood of establishment (risk that a particular species will establish a wild population in Tasmania)	C: Consequence of establishment (risk that an established population would cause harm)	Threat category	Implications for any proposed import into Tasmania
Highly, Moderately or Not Dangerous	Extreme	Extreme	Extreme	Prohibited
Highly, Moderately or Not Dangerous	Extreme	High		
Highly, Moderately or Not Dangerous	Extreme	Moderate		
Highly, Moderately or Not Dangerous	Extreme	Low		
Highly, Moderately or Not Dangerous	High	Extreme		
Highly, Moderately or Not Dangerous	High	High		
Highly, Moderately or Not Dangerous	Moderate	Extreme		
Highly, Moderately or Not Dangerous	High	Moderate	Serious	Import restricted to those license holders approved for keeping serious threat species
Highly, Moderately or Not Dangerous	High	Low		
Highly, Moderately or Not Dangerous	Moderate	High		
Highly Dangerous	Moderate	Moderate		
Highly Dangerous	Moderate	Low		
Highly, Moderately or Not Dangerous	Low	Extreme		
Highly, Moderately or Not Dangerous	Low	High		
Highly Dangerous	Low	Moderate		
Highly Dangerous	Low	Low		
Moderately or Not Dangerous	Moderate	Moderate	Moderate	Import restricted to those license holders approved for keeping moderate threat species
Moderately or Not Dangerous	Moderate	Low		
Moderately or Not Dangerous	Low	Moderate		
Moderately Dangerous	Low	Low		
Not Dangerous	Low	Low	Low	Import permitted
Unknown	Any value	Any value	Extreme until proven otherwise	Prohibited
Any Value	Unknown	Any value		
Any Value	Any value	Unknown		
Unassessed	Unassessed	Unassessed		



Tasmania
Explore the possibilities

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