

PEST RISK ASSESSMENT

Perentie

Varanus giganteus

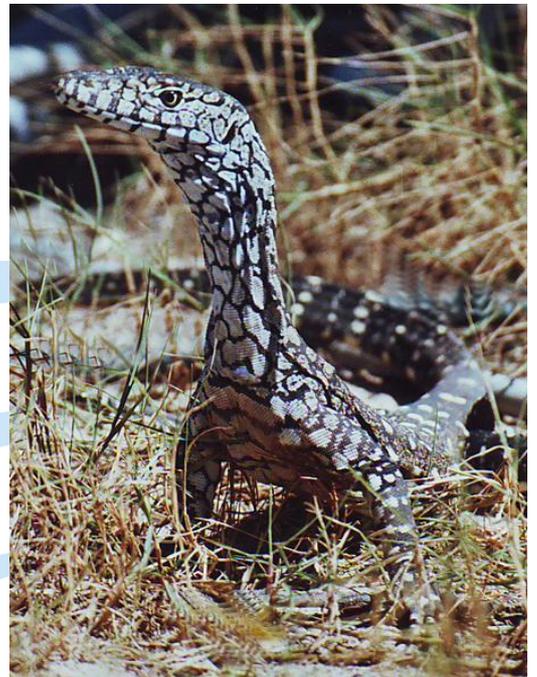


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About this Pest Risk Assessment:

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 Perentie (*Varanus giganteus*) is the largest lizard in Australia and the fourth largest lizard in the world. It is widespread throughout the arid to semi-arid interior of Australia from the coast of Western Australia to central Queensland. There is also a population on Barrow Island, off the coast of northern Western Australia. Perenties occur on open sand plains and on sand ridges. They are mostly ground dwelling, occupying rocky outcrops and deep crevices. Perenties also forage widely in sandy desert and claypans and will sometimes climb trees when disturbed. The lizards on Barrow Island are active throughout the year.

Perenties feed on insects, reptiles, birds, small mammals and carrion. Large adults can predate on small kangaroos. They are opportunistic cannibals and will feed on live and dead conspecifics. On Barrow Island Perenties eat turtle eggs and hatchlings. Although data is limited, *Varanus giganteus* probably breed in spring or early summer. It is likely that females only have one clutch per year, with an average clutch size of 9.3 eggs. Most varanids lay their eggs in a hole dug in the ground, or at the end of a burrow.

Perenties are protected in all jurisdictions where they are present in Australia. *Varanus giganteus* is not listed on the IUCN Red List of Threatened Species. The species is a 'controlled animal' under the Tasmanian *Nature Conservation Act 2002*.

The Perentie is not considered a pest species. It has not established feral populations outside its native range. There is no evidence of the species having any major impacts on the environment or agriculture.

There is a low likelihood that this species could establish in Tasmania, with potential for minor impacts. The most significant impact is likely to be predation because Perenties have a broad diet and could potentially prey on a variety of native animals. The assessment concludes that these impacts are only likely to be low, largely because the Tasmanian climate is not suitable for the species.

This risk assessment categorises Perenties as a moderate threat to Tasmania and proposes that imports be restricted to those licence holders approved for keeping moderate threat species.

2. Introduction

2.1 NAME AND TAXONOMY

Kingdom:	Animalia
Phylum:	Chordata
Class:	Reptilia
Order:	Squamata
Suborder:	Lacertilia
Family:	Varanidae
Genus:	<i>Varanus</i>
Subgenus:	<i>V. (Varanus)</i>
Species:	<i>Varanus giganteus</i>



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Sub-species or variety (if applicable): None known.

Closely related species: *V. acanthurus*, *V. baritji*, *V. breviceuda*, *V. audolineatus*, *V. eremius*, *V. gilleni*, *V. glauerti*, *V. glebopalma*, *V. gouldii*, *V. indicus*, *V. keithhornei*, *V. kingorum*, *V. mertensi*, *V. mitchelli*, *V. panoptes*, *V. pilbarensis*, *V. prasinus*, *V. primordius*, *V. primordius*, *V. scalaris*, *V. semiremex*, *V. spenceri*, *V. storri*, *V. tristis*, *V. varius*.

Common names (including any industry or trade names): Perentie, Monitor Lizard, Goanna.

2.2 DESCRIPTION

The Perentie is the largest lizard in Australia. The average length is about 1.5m, but they may grow to more than 2 metres (Cogger 2000; Horn and King 2004). Australian varanids have a long slender neck with a long, strong body, a muscular tail and well developed limbs with strong claws (King and Green 1993). The body is covered with loose-fitting skin. They have moveable eyelids and an extremely long, slender forked tongue.

The upper body is typically a rich brown with numerous scattered cream or yellow scales that form spots or blotches that tend to align in rows across the body. There is a black rim around the spots. In the young these markings tend to more brilliant and contrasting, becoming more obscure with increasing size. Underneath the Perentie is white or cream. The limbs are darker brown and also spotted with cream or yellow blotches.

The tail is about 1.3 times longer than the head and body, and is laterally compressed with a distinct median dorsal double keel, which does not extend to the base.

2.3 CONSERVATION AND LEGAL STATUS

CONSERVATION STATUS

The Perentie is not listed on the IUCN Red List of Threatened Species (IUCN 2010). The species is not listed as threatened fauna under the *Environment Protection and Biodiversity Conservation Act 1999*.

LEGAL STATUS

In Australia, Perenties are protected under legislation in each State within their native range. They are protected under the *Queensland Nature Conservation Act 1992*; the *Western Australian Wildlife Conservation Act 1950*; the *Northern Territory Territory Parks and Wildlife Conservation Act 2006*; and the *South Australian National Parks and Wildlife Act 1972*.

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

3. Biology and Ecology

3.1 LIFE HISTORY

Although Perenties are Australia's largest lizard there is little published information on the general biology of the species (Pianka 1982, 1986; Green 1986; King *et al.* 1989). Most information on the life history of the Perentie comes from Barrow Island, where the species is abundant (King *et al.* 1989). Perenties are active on Barrow Island throughout the year (Green 1986). In cooler areas of the Australian mainland they may be inactive during winter. The lizards will hibernate in burrows and crevices between May and August (Stirling 1912).



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Perenties are terrestrial lizards, however they may climb trees if approached. On Barrow Island, Perenties shelter from direct sunlight during the middle of the day and occupy burrows or other shelters overnight to avoid rapid cooling of body temperature (King *et al.* 1989). They may take shelter in natural crevices or will use hollows dug by other wildlife such as burrowing bettongs.

Males are more active than females, which may be related to the size of their respective home ranges (King *et al.* 1989). Perenties breed during spring and early summer and have only one clutch of eggs per year. The average incubation period is around 220 days (Horn and King 2004).

There are few data on the longevity of varanids in the wild (King and Green 1993). In captivity there are records of some species being held for up to 20 years, and it has been estimated that in the wild some species can live up to 50 years.

3.2 HABITAT REQUIREMENTS AND PREFERENCES

V. giganteus is only found in the arid interior of Australia, from far western Queensland, through central Australia, to the coast of Western Australia (Horn and King 2004). They forage widely in adjacent sandy desert and claypans. Perenties are essentially a ground-dwelling lizard that inhabit deep crevices and rocky outcrops. They sometimes climb trees when disturbed, although they are not known to use tree hollows (Cogger 2000; Gibbons and Lindenmayer 2000).

Perenties will forage over large distances. The home range of males is of the order of 325 ± 127 ha, and 48 ± 9 ha in females (Horn and King 2004). The home range of breeding lizards is greater than non-breeding individuals; with the males occupying more than double the area during the breeding season than the non-breeding season (Horn and King 2004).

3.3 NATURAL GEOGRAPHIC RANGE

Perenties are widespread throughout the arid to semi-arid interior of Australia from the coast of Western Australia to central Queensland (Cogger 2000). There is also a population on Barrow Island, off the coast of northern Western Australia where it is abundant (Butler 1970; Smith 1976; King *et al.* 1989). The natural range is estimated at approximately 2,200,000 km².

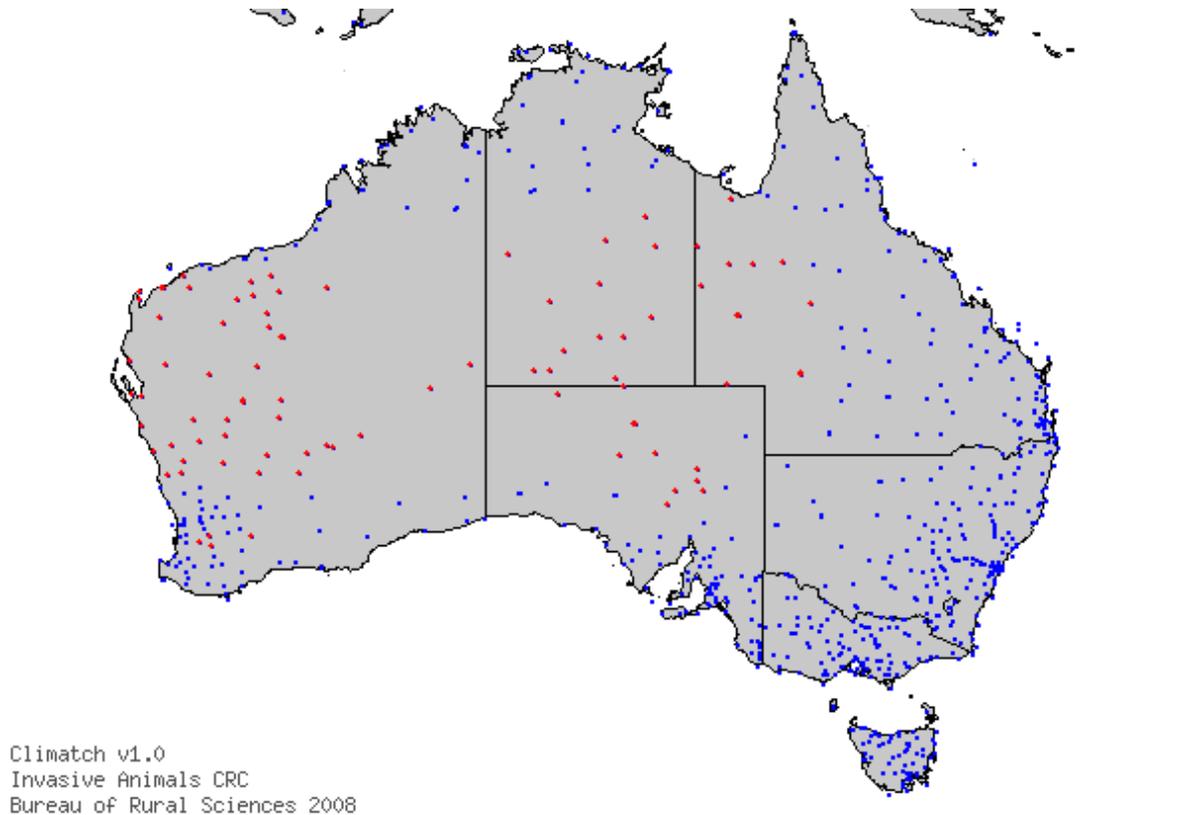


Figure 1. Natural range of the Perentie (*V. giganteus*) (red dots show distribution). (Distribution source: Cogger 2000; Thompson *et al.* 2005; Wilson and Swan 2003).

3.4 INTRODUCED GEOGRAPHIC RANGE

There is no evidence of the Perentie establishing feral (non-naturally occurring) populations outside its native range and no introduction attempts have been noted (Krauss 2009). The species is not recorded on the Global Invasive Species Database (GISP 2011).

3.5 POTENTIAL DISTRIBUTION IN TASMANIA

Using modelling applications developed by the Australian Bureau of Agricultural and Resource Economics and Sciences (DAFF), climate is compared between the species' current and historical

distribution and its potential distribution throughout Australia (shown in Figure 2). Modelling suggests that Perenties would not establish in Tasmania, which is shown to have a dissimilar climate to the native range of the Perentie (highest climate match score: 3).

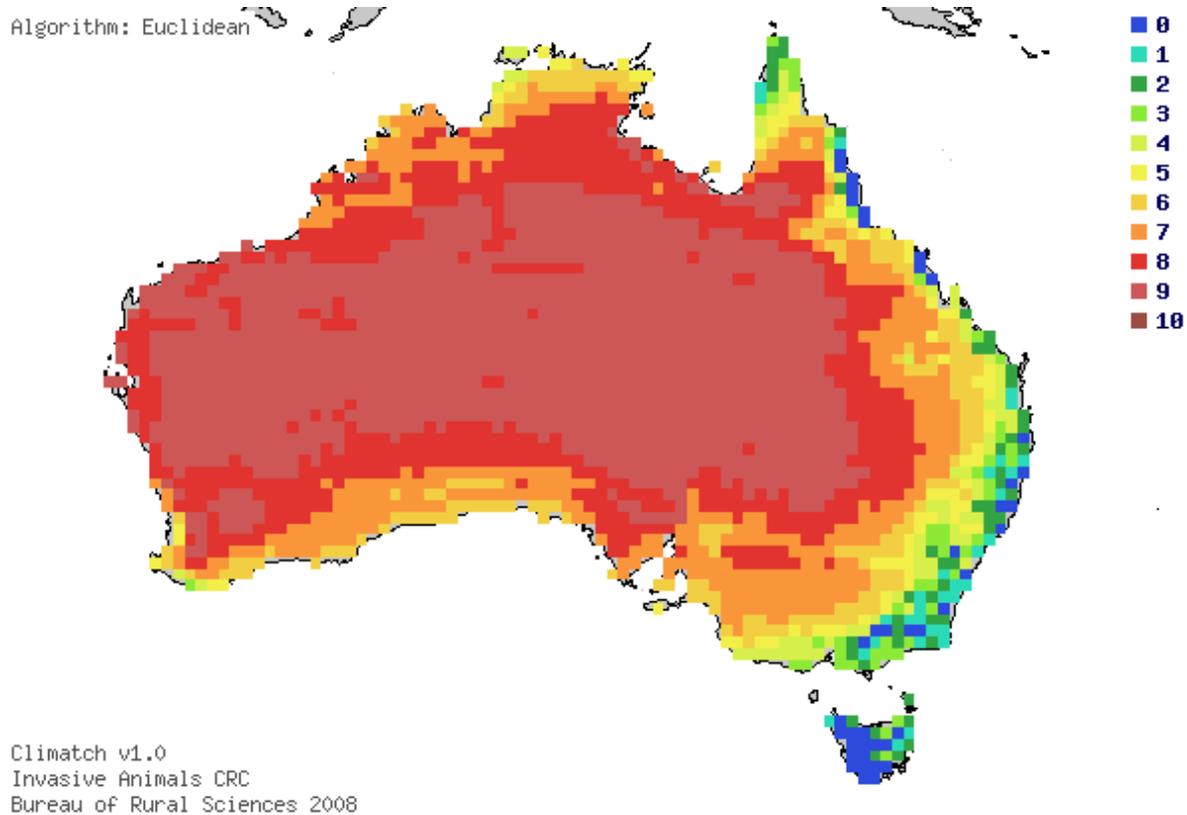


Figure 2. Climate comparison between the historical range of *V. giganteus* and the whole of Australia, where 10 is a ‘perfect’ match and 0 is having a very dissimilar climate. Tasmania shows a match between 0 and 3 (Distribution source: Cogger 2000; Thompson *et al.* 2005).

3.6 DIET AND FEEDING BEHAVIOUR

Perenties are generalist predators and scavengers that feed on a wide range of prey including mammals, birds, fish, amphibians, eggs and insects (King and Green 1979; Weavers 1989). They will also prey on other monitor lizards, including their own species. Gut content analysis indicate that the lizards prey primarily on vertebrates (Horn and King 2004). Any animal that the lizards can overpower may be preyed upon, including rabbits, dogs and small kangaroos.

Monitors will opportunistically prey on food that is locally abundant, and as a result different populations can show intra-specific variation in prey, depending on availability. Guarino (2001) conducted a stomach and faecal analysis of *V. varius* in New South Wales and concluded that carrion was the most important staple food source. Carrion is available throughout the year, and

is generally abundant during periods of drought. Birds, rabbits, reptiles and amphibians were eaten mainly during spring and early summer when they were most abundant.

3.7 SOCIAL BEHAVIOUR AND GROUPINGS

Little is known about the social behaviour of Perenties in the wild. During the breeding season males engage in combat behaviour involving wrestling. They clutch each other with the forelegs and the victor may bite the other male. Males are often seen with wounds during the breeding season, some of which can be severe, suggesting that there is strong competition for mates.

Females may mate frequently with one or more males, and groups of males have been observed trying to mate with an individual female.

3.8 NATURAL PREDATORS AND DISEASE

In their native range feral animals, including dogs, cats, foxes, and dingoes are likely to prey on young Perenties (Horn and King 2004). It is also likely that birds of prey could feed on small Perenties. Young monitors may escape predation by spending their early life in trees. The only records of predators of larger monitors are snakes and dingoes (Greer 2006).

Monitors tolerate a large number of internal and external parasites. Nematodes, protozoans and cestodes are often present in the gastrointestinal tract. The nematode species *Abbreniata perenticola* is specific to *V. giganteus* (Horn and King 2004). Varanids also host blood parasites including protozoans and malarial plasmodia (King and Green 1993).

Ticks and mites are also common on monitors. Thirty or more ticks can be present on an adult. They attach themselves to the chest, the base of the tail behind the cloaca, between the eyes and in the nasal cavity (King and Green 1993).

3.9 THREAT TO HUMAN SAFETY

Most large Perenties can be easily approached by humans if they move slowly and the lizard is aware that the person is coming. If the Perentie is surprised, or the person comes too close, the Perentie will usually run away or climb a tree (Horn and King 2004). Perenties may hold their ground when startled or cornered, and rise up on their rear legs and hiss loudly. There have been reports that Perenties have knocked people down by their tails, and caused serious injuries through bites or scratches. The handling guidelines for this species recommend that two people are always present in the enclosure with Perenties (Ryman 2009).

There is also some evidence that monitor bites, including bites from Perenties, are slightly venomous. Perentie bites can become infectious if bacteria present in the mouth of the lizards are transferred by the bite.

3.10 HISTORY AS A PEST

There are no records of *Varanus giganteus* being introduced into new areas. Four species within the Genus have been introduced into new areas (Kraus 2009). The species are *Varanus gouldii*, *V. indicus*, *V. niloticus* and *V. rosenbergi*.

3.11 POTENTIAL IMPACT IN TASMANIA

Perenties are opportunistic carnivores that take a wide range of prey, across broad size classes. They feed on insects, reptiles and small to medium sized mammals, and also feed on carrion (Cogger 2000). Should a population of Perenties establish in Tasmania, there are many species that could be impacted by direct predation and by competition for prey species and carrion. Many of these species are listed as threatened under the Tasmanian *Threatened Species Protection Act 1995*, such as the Tasmanian Devil (*Sarcophilus harrisii*), Wedge-tailed Eagle (*Aquila audax fleayi*), White-bellied Sea-Eagle (*Haliaeetus leucogaster*), New Holland Mouse (*Pseudomys novaehollandiae*), Spotted-tailed Quoll (*Dasyurus maculatus maculatus*), Green and Gold Frog (*Litoria raniformis*), Striped Marsh Frog (*Limnodynastes peroni*), Mountain dragon (*Rankinia diemensis*), and the Tussock skink (*Pseudemoia pagenstecheri*).

Climate modelling suggests that Tasmania's climate would not readily support the establishment of Perenties, and on this basis, the likelihood of impacts to native fauna is reduced.

4. Risk Assessment

4.1 PREVIOUS RISK ASSESSMENTS

No formal risk assessments have been noted for this species.

4.2 RISK ASSESSMENT

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

Species:	Perentie (<i>Varanus giganteus</i>)		
Date of Assessment:	December 2011		
Literature search type and date:	See references		
Factor	Score		
A1. Risk posed from individual escapees (0-2)	1		<i>The animal can make unprovoked attacks causing moderate injury (requiring medical attention) or severe discomfort but is highly unlikely (few if any records) to cause serious injury (requiring hospitalisation) if unprovoked.</i> Perenties can cause injury by striking with their powerful tail, by scratching and, more infrequently, by biting.
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 = A1 + A2 = 1		Public Safety Risk Ranking A ≥ 2, Highly Dangerous A = 1, Moderately Dangerous A = 0, Not Dangerous = Moderately Dangerous
B1. Family random effect value	-0.59		<i>Varanidae</i>
B2. Proportion of introduction events that led to species establishment (Prop.species value)	0.467		<i>7 out of 15 attempts were successful at the Genus level.</i>
B3. S(Climate 6 value)	-1.88		<i>Climate 6 Score (24).</i>
Stage B. Likelihood of establishment (risk that a particular species will establish a wild population in Tasmania)	Establishment Risk Score = $1 / (1 + \exp(0.80 - 2.90 (\text{Prop.species}) - \text{S}(\text{Climate6}) - \text{Family Random Effect}))$ = 0.12		Establishment Risk Ranking B = ≥0.86, Extreme B = 0.40-0.85, High B = 0.17-0.39, Moderate B = ≤ 0.16, Low = Low

C1. Taxonomic group (0-4)	0	Not in a taxonomic group known to have significant impacts.
C2. Overseas range size (0-2)	0	Range is estimated at 2,200,000 km ² .
C3. Diet and feeding (0-3)	0	<i>Not a mammal</i>
C4. Competition for native fauna for tree hollows (0-2)	0	<i>Does not use tree hollows.</i> Perenties are not known to use tree hollows (Gibbons and Lindenmayer 2000).
C5. Overseas environmental pest status (0-3)	0	<i>Never reported as an environmental pest in any country or region.</i>
C6. Climate match to areas with susceptible native species or communities (0-5)	0	<i>No grid squares within the highest climate match classes that overlap with the distribution of susceptible species.</i> Highest climate match score was 3.
C7. Overseas primary production (0-3)	0	<i>No reports of damage to crops or other primary production.</i> The Perentie is distributed in remote locations of Australia. There are no known reports of impacts on primary production. This may be because there is no overlap between potentially affected industries and the species' distribution.
C8. Climate match to susceptible primary production (0-5)	1	Perenties could impact on poultry and eggs production; however there is less than 10% overlap of suitable climate and poultry production in the State.
C9. Spread disease (1-2)	1	<i>Reptile.</i>
C10. Harm to property (0-3)	0	<i><\$100,000 per year.</i> Unlikely to cause any damage to property.
C11. Harm to people (0-5)	2	<i>Injuries or harm or annoyance likely to be minor and few people exposed.</i>
Stage C. Quantitative Consequence Assessment	Consequence Risk Score = sum of C1 to C11 = 4	Consequence Risk Ranking C > 19, Extreme C = 15-19, High C = 9-14, Moderate C < 9, Low = Low
Qualitative Consequence Assessment		
Adverse impacts	None reported.	
Closes relatives with similar behavioural and ecological strategies that have had adverse impacts elsewhere	Lace Monitors raid poultry farms taking birds and eggs.	
Dietary generalists	The species has traits of a generalist carnivore and consumes a variety of animals including small mammals, birds, insects, reptiles and carrion.	

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	Perenties are not noted for occurring in high densities throughout their range.
Have the potential to cause poisoning and/or physical injury	Perenties can cause physical injury by striking people with their powerful tail. They may also scratch or bite people. The most damage from scratches occurs if the Perentie tries to climb on people; this occurs particularly in captivity. If the Perentie established in Tasmania, it is considered unlikely that people would be risk of serious physical injury.
Harbour of transmit diseases or parasites that are present in Australia	This species is an Australian endemic and harbours diseases and parasites which are present in the country. They tolerate a large number of external parasites such as mites and ticks, and internal parasites such as nematodes in the gastrointestinal tract, cestodes, pentastomes and protozoans.
Have close relatives among Australia's endemic reptiles and amphibians	The Perentie is native to Australia and the genus is widespread over most of the Australian mainland. There are 24 closely related species on the Australian mainland, of which 20 are endemic. Northern and arid regions can support up to 10 different species in one area, whereas temperate areas generally only support 1 or 2 species. No monitor lizards are present in Tasmania.
Are known to have spread rapidly following their release into new environments	There is no evidence of Perenties establishing feral (non-naturally occurring) populations outside their native range and no introduction attempts have been noted.
Stage C. Qualitative Consequence Assessment	Based on the outcomes of the qualitative consequence assessment, it is estimated that the potential consequence of Perenties establishing in Tasmania is low.
Stage C. Consequence of Establishment (risk that an established population would cause harm)	Quantitative Consequence : Low Qualitative Consequence : Low Highest Consequence Assessment: Low
ASSIGNED THREAT CATEGORY:	MODERATE
PROPOSED IMPORT CLASSIFICATION:	IMPORT RESTRICTED TO THOSE LICENCE HOLDERS APPROVED FOR KEEPING MODERATE THREAT SPECIES

5. Risk Management

This risk assessment concludes that Perenties (*Varanus giganteus*) are a moderate threat to Tasmania and that imports should be restricted to those licence holders approved for keeping moderate threat species.

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 licences requirements will be implemented.

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.

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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	N/A		
Vegetables	5	N/A		
Fruit (includes wine grapes)	5	N/A		
Poultry (including eggs)	1.5	1	1	1.5
Cereal grain (includes wheat, barley, sorghum etc)	1	N/A		
Other crops and horticulture (includes nuts and flowers)	1	N/A		
Pigs	1	N/A		
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	N/A		
Total Commodity Damage Score (TCDS)				1.5

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 licence 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		
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		

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