

PEST RISK ASSESSMENT

Long-tailed macaque

Macaca fascicularis



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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

Long-tailed macaques (*Macaca fascicularis*) are native to much of Southeast Asia and have been noted as one of the most geographically wide-spread and abundant non-human primate species in the world. They have been deliberately introduced to a variety of small tropical islands, commonly for biomedical research.

Long-tailed macaques are a pest in many introduced areas and the species is included on the Global Invasive Species Database list of 100 of the "World's Worst" invaders. In Mauritius, the introduced population has contributed to the extinction of one parrot and one owl species, and contributed to the decline of many endangered bird species including pigeons, parrots, birds of paradise and frogmouths. Small reptiles and large mammals have also been affected. Modelling indicates that the Tasmanian climate is unsuitable for this species, however should a population establish, competition with local possum species could be expected.

The species has a significant impact on agriculture and consumes a wide variety of crops. Macaques are frequently killed as agricultural pests and some farmers have stopped planting crops due to damage caused. Long-tailed macaques are also noted for being a nuisance to humans. They may grab or take human possessions, threaten people by lunging, biting, following or chasing, and raid houses, bins and cars. Mobbing behaviour is observed occasionally.

Wild populations of long-tailed macaques are vulnerable to a variety of diseases including herpes B virus, canine distemper virus and hepatitis E. Some of these diseases can be fatal to humans.

The species is currently listed as a species of 'least concern' under the IUCN Red List and is classed as a 'serious' threat under the Vertebrate Pest Committee's list of exotic animals (Vertebrate Pest Committee, 2007). In Tasmania, long-tailed macaques are 'controlled animals' under the *Tasmanian Nature Conservation Act 2002*.

This risk assessment concludes that long-tailed macaques are a serious threat to Tasmania and proposes that imports be restricted to those license holders approved for keeping serious threat species.

2. Introduction

2.1 NAME AND TAXONOMY

Kingdom:	Animalia
Phylum:	Chordata
Class:	Mammalia
Order:	Primates
Family:	Cercopithecidae
Genus:	<i>Macaca</i>
Species:	<i>M. fascicularis</i>



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Sub-species or variety (if applicable): Ten subspecies are recognized. Most are isolated, insular populations with only minor differences such as pelage colour, tail length, and the form of the cheek whiskers (Groves, 2001; cited in Ong & Richardson, 2008). Recognised subspecies are *M. f. atriceps*, *M. f. aureus*, *M. f. condorensis*, *M. f. fascicularis*, *M. f. fuscus*, *M. f. karimondjaware*, *M. f. lasiae*, *M. f. philippensis*, *M. f. tua*, *M. f. umbrosus* (Ong & Richardson, 2008).

Common names (including any industry or trade names): Long-tailed macaque, crab-eating macaque, cynomolgus monkey, java macaque, kra macaque.

Known hybrids: *M. fascicularis* is known to hybridise with Rhesus monkeys (*M. mulatta*), Japanese macaques (*M. fuscata*), pigtail macaques (*M. nemestrina*) moor macaques (*M. maura*) and bonnet macaques (*M. radiata*) (Fooden, 1964; Fa, 1989; Fooden & Aimi, 2005; Groves, 2001 cited in Ong & Richardson, 2008).

Close relatives: The genus *Macaca* is phylogenetically close to mangabeys and baboons, and contains 21 species (Hamada & Yamamoto, 2010; Myers *et al.* 2008). Of these, *M. mulatta* (Rhesus monkey) is listed on the IUCN Global Invasive Species Database (2011).

2.2 DESCRIPTION

The fur is basically uniformly coloured, varying slightly from light brown or greyish yellow to dark brown or grey, while the fur on the underside surface is lighter (Fa, 1989; Rowe, 1996, cited in WPRC, 2010). The face is pinkish brown and thinly haired, with sharp white colourations on the eyelids (Fooden, 2005). Fur on the head sweeps back over the forehead and often creates a crest of hair at the top of the head (WPRC, 2010). Both sexes have cheek whiskers while males have moustaches and females have beards (WPRC, 2010).

As their name suggests, the tail is exceptionally long in this species (40 – 65 cm), and is usually longer than the length from head to rump (Fa, 1989 cited in WPRC, 2010). Tail length can be used to distinguish long-tailed macaques from similar species such as Rhesus monkeys (*M. mulatta*) and Japanese macaques (*M. fuscata*).

Long-tailed macaques are sexually dimorphic. Males are larger than females, weighing between 4.7 - 8.3kg, and measuring between 41.2 - 64.8cm. Comparatively, females weigh between 2.5 - 5.7kg and measure 38.5 - 50.3cm (Fa, 1989 cited in WPRC, 2010). Fur in adult males tends to be longer and sleeker than fur of juveniles and females, and males have large canine teeth (Fooden, 2005; WPRC, 2010).

Infants are born with a black natal coat, which they start losing at 2-3 months and resemble adults in appearance after one year (Fooden, 2005).

Hybrids of long-tailed macaques and Rhesus monkeys (*M. mulatta*) showed transitional characteristics of tail length and coat colours of the two species, particularly where species' ranges overlap in the Indo-Chinese Peninsula (Fooden, 2005).

2.3 CONSERVATION AND LEGAL STATUS

CONSERVATION STATUS

The species is currently listed as a species of 'least concern' under the IUCN Red List (Ong & Richardson, 2008).

Major threats to the species include hunting and habitat loss. The species is subject to a high level of hunting for local consumption and sport. The species is also used for research purposes. In mainland Southeast Asia, females are taken to breeding facilities and males exported internationally for use in laboratory research (Ong & Richardson, 2008).

LEGAL STATUS

The species is classed as a 'serious' threat under the Vertebrate Pest Committee's list of exotic animals (Vertebrate Pest Committee, 2007).

Under the *Environment Protection and Biodiversity Conservation Act 1999*, long-tailed macaques are 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.

In Tasmania, long-tailed macaques are 'controlled animals' under the *Tasmanian Nature Conservation Act 2002*.

Long-tailed macaques are listed on Appendix II of CITES.

3. Biology and Ecology

3.1 LIFE HISTORY

Reproductive events (mating, pregnancy and birth) can occur at any time throughout the year in natural populations, although long-term studies indicate that these events may peak seasonally (Fooden, 2005). Reproductive peaks vary geographically and by year, and are thought to be influenced by the quality of the fruiting season between April and June, as peak births are delayed in years of low fruit production (Fooden, 2005).

Females in natural populations may become reproductively active when they are about 3.5 years old, although captive females may breed earlier when aged 2.5 years (Chance *et al.* 1977, cited in Fooden *et al.* 2005). In the wild, males are usually reproductively active at 5-6 years once they have left their natal groups as sub-adults, although males in captive populations may breed earlier at around 3.5 years (Honjo *et al.* 1984, cited in Fooden, 2005).

Dominant males participate in the majority of breeding events and father the most offspring (Fooden, 2005). Females may opportunistically mate with multiple males, and engage in sneak copulations with subdominant males, however dominant males increase their paternity by engaging in mate guarding strategies (Engelhardt *et al.* 2006). Sperm storage has not been noted in this species.

After a gestation of approximately 163 days (in a captive population recorded by Honjo *et al.* 1984, cited in Fooden, 2005), females have a single young which is raised on milk until they are about 2-3 months old and are able to obtain some of their food independently (Fooden, 2005). Infants are carried by females during foraging trips (Sussman & Tattersal, 1981). Infanticide is committed by adult males and is an important cause of infant deaths in this species (Thompson, 1967, cited in Fooden, 2005).

Effective fertility in females is estimated to cease at around 20 years, and an average female could be expected to produce around eight to nine offspring in her reproductive life (Fooden, 2005). The maximum known lifespan of a captive long-tailed macaque is 37 years 1 month (Jones, 1982 cited in Fooden, 2005).

Long-tailed macaques are known to hybridise with Rhesus monkeys (*M. mulatta*), Japanese macaques (*M. fuscata*), pigtail macaques (*M. nemestrina*) moor macaques (*M. maura*) and bonnet macaques (*M. radiata*) (Fooden, 1964; Fa, 1989; Fooden & Aimi, 2005; Groves, 2001 cited in Ong & Richardson, 2008).

3.2 HABITAT REQUIREMENTS AND PREFERENCES

Long-tailed macaques are highly adaptable and can persist in a variety of habitats. Their distribution is limited to tropical, humid climates with high rainfall (WPRC, 2010), including mangroves, swamp forests, evergreen forests, agricultural areas and degraded habitat (Ong & Richardson, 2008). Suitable habitat is commonly found at sea level but long-tailed macaques can be found up to elevations of 2000m (Fooden, 2005).

Long-tailed macaques are primarily arboreal but may range on the ground along riverbanks and seashore and in open areas (Sussman & Tattersal, 1981). They regularly enter bodies of water and are able to swim up to 100m (Furuya, 1965 cited in Fooden, 1995). At night, long-tailed macaques usually sleep in trees or dense protective vegetation near rivers (Fooden, 1995), and trees are also used during the day in providing protective cover from predators and food resources (Sussman & Tattersal, 1981). The species is not noted for using tree hollows.

3.3 NATURAL GEOGRAPHIC RANGE

The long-tailed macaque has been noted as one of the most geographically widespread and abundant non-human primate species in the world (Wheatley, 1999; cited in Sha *et al.* 2009a). The long-tailed macaque is native to Southeast Asia and occurs naturally in Bangladesh, Brunei, Cambodia, India, Indonesia, Lao PDR, Malaysia, the Philippines, Singapore, Thailand, East Timor and Vietnam. Many offshore islands are included in this range (see Figure 1). The limits of its natural range are hard to determine due to a zone of hybridisation with *M. mulatta* in the north (Ong & Richardson, 2008) and its abundance on numerous small islands. A rough estimate of the natural range is approximately 2.4 million km².

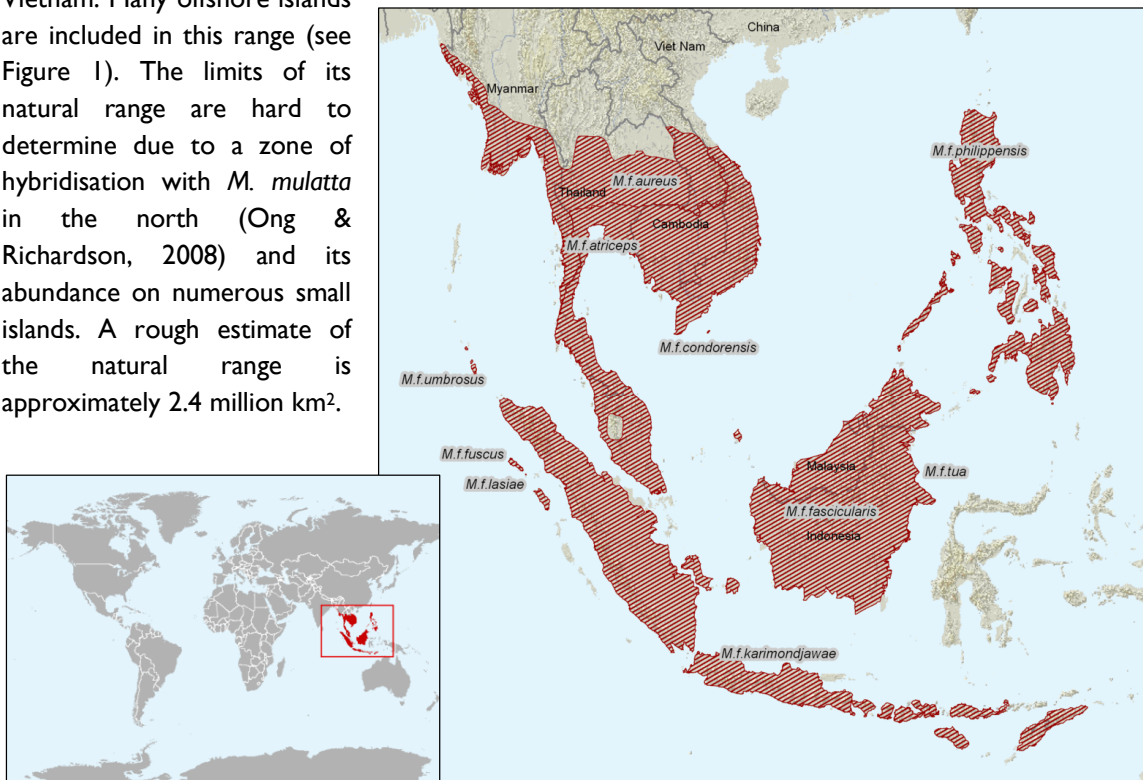


Figure 1. Native range of the long-tailed macaque (*M. fascicularis*) (Source: Ong & Richardson, 2008).

3.4 INTRODUCED GEOGRAPHIC RANGE

Long-tailed macaques have been established feral populations through deliberate introductions and are listed on the Global Invasive Species Database list of 100 of the "World's Worst" invaders.

Non-naturally occurring populations are found on Kabaena Island and Tinjil Island in Indonesia, Ngeuar Island in the Republic of Palau, the Jayapura area of West Papua, Hong Kong, Mauritius and New Guinea (Groves 2001, cited in Ong & Richardson, 2008). Non-native introductions have generally been limited to small tropical islands, with the total introduced range of long-tailed macaques estimated at approximately 466,000 km². Breeding populations have been introduced as supply populations for biomedical research and to support species preservation (WPRC, 2010).

3.5 POTENTIAL DISTRIBUTION IN TASMANIA

Using modelling by the Bureau of Rural Science (DAFF), a climate comparison between the species' current distribution and potential Australian distribution is shown in Figure 2. Modelling suggests that only northern Australia has areas of similar climate which may support introduced populations of long-tailed macaques. Tasmania's climate is shown to be highly dissimilar, with climate match scores between 0 and 2.

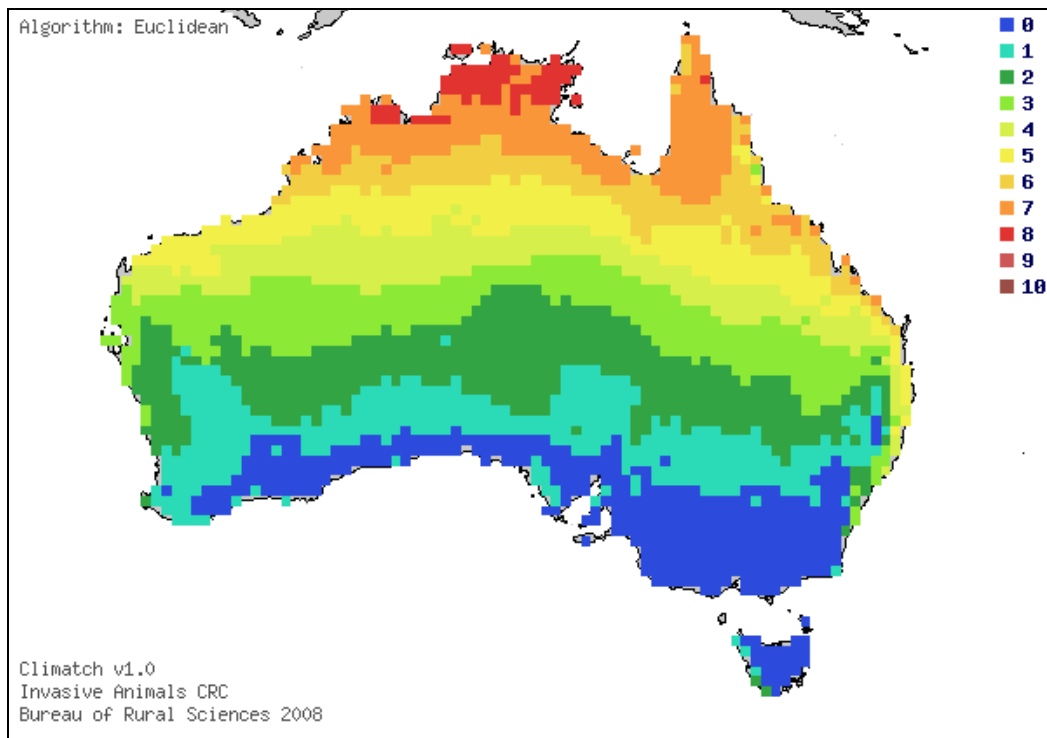


Figure 2. Climate comparison between the natural range of *M. fascicularis* and Australia, where 10 is a 'perfect' climate match and 0 having a dissimilar climate. Tasmania shows a match between 0 and 2. (Distribution source: Ong & Richardson, 2008; Sha *et al.* 2009a).

3.6 DIET AND FEEDING BEHAVIOUR

Long-tailed macaques are eclectic, primarily frugivorous feeders which may show short-term selectivity for particular plant species (Yeager, 1996; Sussman & Tattersall, 1981). Fruit composes approximately 66% of their diet, with leaves making up 17.2% and flowers 8.9% (Yeager, 1996). Insects make up 4.1% (Yeager, 1996), and considerable time is spent foraging for these. The diet may be supplemented with a variety of different species including snails, frogs, crustaceans, octopus, lizards and small birds (including bird eggs and chicks) (WPRC, 2010; Fooden, 2005; Sussman & Tattersal, 1981).

Feeding is the most common daytime activity. When foraging, the group subdivides into smaller groups, which feed in different locations and may travel up over 2km from the sleeping site in order to obtain food (Sussman & Tattersal, 1981). When foraging, long-tailed macaques travel in circuitous routes and modify their route depending on protective vegetation cover, feeding locations, resting sites and water sources (Sussman & Tattersal, 1981).

Feeding may take place at all levels of the forest. Long-tailed macaques deploy a variety of feeding strategies, including picking fruit by hand or plucking it with their teeth, turning over rocks, leaping and snatching insects from the air, and storing food in cheek pouches (Sussman & Tattersal, 1981; Lucas & Corlett, 1998).

3.7 SOCIAL BEHAVIOUR AND GROUPINGS

Long-tailed macaques generally live in groups of 35 to 50 individuals, although some larger groups may have 100 individuals (Sussman & Tattersal, 1981). Groups exist in varying densities from 11 individuals/km² (Crockett & Wilson, 1980, cited in Fooden 2005) to 1,111 individuals/km² (Wheatley, 1999, cited in Sha *et al.* 2005a). Several males may exist in one group but the majority of the group is female (Sussman & Tattersal, 1981).

Playing is mostly undertaken by juveniles and may include wrestling, chasing and following other individuals. Mutual grooming is an important part of social activity and occurs with twice the frequency of autogrooming (Sussman & Tattersal, 1981). Mutual grooming among adults of the same sex is uncommon, and grooming sessions are very thorough, ranging from 15 seconds to 29 minutes (Sussman & Tattersal, 1981).

Long-tailed macaques demonstrate brief agonistic behaviour, and this commonly occurs over access for feeding or resting sites (Sussman & Tattersal, 1981). In situations where humans fed macaques, aggressive encounters increased within and between macaque groups at the feeding sites. Serious injury or death may result in aggressive encounters between macaques (Wheatley, 1991 cited in WPRC, 2010).

3.8 NATURAL PREDATORS AND DISEASE

In Southeast Asia, natural predators of long-tailed macaques are komodo dragons (*Varanus komodoensis*), pythons, Philippine eagles (*Pithecophaga jefferi*), leopards (*Panthera pardus* and *Neofelis*

nebulose), and tigers (*P. tigris*). Crocodiles have been observed preying on long-tailed macaques in Thailand and domestic dogs may also attack and kill long-tailed macaques (Fooden, 2005).

In Tasmania, there are few potential predators other than large raptors such as the wedge-tailed eagle (*Aquila audax fleayi*) and, should it become established, the introduced European red fox (*Vulpes vulpes*).

Wild populations of long-tailed macaques are vulnerable to a variety of diseases, as evidenced by the presence of viral antibodies to the disease. Diseases found in long-tailed macaques include herpes B virus, canine distemper virus, simian varicella virus, cytomegalovirus, rhesus rhadinovirus, ebola and hepatitis E (Marshall & Beehler, 2007). Some symptoms of pre-existing infectious diseases may only appear when macaques are subject to stress in captivity or experimental manipulations (Dillberger *et al.* 1994) and further details of disease are contained in Gardner & Luciw (2008).

3.9 THREAT TO HUMAN SAFETY

Long-tailed macaques have the potential to cause moderate physical injury to humans by biting and scratching. The *Macaca* genera has been recognised as a genera that harbours a high number of zoonoses¹ which pose a threat to human safety (Pavlin *et al.* 2009), and many of these diseases may be transferred by biting or scratching.

Long-tailed macaques are vectors for simian foamy virus, a disease of similar origin to HIV which can be transferred by bites, scratches and mucous, (Jones-Engel *et al.* 2005). Little is known about the associated consequences of the virus in humans (Calattini *et al.* 2007), although it has been found to be prevalent in people who regularly visit monkey temples and hunt primates for bushmeat (Jones-Engel *et al.* 2005).

Herpes B virus (*Herpesvirus simiae*) occurs in long-tailed macaques and many other macaque species. Humans can become infected with herpes B virus through bites, scratches, and contact with body fluid or tissue. Infection can be severe and result in ascending paralysis and a high fatality rate, or neurological impairment (Huff & Barry, 2003; Williams & Barker, 2001). The prevalence of human infection with herpes B virus is low, as is secondary transmission of the virus.

Long-tailed macaques can carry hepatitis E which can be spread via contaminated water to humans, and although person to person transmission is possible, it is relatively infrequent (Hirano *et al.* 2003). Symptoms of hepatitis E include jaundice, loss of appetite, inflammation of the liver, abdominal pain, nausea, vomiting, and fever. Hepatitis E virus infections are usually self-limited, and hospitalization is generally not required. No available therapy is capable of altering the course of acute infection (World Health Organisation, 2005).

3.10 HISTORY AS A PEST

Long-tailed macaques are a pest in many introduced areas and the species is included on the Global Invasive Species Database list of 100 of the "World's Worst" invaders. In Mauritius, the introduced population has contributed to the extinction of the broad-billed parrot (*Lophopsittacus mauritianus*)

¹ Infectious animal diseases which can be transferred to humans.

and scops owl (*Scops commersoni*) and the decline of endangered bird species such as the Mauritian green parrot, pink pigeon (*Columba mayeri*), and Mauritius fody (*Foudia rubra*) through the consumption of eggs and chicks and the destruction of nests (Global Invasive Species Database, 2011; WPRC, 2010; Sussman & Tattersal, 1981). They have been connected with the decline of birds from the families Columbidae (pigeons), Psittacidae (parrots), Paradisaeidae (birds of paradise) and Podarigidae (frogmouths), as well as small reptiles and large mammals (especially Phalangeridae) (Global Invasive Species Database, 2011). Introduced populations of long-tailed macaques are also noted for their impact in consuming and dispersing the seeds of exotic plant species, such as the strawberry guava (*Psidium cattleianum*), and changing the composition of native forests (Global Invasive Species Database, 2011).

The species has a significant impact on agriculture. Long-tailed macaques consume a wide variety of crops including cassava, maize, beans, peanut, papaya, banana, sweet potato, mango, young coconut, pineapple, breadfruit and jackfruit. Some farmers have stopped planting these crops due to the loss of yield caused by macaques (Global Invasive Species Database, 2011). In Mauritius alone, an estimated \$US1.5-3 million dollars damage is caused per year (Global Invasive Species Database, 2011). In Malaysia, Sumatra, Java and Thailand, long-tailed macaques are frequently killed for destroying and consuming crops (Wolfhiem, 1983, Lekagul and McNeely 1983; cited in Long, 2003).

Long-tailed macaques are noted for harassing people and being a human nuisance (Global Invasive Species Database, 2011). In Singapore, human-macaque conflict has increased with loss of natural habitat (95% loss of original forest cover since 1819), and conflict is commonly associated with food or food cues such as plastic bags (Sha *et al.* 2009a, Sha *et al.* 2009b). Long-tailed macaques may grab or take human possessions, threaten people by lunging, biting, following or chasing, and raid houses, bins and cars. Mobbing behaviour is observed occasionally (Sha *et al.* 2009b). Direct feeding of long-tailed macaques by residents and visitors (despite the penalty fine for doing so) is thought to have increased conflict in Singapore, and surveys have shown that local residents value the macaques and consider their protection and conservation important (Sha *et al.* 2009b).

3.11 POTENTIAL IMPACT IN TASMANIA

Long-tailed macaques are likely to compete with and prey upon numerous bird species in Tasmania. They have been shown to have an impact via competition and predation on scientific families of pigeons, parrots, birds of paradise and frogmouths (Global Invasive Species Database, 2011). In Tasmania, the long-tailed macaque may prey on numerous bird species and has the potential to compete with fruit-eating birds such as currawongs and rosellas.

Long-tailed macaques compete with small reptiles and large mammals (particularly possums) in their introduced range (Global Invasive Species Database, 2011). An established Tasmanian population of long-tailed macaques is likely to compete with possum species for fruits, leaves, insects and flowers, and potential Tasmanian competitors include the common brushtail possum (*Trichosurus vulpecula*), common ringtail possum (*Pseudocheirus peregrinus*), eastern pygmy possum (*Cercartetus nanus*) and little pygmy possum (*Cercartetus lepidus*) (Strahan, 1995).

4. Risk Assessment

4.1 PREVIOUS RISK ASSESSMENTS

The species is classed as a 'serious' threat under the Vertebrate Pest Committee's list of exotic animals (Vertebrate Pest Committee, 2007). A formal risk assessment has not been carried out for this species previously.

4.2 RISK ASSESSMENT

The following risk assessment determines the risk of long-tailed macaque to Tasmania using the Bomford model (2008) and proposes assigned threat categories and import classifications for the species.

Species:	Long-tailed macaque (<i>Macaca fascicularis</i>)	
Date of Assessment:	March 2011	
Literature search type and date:	See references	
Factor	Score	
A1. Risk posed from individual escapees (0-2)	2	<i>Animal that sometimes attacks when unprovoked and/or is capable of causing serious injury (requiring hospitalisation) or fatality.</i> Long-tailed macaques are capable of spreading diseases which can be fatal to humans, such as herpes B.
A2. Risk to public safety from individual captive animals (0-2)	0	<i>Nil or low risk (highly unlikely or not possible).</i> Although there is a risk of contracting fatal diseases from this species, the probability of irresponsible products being obtained and irresponsibly used is unlikely.
Stage A. Risk posed by individual animals (risk that a captive or escape animal would harm people)	Public Safety Risk Score = A1 + A2 = 2	Public Safety Risk Ranking A ≥ 2, Highly Dangerous A = 1, Moderately Dangerous A = 0, Not Dangerous = Highly Dangerous
B1. Climate match score (1-6)	1	<i>Very low climate match score.</i> Climate match scores were between 0 and 2.
B2. Exotic population established overseas score (0-4)	4	<i>Exotic population established on a larger island (>50,000km²).</i> Long-tailed macaques have established

		in New Guinea (area: 786,000km ²) and other smaller islands.
B3. Overseas range size score (0-2)	1	Overseas size range score 1-70 million km ² . The estimated overseas range (natural and introduced) is approximately 2.86 million km ² .
B4. Taxonomic class score (0-1)	1	<i>Mammal</i> .
Stage B. Likelihood of establishment (risk that a particular species will establish a wild population in Tasmania)	Establishment Risk Score = B1 + B2 + B3 + B4 = 7	Establishment Risk Ranking B = 11-13, Extreme B = 9-10, High B = 6-8, Moderate B ≤ 5, Low = Moderate
C1. Taxonomic group (0-4)	0	<i>Other group</i> . No taxonomic matches.
C2. Overseas range size (0-2)	0	<10 million km ²
C3. Diet and feeding (0-3)	3	<i>Mammal that is primarily a grazer or a browser</i> . Long-tailed macaques are eclectic, primarily frugivorous feeders.
C4. Competition for native fauna for tree hollows (0-2)	0	<i>Does not use tree hollows</i> .
C5. Overseas environmental pest status (0-3)	3	<i>Major environmental pest in any country or region</i> . In Mauritius, the introduced population has contributed to the extinction of the broad-billed parrot (<i>Lophopsittacus mauritianus</i>) and scops owl (<i>Scops commersoni</i>) and the decline of multiple endangered bird species. This species is noted for consuming and dispersing the seeds of exotic plant species and changing the composition of native forests
C6. Climate match to areas with susceptible native species or communities (0-5)	0	<i>The species has no grid squares within the highest six climate match classes (i.e. 10 to 5) that overlap the distribution of any susceptible native species or ecological communities</i> .
C7. Overseas primary production (0-3)	3	<i>Major pest of primary production in any country or region</i> . Long-tailed macaques are a pest in many introduced areas. The species has a significant impact on agriculture and

		consumes a wide variety of crops. Millions of dollars damage to agriculture is estimated per year.
C8. Climate match to susceptible primary production (0-5)	0	<i>No match between climate and susceptible primary production.</i>
C9. Spread disease (1-2)	2	<i>Mammal.</i>
C10. Harm to property (0-3)	0	<\$100,000 per year. As there was no climatch score ≥ 5 in any region of Tasmania, estimated harm to property is very low.
C11. Harm to people (0-5)	4	<i>Injuries or harm severe or fatal but few people at risk.</i> Long-tailed macaques may cause moderate injury by biting and scratching, and transmit diseases such as herpes B and hepatitis E. Herpes B can be fatal to humans, although the prevalence of human infection is low.
Stage C. Consequence of Establishment (risk that an established population would cause harm)	Consequence Risk Score = sum of C1 to C11 = 15	Consequence Risk Ranking C > 19, Extreme C = 15-19, High C = 9-14, Moderate C < 9, Low = High
ASSIGNED THREAT CATEGORY:	SERIOUS	
PROPOSED IMPORT CLASSIFICATION:	IMPORT RESTRICTED TO THOSE LICENSE HOLDERS APPROVED FOR KEEPING SERIOUS THREAT SPECIES	

5. Risk Management

This risk assessment concludes that long-tailed macaques (*Macaca fascicularis*) 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 long-tailed macaques 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	N/A		
Vegetables	5	3	0	0
Fruit (includes wine grapes)	5	3	0	0
Poultry (including eggs)	1.5	N/A		
Cereal grain (includes wheat, barley, sorghum etc)	1	N/A		
Other crops and horticulture (includes nuts and flowers)	1	1	0	0
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)				0

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		
Highly, Moderately or Not Dangerous	High	Low		
Highly, Moderately or Not Dangerous	Moderate	High		
Highly Dangerous	Moderate	Moderate	Serious	Import restricted to those license holders approved for keeping serious threat species
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	Moderate	Import restricted to those license holders approved for keeping moderate threat species
Unknown	Any value	Any value	Low	Import permitted
Any Value	Unknown	Any value	Extreme until proven otherwise	Prohibited
Any Value	Any value	Unknown		
Unassessed	Unassessed	Unassessed		



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