PEST RISK ASSESSMENT

Himalayan tahr

Hemitragus jemlahicus

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Department of Primary Industries, Parks, Water and Environment

Tasmania

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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 mammals, birds, reptiles and amphibians 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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1. Summary

The Himalayan tahr (*Hemitragus jemlahicus*) is a native of the Himalayan ranges in Nepal, India and China. It has established feral populations in New Zealand, South Africa and Argentina. In those areas where it has established, feral populations have caused extensive damage to native vegetation in alpine areas. It also competes with domestic stock for grazing.

The species predominantly inhabits steep rocky and vegetated mountain sides and sub-alpine forests, and may be found at altitudes of 1000 m to 5,200 m. It is considered highly likely that the species could establish in Tasmania.

Himalayan tahr is listed as 'near threatened' by the IUCN. The species is believed to be in significant decline in its natural range due to hunting for food and habitat loss, making the species close to qualifying for 'vulnerable'.

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

The Vertebrate Pest Committee has assessed the Himalayan tahr as a 'serious' threat species and considers that the keeping of Himalayan tahr should be limited to statutory zoos or endorsed special collections (VPC 2007).

This risk assessment concludes that the Himalayan tahr is an extreme threat to Tasmania and recommends that imports be prohibited.

2. Introduction

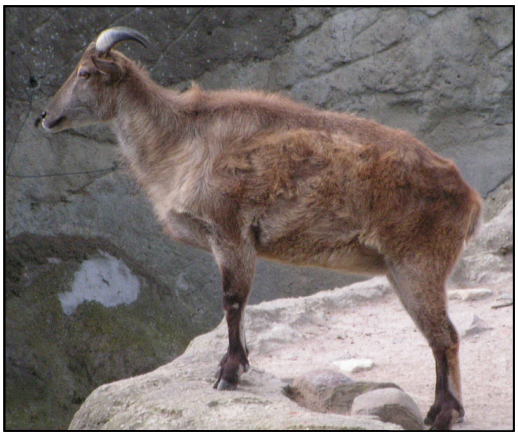

Photo: Michail Jungierek. Image from Wikimedia Commons under a *GNU Free Documentation License, Version 1.2*)

2.1 NAME AND TAXONOMY

Kingdom: Animalia

Phylum: Chordata

Class: Mammalia

Order: Cetartiodactyla

Family: Bovidae

Genus: *Hemitragus*

Species: *H. jemlahicus*

Sub-species or variety (if applicable): No subspecies are currently recognized.

Common names (including any industry or trade names): Himalayan tahr

Known hybrids: No hybrids are noted.

2.2 DESCRIPTION

The Himalayan tahr is a large ungulate related to the wild goat. The species shows strong sexual dimorphism; adult males average 73 kg whereas adult females weigh 36 kg (Tustin 1990 in Forsyth 2001).

Body length ranges from 90-140 cm while shoulder height ranges from 65-100 cm (Huffman 2004). They have relatively small heads with large eyes and small pointed ears. Males have different coloration than females, and, in winter, males also grow a long, shaggy mane around the neck and shoulders which extends down the front legs. After the spring moult the coat is much shorter and lighter in colour.

Horns are found on both sexes but are usually larger in males. Horns curve upward, backwards, and then inwards, to a maximum length of about 35 cm (Parkes and Tustin 1989).

2.3 CONSERVATION AND LEGAL STATUS

CONSERVATION

Himalayan tahr is listed as 'near threatened' by the IUCN because the species is believed to be in significant decline in its natural range due to hunting for food and habitat loss, making the species close to qualifying for 'vulnerable' (Bhatnagar & Lovari 2008).

LEGAL STATUS

The Commonwealth Vertebrate Pest Committee has assessed the Himalayan tahr as a 'serious' threat species and considers that the keeping of Himalayan tahr should be limited to statutory zoos or endorsed special collections (VPC 2007).

Himalayan tahr are 'controlled' animals under the Tasmanian *Nature Conservation Act 2002*.

3. Biology and Ecology

3.1 LIFE HISTORY

Most available information on the species focuses on northern hemisphere populations where mating occurs from October to January. One (or occasionally two) kids are born in June and July after a gestation of 180-242 days, depending on delayed implantation (Smith and Xie 2008 in Bhatnagar and Lovari 2008). Delayed implantation (or embryonic diapause), is where the embryo does not immediately implant in the uterus following fertilisation, but is maintained in a state of dormancy. No development takes place as long as the embryo remains unattached to the uterine lining and this effectively lengthens the active gestation period, which allows mating to occur and young to be born at times of the year optimal for that species (Renfree and Shaw 2000). In the southern hemisphere, the breeding cycle has shifted 6 months to align with appropriate climatic conditions and consequently the rut[1] is in May to June (DoC 2011) with young born around December.

The age at sexual maturity is 1.5 years, with captive animals living up to 22 years (Smith and Xie 2008 in Bhatnagar and Lovari 2008). In the wild, survivorship is probably considerably less, with estimates in New Zealand that 80% of all young die by the end of their third winter (Christie and Andrews 1964). Males up to the age of 13 years have been recorded in the wild in New Zealand (Parkes and Tustin, 1989).

3.2 HABITAT REQUIREMENTS AND PREFERENCES

Historically, the Himalayan tahr had a continuous distribution throughout Nepal between 1,500 and 5,200 m above-sea-level (asl), but this is now being increasingly disrupted by activities related to human encroachment. The species now predominantly inhabits steep rocky and vegetated (woods and scrub) mountain sides, especially between 3,000 to 4,000 m asl. The tahr also inhabits temperate to sub-alpine forests up to the treeline, between 2500 and 5,200 m asl. The species eats grass, other herbs and some fruits (Bhatnagar and Lovari 2008).

In New Zealand, Himalayan tahr occur between about 1000 m asl and at or above the vegetation limit (1550 m asl). Tahr colonisation has lead to the decrease in tall snow tussocks (*Chionochloa* spp.) and an increase in shortsward grasses (e.g., *Poa colensoi*) in alpine areas. Other vegetation types impacted include podocarp scrub and matagouri scrub (Tustin and Parkes 1988).

Himalayan tahr was accidentally introduced to Table Mountain in South Africa in about 1939, and deliberately introduced to parts of the Andes mountain range in Argentina in 2000 and 2006 (Flueck 2009). Table Mountain has a maximum altitude of 1,084 metres and a "Mediterranean" climate (hot, dry summers and a short, wet cool to mild winter) with an all time low of only -1˚C

1 Period of mammalian sexual activity.

(SAN Parks 2011). Consequently, the range of climates occupied by the Himalayan tahr indicates it has quite a broad range of environmental adaptability with regard to temperature.

Climate modelling for the species' potential range in Australia is provided in Section 3.5.

3.3 NATURAL GEOGRAPHIC RANGE

This species natural range is in the Himalayas including China (southern Tibet), north India (Jammu and Kashmir to Sikkim), and Nepal over an area of approximately 1 million km^2 (Figure 1).

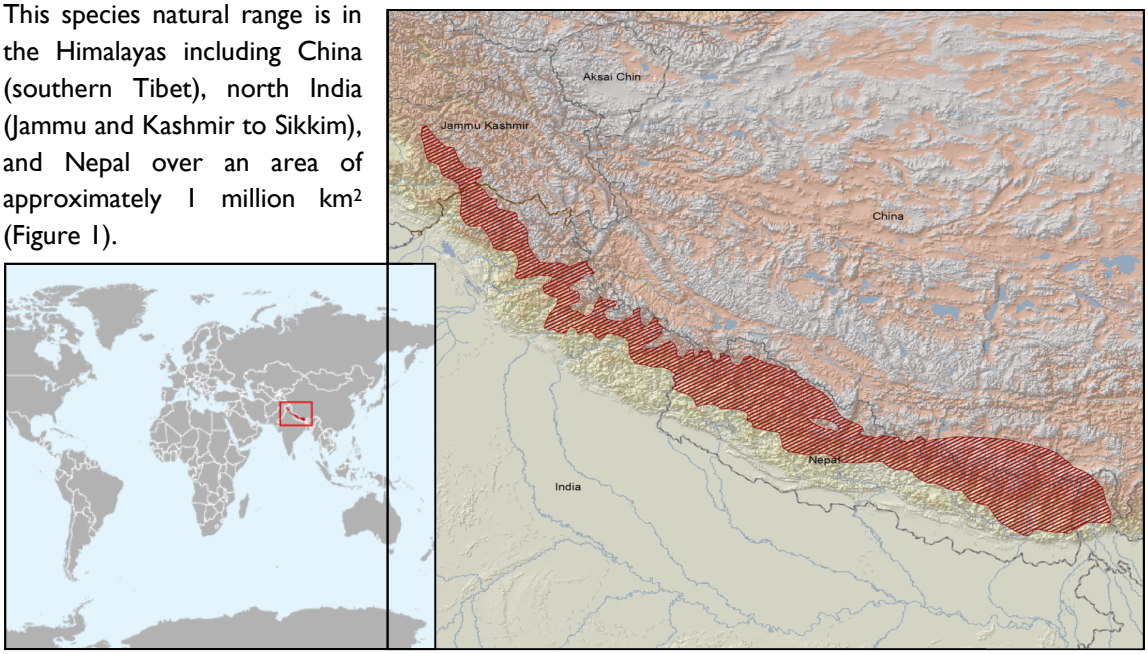

Figure 1. The natural geographic range of the Himalayan tahr (*H. jemlahicus*). (Source: Bhatnagar & Lovari 2008).

3.4 INTRODUCED GEOGRAPHIC RANGE

In New Zealand, where the Himalayan tahr was intentionally introduced in 1904, the species is considered a pest and is the focus of a management plan and active culling. Eradication of Himalayan tahr is considered not feasible; consequently the New Zealand Department of Conservation's management policy for the species is to control numbers in critical sites of high conservation value. This is achieved through a combination of recreational and commercial hunting and government culling programs (DoC 2011). The range of Himalayan tahr in New Zealand is approximately 6,500 km^2.

In South Africa, Himalayan tahr were introduced to Table Mountain as a consequence of a small number of individuals escaping from a wildlife park. They were subject to regular culling in the 1970s and1980s (Long 2003), and are the focus of an ongoing eradication program by the South African National Parks Board which commenced in the early 2000s (SAN Parks 2004). Prior to the eradication program in South Africa, the range was localised to approximately 20 km^2.

The species has recently, in 2000 and 2006, been imported and released by private individuals in parts of the Andean mountain range in Argentina (Flueck 2009). Given the early stage of these introductions, which has reportedly been successful, there is little information on the extent of their range or impacts, although these are considered to be quite limited given the number of animals estimated to be present (450 individuals by 2008) (Flueck 2009), and the relatively short duration since introduction. However, as much of the Andean Mountain range is considered to be suitable for Himalayan tahr, it is considered that if this introduction is not controlled quickly and effectively then their range could rapidly spread along the length of South America (Flueck 2009), comprising an additional potential range in the order of 500,000 km^2.

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.

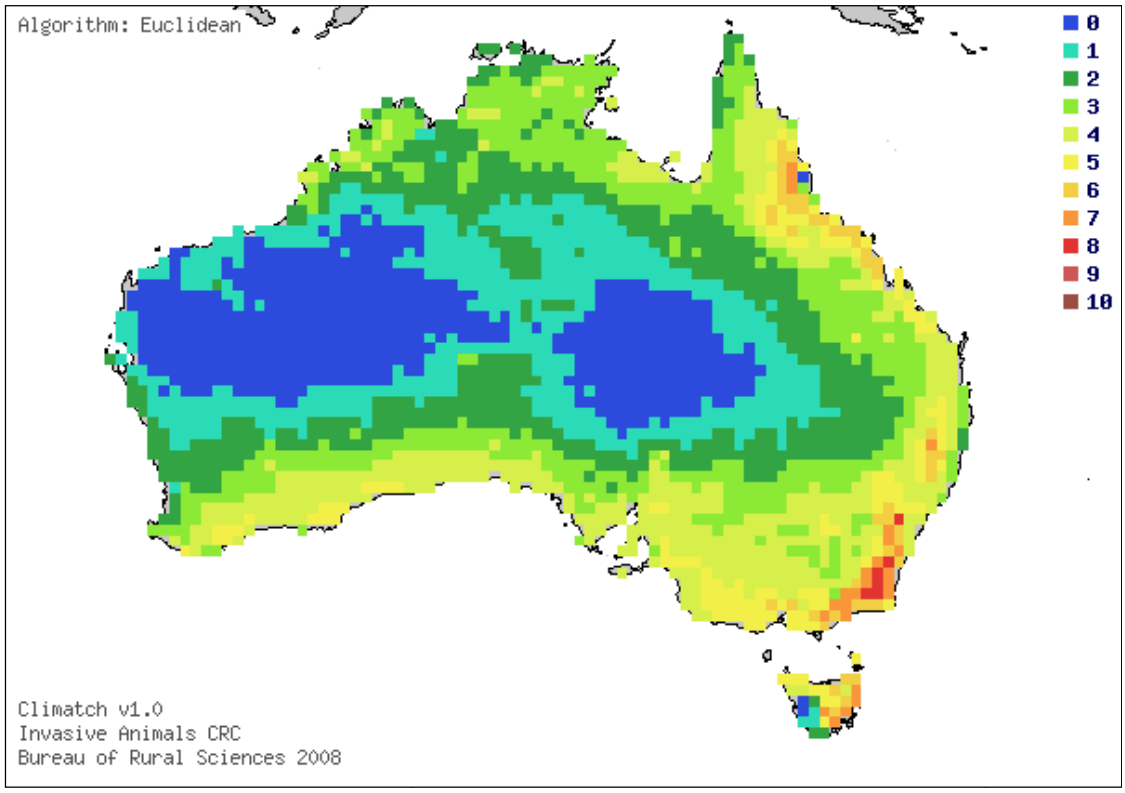

Figure 1. Climate comparison between the natural range of Himalayan tahr and Australia, where 10 is a 'perfect' climate match and 0 is having a very dissimilar climate. Tasmania shows a match between 0 and 7. (Distribution source: Source: Gibbs and Flux, 1973; Andrews and Christie 1964; Bhatnagar & Lovari 2008).

Climate modelling suggests that Himalayan tahr would find Tasmania's climate suitable. It is considered likely that all areas of an altitude of approximately 1000 m would be potential habitat for the species. The prevalence of suitable habitat (vegetated and open areas plus steep rocky slopes) in the high country of Tasmania suggests that there would be extensive areas of potentially suitable habitat for Himalayan tahr to occupy. All areas of Tasmania over 1000 m, and therefore potential habitat, are shown in Figure 2.

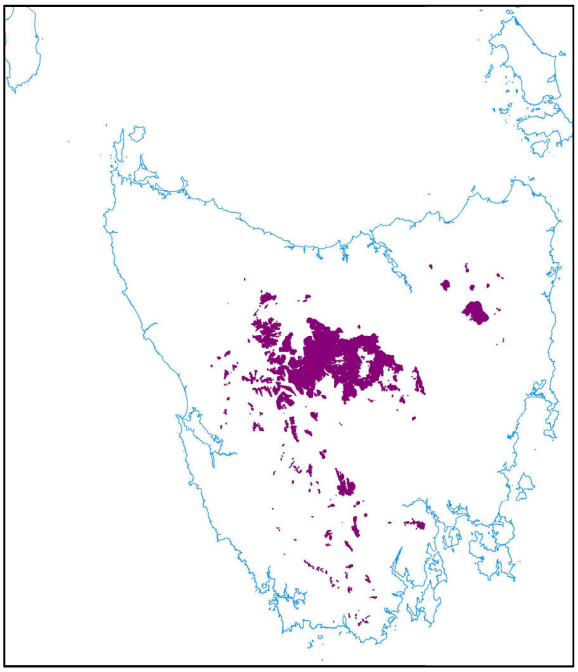

Figure 2. Potential Himalayan tahr habitat in Tasmania: areas over 1000 m asl. (Source: DPIPWE, 2011).

3.6 DIET AND FEEDING BEHAVIOUR

The Himalayan tahr is a generalist herbivore that grazes on a range of plants including herbs grasses and woody species, (DoC 2011; Fleuck 2009). In the evening, they move to lower altitudinal zones for foraging during the night, returning to higher elevations and cover in the morning. Himalayan tahrs regularly overlap with domestic stock when they are foraging (Kittur *et. al.* in Fluek 2009).

3.7 SOCIAL BEHAVIOUR AND GROUPINGS

For most of the year the bulls (adult males) usually mob together, living apart from the nanny herds. Nanny herds, which include adult females, immature males (less than two years old) and kids, typically consist of small groups of 2-20 individuals (Bhatnagar and Lovari 2008) although groups larger than 30 individuals are commonly recorded in moderate and high density populations in New Zealand (Tustin 1990 in Forsyth and Hickling 1997). The sexes mix during the rut, which in New Zealand occurs from the end of April through to June.

In New Zealand, after the rut, the distribution is determined by snow. Himalayan tahr descend and seek the cover of rocky outcrops, shrub-land and other sheltered places in bad weather. As the weather improves in spring the herds gradually make their way back up to the summer pastures (Forsyth *et al.* 2000, Andrews and Christie 1964).

Himalayan tahrs are shy and difficult to approach. There are no reports of aggressive behaviour by the species towards people.

3.8 NATURAL PREDATORS AND DISEASE

PREDATION

In its natural range, the principal predators of the Himalayan tahr are leopard and snow leopard (Huffman 2011). In its introduced range in New Zealand, it has no natural predators. Accidental deaths occur regularly due to the extremely rugged terrain that Himalayan tahr occupy (Christie and Andrews 1964).

In Tasmania it is likely that there would be few potential predators of the Himalayan tahr. Given the size of potential Tasmanian predators such as Tasmanian devils and wedge-tailed eagles, it is likely that Himalayan tahr would only be susceptible to predation when either very young (i.e. of sufficiently small size to be taken by wedge-tailed eagle or Tasmanian devil) or in very poor condition.

DISEASE

In New Zealand a virus with Parapox-like symptoms was periodically noted in Himalayan tahr in the eastern Alps during the 1990s (Forsyth and Tustin 2001). The species also suffers from pinkeye (Kerato-conjunctivitis); the eyes become white and the disease causes temporary or permanent blindness. Contagious ecthyma (scabby mouth), also found in sheep, afflicts tahr in New Zealand. Symptoms include festering wounds and scabs on the mouth, palate, udders and feet (Christie and Andrews, 1964).

Himalayan tahrs carry a small host specific mallophagan louse (*Damalinia hemitragi*). Nematode parasites recorded from the Himalayan tahr include *Oesophagastomum venulosum* and *Trichuris ovis* (the whipworm). Both *O. venulosum* and *T. ovis* also occur in sheep (Christie and Andrews, 1964).

Himalayan tahrs are susceptible to a number of diseases that affect other domestic ruminants (beef cattle, sheep and goats). These diseases are described in an import risk assessment conducted by Biosecurity Australia (BA 2010). This includes John's disease, which is caused by *M. avium* subsp. *paratuberculosis.*

3.9 THREAT TO HUMAN SAFETY

Himalayan tahrs do not appear to pose any risk to humans via physical injury.

A number of diseases, including rabies, anthrax, Rift Valley fever, and tuberculosis, have been associated with the *Hemitragus* genus (Pavlin *et al.* 2009). These diseases are all List A diseases under *Animal Health Act 1995* and are not present in Tasmania. Therefore Himalayan tahrs do not appear to pose any disease risk to Tasmanians.

3.10 HISTORY AS A PEST

Himalayan tahr is recognised as a significant environmental pest in New Zealand and South Africa. In New Zealand the species was deliberately released in 1904 and 1909 as part of a government sponsored program to provide hunting opportunities (Wodzicki 1950). By the 1930s it was already recognised that the species had spread widely in suitable habitat and was an environmental pest. Its harmful effects (impact on alpine vegetation and downstream water and soil quality, competition with stock and causing land degradation) outweighed its value for hunting. Consequently the tahr became the target of government control programs (Tustin and Parkes 1988, Wodzicki 1950). Debate about the potential for eradication peaked in the 1980s and it was formally concluded in 1991 that eradication was not feasible and sustained control was the most appropriate option (Parkes 2009). The annual cost of controlling Himalayan tahr in New Zealand is approximately US$300,000 (Flueck 2009).

Himalayan tahr established on Table Mountain in South Africa after escaping from a private animal collection on an adjacent property in the 1930s and grew to a population of about 120 individuals. The population was regularly culled between the 1970s and 1990s (Long 2003) and is currently the the focus of an ongoing eradication campaign by the South African National Parks Board. The reason for the eradication program was the species' impact on flora and environmental values in the National Park.

Himalayan tahrs have recently been released in Argentina (2000, 2006) and have rapidly established (Flueck 2009). Serious concerns have been expressed that this will lead to a widespread population of Himalayan tahrs in the Andes and cause significant environmental impact. Based on habitat use in the Himalayas and New Zealand, it is likely that the Himalayan tahr can occupy the foothills and all elevations of the southern Andes (Flueck 2009). Himalayan tahr would impact flora, its associated fauna, soils and hydrology. Unlike New Zealand, which has no native land mammals, there are numerous terrestrial mammals in the Andes that may be impacted (Flueck 2009).

3.11 POTENTIAL IMPACT IN TASMANIA

Given the preference Himalayan tahr have for higher altitude areas (generally over 1000 m asl), it is most likely that, in Tasmania, impacts on pasture would be limited to competition for rough grazing, although it is possible that grazing of improved pasture and crop areas at higher altitudes could occur. Early Himalayan tahr control programs in New Zealand were initiated largely in response to anecdotal concerns that grazing and environmental degradation caused by Himalayan tahr was causing a reduction in sheep carrying capacity of lands within the Himalayan tahr's range (Wodzicki 1950).

In Tasmania, the species would also be likely to have a significant impact on environmental values in the highland conservation areas of the state, through grazing and trampling. Many of the areas most suitable for Himalayan tahr establishment are contained within Tasmania's networks of parks and reserves. These sites not only protect high value conservation areas but are also a significant tourism asset.

The alpine sphagnum bogs and associated fens ecological community is listed as endangered under the *Environment Protection and Biodiversity Conservation Act 1999*. This community occurs in Tasmania between 600m and 1200m and is particularly vulnerable to the impacts of ungulates (J. Whinnam, DPIPWE pers. comm.).-It is therefore possible that the Himalayan tahr – should it become established – would be considered a key threat to this community.

The Tasmanian and New Zealand mountain floras have very strong affinities, sharing many species and genera in common (T. Rudman, DPIPWE pers. comm.). Analogous grass and shrub species are present in Tasmania and are likely to provide suitable feed as the Himalayan tahr has adapted to New Zealand grassland species. Of the New Zealand shrub species grazed, many have congeneric species in Tasmania that are highly likely to provide suitable feed (e.g. *Gaultheria*, *Coprosma*, *Podocarpus*). It is likely that Tasmanian vegetation species would provide suitable feed if found within the habitat preferences of the Himalayan tahr. Sedge species, which are a common component of ground layers through Tasmania, are also recorded as in the diet of Himalayan tahr (Parkes and Forsyth 2008), indicating they would likely be consumed in Tasmania also.

Vegetation types present in Tasmania that may provide suitable feed would include montane grasslands and subalpine coniferous heaths and shrublands, particularly where these may occur as a mosaic such as on the Central Plateau (T. Rudman, DPIPWE pers. comm.). These areas would be susceptible to overgrazing and erosion.

Given the lower altitudes and less sheer alpine topography in Tasmania compared with New Zealand and the Himalayas, it is possible that daily and seasonal movement patterns in Himalayan tahr exhibited in Tasmania could be quite different to that described for its native range and New Zealand (e.g. Tustin and Parkes 1988). The implications of this are unknown but may lead to a concentration or dispersion of grazing pressure and therefore differing levels of impact.

DISEASE

Himalayan tahr are reported to have diseases that are similar to ones which afflict sheep, including John's disease. Consequently there is some potential for the species to act as a reservoir of diseases that are present in Tasmania which impact on agriculture.

4. Risk Assessment

4.1 PREVIOUS RISK ASSESSMENTS

The Himalayan tahr has previously been assessed by the Commonwealth Vertebrate Pest Committee (2007) as a 'serious' risk. The VPC recommended that imports be limited to statutory zoos or endorsed special collections (VPC 2007).

The Himalayan tahr has not previously been considered for importation into Tasmania.

4.2 RISK ASSESSMENT

The following risk assessment determines the risk of Himalayan tahr to Tasmania using the Bomford model (2008) adapted for use in the Tasmanian context and proposes assigned threat categories and import classifications for the species.

Species:	**Himalayan tahr** (*Hemitragus jemlahicus*)	
Date of Assessment:	April 2011	
Literature search type and date:	See references	
Factor	**Score**	
A1. Risk posed from individual escapees (0-2)	0	*Will not make unprovoked attacks causing injury requiring medical attention, and which, even if cornered or handled, are unlikely to cause injury requiring hospitalisation.* Himalayan tahr pose little, if any, risk to humans.
A2. Risk to public safety from individual captive animals (0-2)	0	*Highly unlikely or not possible.*
Stage A. Risk posed by individual animals (risk that a captive or escape animal would harm people)	**Public Safety Risk Score** = A1 + A2 = 0	**Public Safety Risk Ranking** A ≥ 2, Highly Dangerous A = 1, Moderately Dangerous A = 0, Not Dangerous = Not Dangerous
B1. Climate match score (1-6)	4	*High*
B2. Exotic population established overseas score (0-4)	4	*Exotic populations have been established on a large island (>50,000 km^2) or anywhere on a continent.* Populations have established in NZ, South Africa and Argentina.
B3. Overseas range size score (0-2)	0	*< 1 million km^2*
B4. Taxonomic class score (0-1)	1	*Mammal*

Stage B. Likelihood of establishment (risk that a particular species will establish a wild population in Tasmania)	**Establishment Risk Score** = B1 + B2 + B3 + B4 = 9	**Establishment Risk Ranking** B = 11-13, Extreme B = 9-10, High B = 6-8, Moderate B ≤ 5, Low = High
C1. Taxonomic group (0-4)	2	*Mammal from a family particularly prone to causing agricultural damage (Bovidae)*
C2. Overseas range size (0-2)	0	*< 10 million km²*
C3. Diet and feeding (0-3)	3	*Mammal that is primarily a grazer or browser*
C4. Competition for native fauna for tree hollows (0-2)	0	*Does not use tree hollows*
C5. Overseas environmental pest status (0-3)	3	*Major environmental pest in any country or region* NZ and South Africa
C6. Climate match to areas with susceptible native species or communities (0-5)	5	*75% of the geographic range of one or more susceptible native species or communities...* Likely to have a significant impact on environmental values through grazing and trampling, and may impact endangered alpine sphagnum bogs and associated fens, as well as feed upon montane grasslands, subalpine coniferous heaths and shrublands.
C7. Overseas primary production (0-3)	1	*Minor pest of primary production in any country or region*
C8. Climate match to susceptible primary production (0-5)	4	*High climate match with susceptible industry.*
C9. Spread disease (1-2)	2	*All birds and mammals (likely)*
C10. Harm to property (0-3)	0	*< $100,000/year* Fence building
C11. Harm to people (0-5)	0	*Negligible risk*
Stage C. Consequence of Establishment (risk that an established population would cause harm)	**Consequence Risk Score** = sum of C1 to C11 =20	**Consequence Risk Ranking** C > 19, Extreme C = 15-19, High C = 9-14, Moderate C < 9, Low = Extreme
ASSIGNED THREAT CATEGORY:	**EXTREME**	
PROPOSED IMPORT CLASSIFICATION:	**PROHIBITED**	

5. Risk Management

Based on the outcomes of the risk assessment it is recommended that Himalayan tahr (*Hemitragus jemlahicus*) be placed on the list of species that are prohibited imports because they represent an extreme threat to Tasmania.

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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**	2	4	88
Timber (includes native and plantation forests)	**10**	N/A		
Aquaculture	**6**	N/A		
Sheep (includes wool and meat)	**5**	2	4	40
Vegetables	**5**	N/A		
Fruit (includes wine grapes)	**5**	N/A		
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**	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)				128

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		

RESOURCE MANAGEMENT AND
CONSERVATION DIVISION

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