

# PEST RISK ASSESSMENT

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## Northern Palm Squirrel

*Funambulus pennantii*



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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 the use within the Department.

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# I. Summary

The Northern Palm Squirrel (*Funambulus pennantii*) is a rodent in the Sciuridae family. They are native to India, Nepal, Pakistan, Iran and Bangladesh. They are considered an adaptable species, occupying a broad range of habitats in their native range. The Northern Palm Squirrel has been introduced and established in Perth and Sydney, although they are no longer present in Sydney. They have also established populations on the Andaman and Nicobar Islands in India and in the French West Indies. The species is a significant pest of fruit and vegetable crops in both its native and introduced ranges and it has been known to ruin electrical wiring and damage amenity trees.

Northern Palm Squirrels are listed as an 'extreme' threat under the Vertebrate Pest Committee's threat categories and are 'controlled animals' under the Tasmanian *Nature Conservation Act 2002*.

This risk assessment estimates that there is a moderate likelihood that Northern Palm Squirrels could establish in Tasmania, with high consequences. The assessment concludes that Northern Palm Squirrels represent a 'serious' threat to Tasmania. It is recommended that imports of Northern Palm Squirrels are restricted to those license holders approved for keeping serious threat species under a number of management conditions.

## 2. Introduction

### 2.1 NAME AND TAXONOMY

<b>Kingdom:</b>	Animalia
<b>Phylum:</b>	Chordata
<b>Class:</b>	Mammalia
<b>Order:</b>	Rodentia
<b>Family:</b>	Sciuridae
<b>Genus:</b>	<i>Funambulus</i>
<b>Subgenus:</b>	<i>Prasadsciurus</i> (Moore and Tate 1965)
<b>Species:</b>	<i>Funambulus pennantii</i> (Wroughton 1905)
<b>Sub-species:</b>	<i>F. p. pennantii</i> , <i>F. p. argentescens</i>

**Common names (including industry or trade names):**  
Northern Palm Squirrel, Five-Striped Palm Squirrel, Asian Palm Squirrel.

**Close relatives:** There are five species in the genus, including *F. palmarum* (Three-striped Palm Squirrel), *F. tristriatus* (Jungle Striped Squirrel), *F. layardi* (Layard's Palm Squirrel) and *F. sublineartus* (Dusky Palm Squirrel) (Nowak 1999; Srinivasulu *et al.* 2004). *F. pennantii* was previously grouped with *F. palmarum* (Csurhes 2010). There are no species within the genus listed on the IUCN's Global Invasive Species Groups top 100 invasive species. *F. pennantii* is the only species of the genus present in Australia.

**Note:** In the scientific literature *F. pennantii* is often misspelt *F. pennanti*. *F. pennantii* is also often referred to as the Indian Palm Squirrel, however this common name usually applies to *F. palmarum*.

### 2.2 DESCRIPTION

The Northern Palm Squirrel is a rodent in the Sciuridae family. Diagnostic features of the Sciuridae include a bushy tail and bold stripes running along the body. They range in size from 250–270mm, including a tail length of 110-120mm (Watts and Aslin 1981; Long 2003). Northern Palm Squirrels weigh approximately 135g, but may reach 200g.

*F. pennantii* has five stripes including three bold stripes running along the body, and two paler stripes running between the hind and fore legs (Csurhes 2010). The fur is dense and light brown on the head, ears and feet. They have deep red-brown dorsal fur and the belly is white (Seebeck 1989). The bushy tail is banded with long dark brown and white hairs. They are highly mobile, darting rapidly on the ground, and are agile climbers.



(Photo: Muhammad Mahdi Karim 2009. Image from Wikimedia Commons under a GNU Free Documentation License, Version 1.2)

## 2.3 CONSERVATION AND LEGAL STATUS

### CONSERVATION STATUS

The Northern Palm Squirrel is currently listed as a species of 'least concern' under the IUCN because it has a wide distribution with a large population, occurring in a number of protected areas and they can also tolerate some habitat modification (Nameer and Molur 2008).

None of the species within the Scuridae family are listed on the Global Invasive Species Database list of the world's worst 100 invasive species (GISD 2005).

### LEGAL STATUS

Northern Palm Squirrels are not listed as 'specimens taken to be suitable for live import' under the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBCA). This means that live *F. pennantii* can not be imported into Australia. The species is classed as a 'extreme' threat under the Vertebrate Pest Committee's threat categories (VPC 2007), however a pest risk assessment has not been conducted by the VPC for this species.

The legal status of *F. pennantii* varies across Australian jurisdictions. Northern Palm Squirrels can be kept as pets and desexed animals can be sold in New South Wales. In Western Australia there is a small feral population of *F. pennantii* that is subject to control. In WA they are listed as prohibited pests under the *Agriculture and Related Resources Protection Act 1976* and cannot be kept or sold. They are also a Class I declared pest animal under the *Land Protection (Pest and Stock Route Management) Act 2002* in Queensland. In Tasmania they are 'controlled animals' under the *Tasmanian Nature Conservation Act 2002*.

## 3. Biology and Ecology

### 3.1 LIFE HISTORY

In India Northern Palm Squirrels are capable of breeding all year, although there are two or three breeding peaks annually (Nowak 1991; Seebeck 1989). The population in Perth breeds from August to May with peaks in October and April (Seebeck 1989). Courtship involves chasing and tail biting. During the breeding season females will mate between three to four times a day with one or more males. Gestation takes approximately 42 days and there are usually 2 or 3 young (with a range from one to five) (Nowak 1991; Seebeck 1989). In India females can produce up to three litters a year, depending on food availability (Nowak 1991). Young are born in nests that are made of grass and fibre. They generally nest in trees, but have been reported in tree hollows, and in urban areas they also nest in roofs or walls (Parshad 1999).

Sex ratio is 1:1 at birth, although in India the female death rate is higher and as a result the adult sex ratio is 2.3:1 (Seebeck 1989). Young are weaned after approximately 10 weeks and are sexually mature after nine months. On average Northern Palm Squirrels live for five to six years in captivity and at least 18 months in the wild (Csurhes 2010; Seebeck 1989).

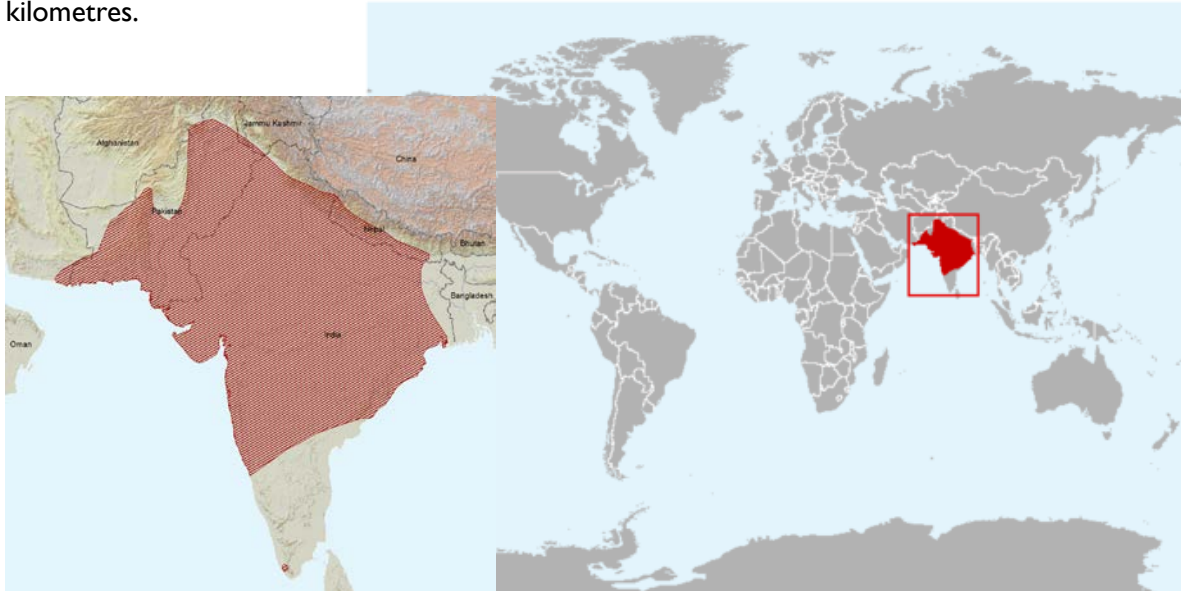
### 3.2 HABITAT REQUIREMENTS AND PREFERENCES

*F. pennantii* is most suited to subtropical habitats that are seasonally hot and arid (Csurhes 2010). In their native range they are common in a wide range of habitats including open palm growths, forest and scrub, gardens, parks and schools (Long 2003). They are also common around plantations and farm land (Nowak 1999). They can survive in arid regions by sheltering in irrigated areas such as gardens and orchards (Sedgwick 1968).

It is considered that the habitat in Perth is not highly suitable to Northern Palm Squirrels, and as such they are restricted to urban areas and plantations (Seebeck 1989; Csurhes 2010). This has been supported by the restricted population size of the feral population, which only covers 30km<sup>2</sup>, despite the species being present in the area since 1898 (Jenkins 1977). It has been noted that in Perth they tend not to favour native eucalypts, preferring gardens with exotic trees, in particular palms (Csurhes 2010). They also shelter in buildings and feed on scraps. There is a large population of Northern Palm Squirrels in the gardens of Perth Zoo, where they enter animal enclosures and feed on the food left for the animals.

### 3.3 NATURAL GEOGRAPHIC RANGE

As shown in Figure 1, the Northern Palm Squirrel is widely distributed throughout Iran, India, Pakistan and Nepal (Nameer and Molur 2008). They have also been reported in Bangladesh (Srinivasulu *et al.* 2004). The species is present from sea level to elevations of 4000 meters above sea level. The natural range of Northern Palm Squirrels is estimated to be 3.8 million square kilometres.



**Figure 1.** Native range of the Northern Palm Squirrel (*F. pennantii*) in Iran, India, Nepal and Pakistan (modified from Nameer and Molur 2008). Note: Populations that extend from eastern India and Nepal into Bangladesh are not shown in this figure.

### 3.4 INTRODUCED GEOGRAPHIC RANGE

Northern Palm Squirrels were released into the grounds of Perth zoo in about 1898 (Seebeck 1989; Sedgwick 1968). A feral population established in the zoo and has subsequently spread to an area of approximately 30 km<sup>2</sup> in the surrounding suburbs (Csurhes 2010; DAF 2000; Long 1988). Populations also established in Sydney adjacent to Taronga Zoo but are thought to have been eradicated (Wilson *et al.* 1992). In Sydney the population spread to an area 5km in diameter. Northern Palm Squirrels were last seen in Sydney in the late 1970s (Long 2003).

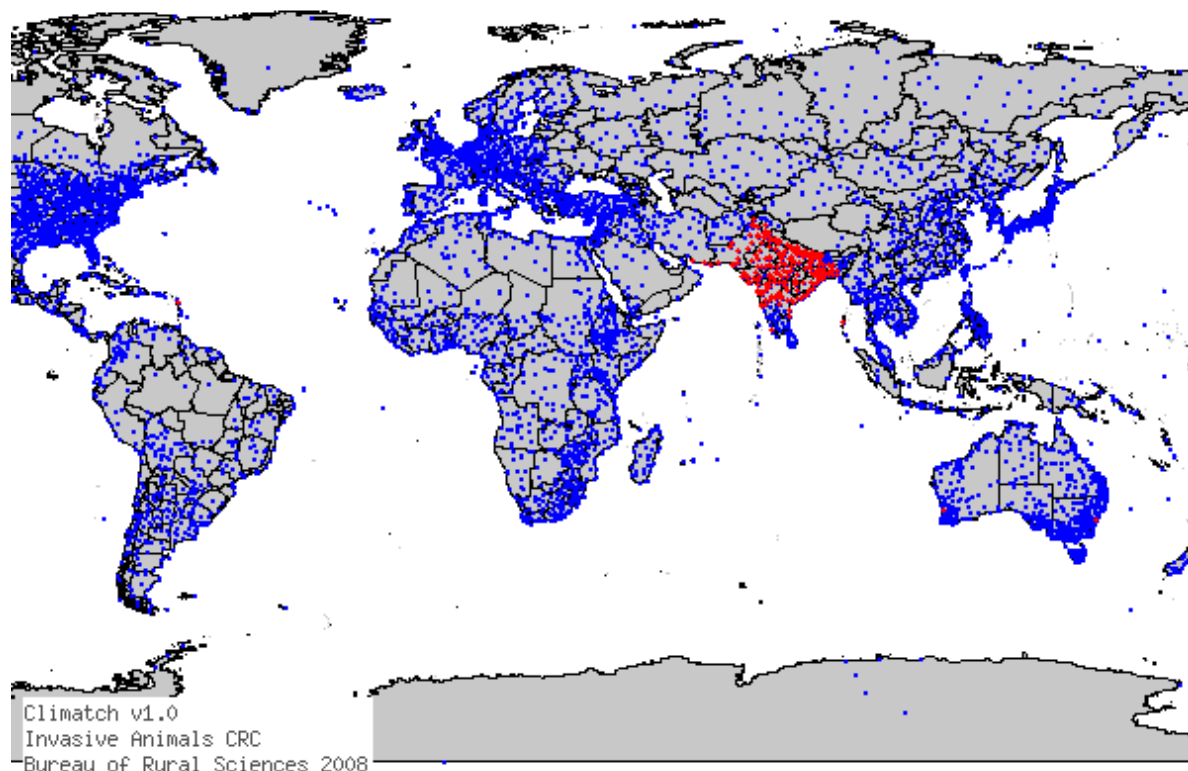
The species has been introduced onto the Andaman and Nicobar Islands of India (Srinivasulu *et al.* 2004), and there is an introduced population in the French West Indies (Lorvelec *et al.* 2007).

### 3.5 POTENTIAL DISTRIBUTION IN TASMANIA

A climate comparison between the species' current distribution (Figure 2) and potential Australian distribution is shown in Figure 3. The Bureau of Rural Science Climatch model suggests that a large



area of northern Australia has highly suitable climate that could support the establishment of Northern Palm Squirrels. The modelling suggests that Tasmania's climate is only moderately suitable with a highest climate match score of 5 on Flinders Island. On the Tasmanian mainland the most suitable climates are in the south-east, north-east and far north-west.



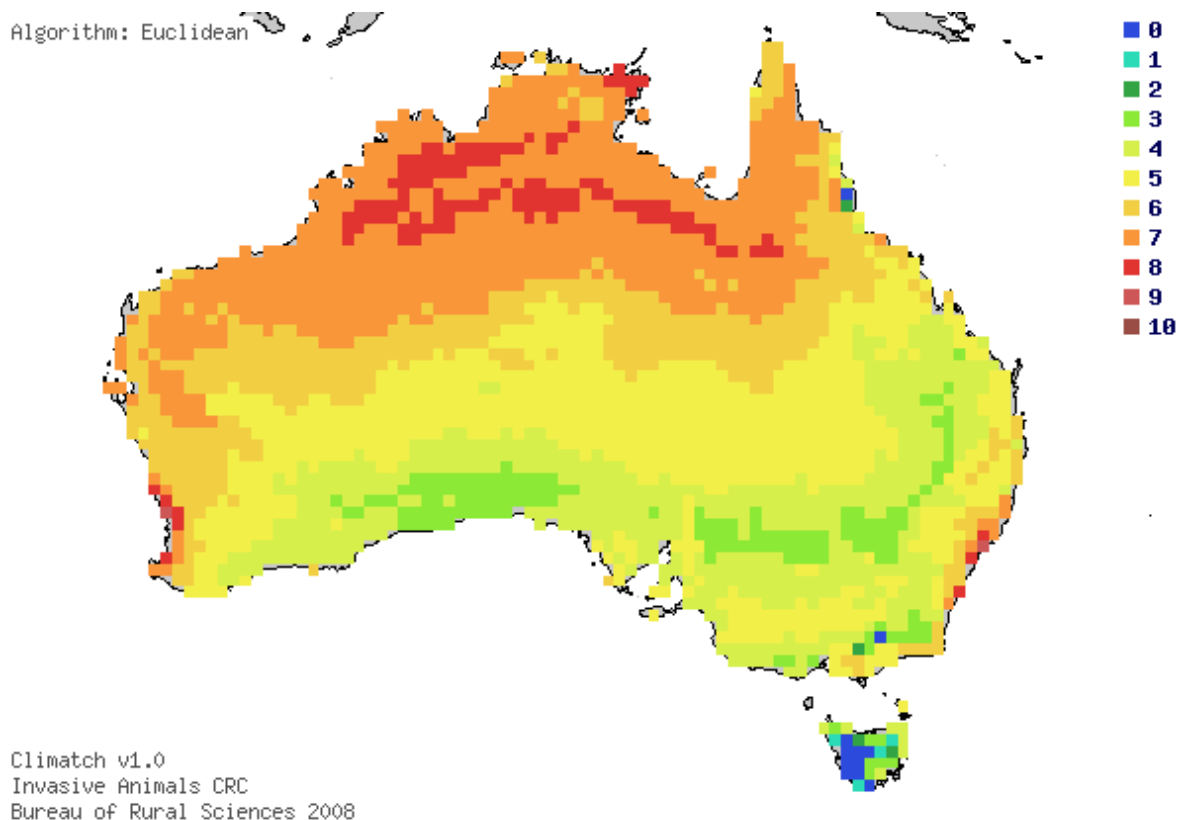
**Figure 2.** Native and introduced range of the Northern Palm Squirrel (*F. pennantii*) used in the Climatch model input. Distribution information was sourced from Lorvelec *et al.* (2007), Nameer and Molur (2008), Seebeck (1989), Srinivasulu *et al.* (2004), and Sedgwick (1968).

### 3.6 DIET AND FEEDING BEHAVIOUR

Northern Palm Squirrels are essentially herbivores, however their diet does include some animal material such as birds' eggs, chicks, and insects including locusts (Nowak 1991; Seebeck 1989; Stalder and Lundrigan 2009). They are opportunistic feeders, eating a broad range of food depending on seasonal availability. In India they eat seeds throughout the year, and leaves and soft fruit during autumn. They have also been reported eating nuts and the nectar of silky oaks (*Grevillea robusta*), an Australian native species, in India (Nowak 1991).

They feed on a number of crops in India and Western Australia including citrus, stone fruit, pineapple, mango, pomegranate, apples, guava, blackberries, grapes, sugarcane and groundnuts (Cusurhes 2010). In urban areas they also feed on food scraps (Seebeck 1989). They will often feed in large groups and are generally arboreal, but may also feed on the ground.





**Figure 3.** Climate comparison between the natural and introduced range of *F. pennantii* and Australia, where 10 is a 'perfect' climate match and 0 is a very dissimilar climate. Tasmania shows a match between 0 and 5, with the highest climate match on Flinders Island.

### 3.7 SOCIAL BEHAVIOUR AND GROUPINGS

Northern Palm Squirrels are active during the day. Feeding, courtship and reproductive behaviour begins several hours after sunrise, and peaks 1-2 hours before sunset (Wright 1972 cited in Seebeck 1989). They are not regarded as being strictly territorial, however they will defend nest and roost sites. They can live in groups of up to 10 individuals (Long 2003). The home range of Northern Palm Squirrels in India is approximately 0.2ha for males and 0.15ha for females, although in urban areas the home range can be smaller (Nowak 1991).

### 3.8 NATURAL PREDATORS AND DISEASE

Seebeck (1989) notes that predation of Northern Palm Squirrels in the wild is low. There are reports of predation by varanid lizards. Likewise predation in Australia also appears low, where corvids and diurnal raptors have been listed as predators (Seebeck 1989).

Several nematode parasites have been reported in India, and mites have been found on Northern Palm Squirrels in Australia (Seebeck 1989).

### 3.9 THREAT TO HUMAN SAFETY

Northern Palm Squirrels are not regarded as a serious threat to human safety. They are small animals that are easily domesticated and commonly kept in homes in New South Wales.

There is limited information about the zoonotic diseases that Northern Palm Squirrels could transmit. Species within the *Funambulus* genus are known to carry tick-borne encephalitis, and other species in the Sciuridae are known to carry diseases such as rabies, rift valley fever, leptospirosis, and echinococcus (Pavlin *et al.* 2009). Rabies and rift valley fever are both List A diseases under the *Animal Health Act 1995*. They do not occur in Tasmania.

Leptospirosis is a bacterial disease that affects humans and animals. It is caused by *Leptospira* bacterium that are found in infected urine and tissue. Common symptoms of the disease are fever, severe headache, sore muscles, chills, vomiting, and red eyes. In severe cases it can cause Weil's disease resulting in kidney failure. Most people who develop severe disease symptoms require hospitalisation and it can be fatal (NSWHD 2007).

Leptospirosis is known to have spread from the United States to Japan via the trade in squirrels (Masuzawa *et al.* 2006). The bacteria have not been detected in the population of Northern Palm Squirrels on the mainland of Australia. *Leptospira interrogans serovar hardjo* and *Leptospira interrogans serovar pomona* are List B diseases under the *Animal Health Act 1995*. They have been reported in the State but are not common. There is a greater incidence of the disease in tropical and subtropical areas, but it can be a problem seasonally in temperate areas (Leighton and Kuiken 2001).

There is a very small risk that feral squirrels in Tasmania could spread leptospirosis to humans. It is considered that the level of risk is extremely low because the disease is not common, and the introduction of squirrels is unlikely to increase the likelihood that people will be infected by animals.

### 3.10 HISTORY AS A PEST

Northern Palm Squirrels have established feral populations an area of approximately 30km<sup>2</sup> in Perth (Csurhes 2010; DAF 2000; Long 1988). Satellite populations that periodically establish outside this area are removed by the Western Australian government (DAF 2000). Therefore there is an ongoing cost to eradicate satellite populations.

In Western Australia the squirrels scavenge food and damage garden plants and horticultural crops by eating fruit and buds (Csurhes 2010; DAF 2000; Long 1988). They have been reported stealing student's lunches at local schools. They are thought to impact on native birds by feeding on birds' eggs, and can also cause property damage by chewing through electrical wire, posing a fire risk (DAF 2000). Within the grounds of the zoo they enter animal enclosures and steal food, meaning

that more food needs to be put out to feed the animals. There is also a risk that the movement of Northern Palm Squirrels between animal enclosures could spread diseases.

The squirrels are reported as a pest in India, both within their native range, and on the Andaman and Nicobar Islands, where they are introduced. They cause significant damage to fruit and vegetable crops including pineapple, mango, pomegranate, apples, berries and grapes (Csurhes 2010; Parshad 1999). They have also been reported damaging and contaminating paddy bags used to store rice and damaging spice crops (Chaudhary and Tripathi 2010; Chopra and Chaudhary 2010).

### 3.11 POTENTIAL IMPACT IN TASMANIA

If Northern Palm Squirrels were introduced into Tasmania there is potential that they would impact on the State's primary production sectors. In India they have been reported feeding on some crops that are also grown in Tasmania such as apples and berries, however they are likely to feed on a range of fruit, vegetables and nuts in the State. There is also potential that the species would impact on household gardens and cause some property damage by chewing through wiring. They may also become a nuisance by scavenging food.

The potential impact of Northern Palm Squirrels on Tasmanian wildlife could include predation on birds' eggs, chicks and insects; and competition for food with the New Holland Mouse (*Pseudomys novaehollandiae*) and possums, including the Common Brushtail Possum (*Trichosurus vulpecula*), Common Ringtail Possum (*Pseudocheirus peregrinus*), Eastern Pygmy Possum (*Cercartetus nanus*) and Little Pygmy Possum (*Cercartetus lepidus*) (Strahan, 1995). The Northern Palm Squirrel could also compete with insectivorous vertebrates such as lizards.

Other species which may experience competition with the Northern Palm Squirrel include the Eastern Quoll (*Dasyurus viverrinus*), Southern Brown Bandicoot (*Isodon obesulus*) and Eastern Barred Bandicoot (*Perameles gunnii*). These three species are largely insectivorous, but the Eastern Quoll also opportunistically eats fruit and small vertebrates (Bryant and Squires 2009; Menkhorst and Knight 2001). Macropods such as Bennetts Wallaby (*Macropus rufogriseus*) and Tasmanian Pademelon (*Thylogale billardierii*) could also experience competition.

## 4. Risk Assessment

### 4.1 PREVIOUS RISK ASSESSMENTS

A draft risk assessment has been developed by the Queensland Government, Department of Employment, Economic Development and Innovation (Csurhes 2010). The assessment concludes that the risk of introduction of *F. pennantii* to Queensland is very high. The likelihood of introduction into Queensland is particularly high because the species is sold as a pet in New South Wales, and squirrels are moved illegally across the border. It is considered that eradication would be very difficult, if not impossible (Csurhes 2010).

The Vertebrate Pest Committee classify the Northern Palm Squirrels as an extreme threat, however no pest risk assessment has been developed (VPC 2006).

### 4.2 RISK ASSESSMENT

The following risk assessment estimates the level risk of Northern Palm Squirrels to Tasmania using the Bomford model (Bomford 2008). The assessment then assigns the species into a threat category. The category used to score each factor is shown in column three in italics and where necessary the rational for each assessment is also provided.

Species:	Northern Palm Squirrel ( <i>Funambulus pennantii</i> )	
Date of Assessment:	February 2011	
Literature search type and date:	See references	
Factor	Score	
A1. Risk posed from individual escapees (0-2)	0	<i>Animals that will not make unprovoked attacks causing injury requiring medical attention, and which, even if cornered or handled, are unlikely to cause injury requiring hospitalisation.</i> Northern Palm Squirrels are not regarded as dangerous to humans, and even if cornered are unlikely to cause serious injury. They are easily domesticated.
A2. Risk to public safety from individual captive animals (0-2)	0	<i>Nil or low risk (highly unlikely or not possible).</i> The risk to public safety from irresponsible use of products obtained from Northern Palm Squirrels is considered negligible.
<b>Stage A. Risk posed by individual animals (risk that a captive or escape animal would harm people)</b>	<b>Public Safety Risk Score</b> = A1 + A2 = 0	<b>Public Safety Risk Rank</b> A ≥ 2, Highly Dangerous A = 1, Moderately Dangerous A = 0, Not Dangerous <b>= Not Dangerous</b>
B1. Climate match score (1-6)	1	<i>Low climate match score.</i> The sum of squares for match classes 10 to 6 is 0.

B2. Exotic population established overseas score (0-4)	4	<p>Exotic populations have been established on a large island (&gt; 50 000 km<sup>2</sup>) or anywhere on a continent, including the Australian mainland.</p> <p>Northern Palm Squirrels have established populations on the Australian mainland in Perth and Sydney (Wilson et al. 1992).</p>
B3. Overseas range size score (0-2)	1	<p>Overseas range class of 1-70 million km<sup>2</sup> (includes current and past 1000 years, natural and introduced range).</p> <p>The Northern Palm Squirrel is widely distributed throughout the Iran, Pakistan, India and Nepal (Nameer and Molur 2008). The global range is estimated at 3.8 million km<sup>2</sup></p>
B4. Taxonomic class score (0-1)	1	Mammal.
<b>Stage B. Likelihood of establishment (risk that a particular species will establish a wild population in Tasmania)</b>	<b>Establishment Risk Score</b> = B1 + B2 + B3 + B4 = 7	<b>Establishment Risk Rank</b> B = 11-13, Extreme B = 9-10, High B = 6-8, Moderate B ≤ 5, Low <b>= Moderate</b>
C1. Taxonomic group (0-4)	2	Mammal in one of the orders that have been demonstrated to have detrimental effects on prey abundance and/or habitat degradation (Rodentia).
C2. Overseas range size (0-2)	0	<p>Overseas geographic range class less than 10 million square kilometres.</p> <p>The range of Northern Palm Squirrels is estimated at 3.8 million km<sup>2</sup>.</p>
C3. Diet and feeding (0-3)	1	<p>Mammal that is a non-strict carnivore (mixed animal-plant matter in diet).</p> <p>Northern Palm Squirrels have broad opportunistic diets. They are primarily herbivores but will also eat birds' eggs, chicks and insects (Csurhes 2010).</p>
C4. Competition for native fauna for tree hollows (0-2)	2	<p>Can nest or shelter in tree hollows</p> <p>Northern Palm Squirrels are reported to build nests in trees made from grass and fibre, however Parshad (1999) reports that they do inhabit holes in tree trunks and branches.</p>
C5. Overseas environmental pest status (0-3)	1	<p>Minor environmental pest in any country or region.</p> <p>There are no reports of Northern Palm Squirrels being a significant environmental pest, however they eat birds' eggs and it has been reported that they are likely to impact on native birds nesting in parks in Western Australia (DAF 2000).</p>
C6. Climate match to areas with susceptible native species or communities (0-5)	3	<p>25% of the geographic range of one or more susceptible native species or ecological communities that are listed as threatened under Tasmanian legislation lies within the mapped area of the six climate match classes (10, 9, 8, 7, 6, and 5)= 3</p> <p>More than 25% of the New Holland Mouse population in Tasmania overlaps the potential range of <i>F. pennantii</i>. Squirrels are likely to compete with the New Holland Mouse for food as</p>

		seeds are the main items in the diets of both species.
C7. Overseas primary production (0-3)	3	Major pest of primary production in any country or region. <i>F. pennantii</i> is a significant pest of orchards and nurseries in India. Palm squirrels damage fruit in Perth including citrus, stone fruit and ornamental plants (Long 2003).
C8. Climate match to susceptible primary production (0-5)	2	Total Damage Commodity Score is 32. (See Appendix A). <i>F. pennantii</i> is a serious pest in India where they eat fruit and vegetables. They eat a wide range of fruit including apples, berries and grapes. In Western Australia they damage citrus, stonefruit and ornamental plants (Long 2003).
C9. Spread disease (1-2)	2	All mammals and birds (likely or unknown effect on native species and on livestock and other domestic animals).
C10. Harm to property (0-3)	1	Total annual dollar value of damage if the exotic species established throughout the area which it has a climate match within the highest six classes (classes 10 to 5): \$100,000 to \$1 million per year. Northern Palm Squirrels damage electrical wiring in the roofs of houses in Western Australia, potentially posing a fire risk (Long 2003). The potential for damage in Tasmania is likely to be minor because the climate match suggests that the squirrels would not become widespread in Tasmania.
C11. Harm to people (0-5)	0	Low risk of harm to people = 0. There are reports of other species of squirrel transmitting leptospirosis to humans and the disease has been recorded in Tasmania. Despite this the disease is rare and the introduction of Northern Palm Squirrels into the State is unlikely to increase the risk to humans.
<b>Stage C. Consequence of Establishment (risk that an established population would cause harm)</b>	<b>Consequence Risk Score</b> = sum of C1 to C11 = 17	<b>Consequence Risk Ranking</b> C > 19, Extreme C = 15-19, High C = 9-14, Moderate C < 9, Low = <b>HIGH</b>
<b>ASSIGNED THREAT CATEGORY:</b>	<b>SERIOUS</b>	
<b>PROPOSED IMPORT CLASSIFICATION:</b>	<b>IMPORT RESTRICTED TO THOSE LICENSE HOLDERS APPROVED FOR KEEPING SERIOUS THREAT SPECIES</b>	

## 5. Risk Management

This risk assessment concludes that Northern Palm Squirrels (*Funambulus pennantii*) are a serious threat to Tasmania and that imports be restricted to those license holders approved for keeping serious threat species. On the basis of this risk assessment, it is recommended that Northern Palm Squirrels 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
<b>Industry</b>	<b>Commodity Value Index (CVI)</b>	<b>Potential Commodity Impact Score (PCIS, 0-3)</b>	<b>Climate Match to Commodity Score (CMCS, 0-5)</b>	<b>Commodity Damage Score (CDS columns 2 x 3 x 4)</b>
<b>Cattle (includes dairy and beef)</b>	11	N/A		
<b>Timber (includes native and plantation forests)</b>	10	N/A		
<b>Aquaculture</b>	6	N/A		
<b>Sheep (includes wool and meat)</b>	5	N/A		
<b>Vegetables</b>	5	3	1	15
<b>Fruit (includes wine grapes)</b>	5	3	1	15
<b>Poultry (including eggs)</b>	1.5	N/A		
<b>Cereal grain (includes wheat, barley, sorghum etc)</b>	1	N/A		
<b>Other crops and horticulture (includes nuts and flowers)</b>	1	2	1	2
<b>Pigs</b>	1	N/A		
<b>Bees (includes honey, beeswax, and pollination)</b>	0.5	N/A		
<b>Oilseeds (includes canola, sunflower etc)</b>	0.5	N/A		
<b>Grain legumes (includes soybeans)</b>	0.3	N/A		
<b>Other livestock (includes goats and deer)</b>	0.3	N/A		
<b>Total Commodity Damage Score (TCDS)</b>				32

## APPENDIX B: ASSIGNING SPECIES TO THREAT CATEGORIES

<b>A: Danger posed by individual animals</b> (risk a captive or escaped individual would harm people)	<b>B: Likelihood of establishment</b> (risk that a particular species will establish a wild population in Tasmania)	<b>C: Consequence of establishment</b> (risk that an established population would cause harm)	<b>Threat category</b>	<b>Implications for any proposed import into Tasmania</b>
Highly, Moderately or Not Dangerous	Extreme	Extreme	Extreme	Import 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		
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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