

= Quoll =

The quoll ( / ˈkwɒl / ; genus *Dasyurus* ) is a carnivorous marsupial native to mainland Australia , New Guinea , and Tasmania . It is primarily nocturnal and spends most of the day in its den . Of the six species of quoll , four are found in Australia and two in New Guinea . Another two species are known from fossil remains in Pliocene and Pleistocene deposits in Queensland . Genetic evidence indicates that the quoll evolved around 15 million years ago in the Miocene , and that the ancestors of the six species had all diverged by around four million years ago . The quoll species vary in weight and size , from 300 g ( 11 oz ) to 7 kg ( 15 lb ) . They have brown or black fur and pink noses . They are largely solitary , but come together for a few social interactions such as mating which occurs during the winter season . A female gives birth to up to 18 puppies , of which only six survive to suckle on her teats .

The quoll eats smaller mammals , small birds , lizards , and insects . Its natural lifespan is between two and five years . All species have drastically declined in numbers since Australasia was colonised by Europeans , with one species , the eastern quoll , becoming extinct on the Australian mainland , now being found only in Tasmania . Major threats to their survival include the cane toad , predators , urban development , and poison baiting . Conservation efforts include breeding programs in captivity .

= = Taxonomy = =

The name *Dasyurus* ( from Greek ????????? , *dasyouros* ) means " hairy @-@ tail " , and was coined by Étienne Geoffroy Saint @-@ Hilaire in 1796 .

In 1770 , Captain Cook collected quolls on his exploration of the east coast of Australia , adopting the Aboriginal name for the animals . Although the origin of Cook 's specimens are unclear , the word and its variants je @-@ quoll , jaquol or taquol are derived from the language of the Guugu Yimithirr people of far north Queensland . No evidence indicates the local indigenous people used the word in the Sydney area . They were likened in appearance to a polecat or marten in the earliest reports , the tiger quoll being called " spotted marten " and eastern quoll " spotted opossum " , but by 1804 , the names " native cat " and " tiger cat " had been adopted by early settlers . In the 1960s , noted naturalist David Fleay pushed for the revival of the term " quoll " , as he felt the then current vernacular names were misleading . They are very well known animals in Australia .

Four species have been recovered from Pleistocene cave deposits from Mount Etna Caves National Park near Rockhampton in central Queensland . Remains of the tiger quoll and the northern quoll , and a species either identical or very similar to the eastern quoll , as well as a prehistoric species as yet undescribed , all lived in what was a rainforest climate . The northern quoll is still found in the region . The fossil species *D. dunmali* , described by Bartholomai in 1971 , is the oldest species recovered to date . Its remains were found in Pliocene deposits near Chinchilla in southeastern Queensland . Known only from a lower jaw and some teeth , it was a relative of the tiger quoll .

The first species described , the eastern quoll , was originally placed in the American opossum genus *Didelphis* by an anonymous author , and named *Didelphis maculata* . This name is no longer considered valid , and the second part of the name is now given to a different species , the tiger quoll , *Dasyurus maculatus* , while the eastern quoll was renamed *Dasyurus viverrinus* by George Shaw in 1800 .

The tribe Dasyurini , to which quolls belong , also includes the Tasmanian devil , the antechinus , the kowari , and the mulgara . Genetic analysis of cytochrome b DNA and 12S rRNA of the mitochondria indicates the quolls evolved and diversified in the late Miocene between 15 and 5 million years ago , a time of great diversification in marsupials . The ancestors of all current species had diverged by the early Pliocene , around 4 million years ago .

The genus *Dasyurus* consists of six species of quoll :

The bronze quoll ( *D. spartacus* ) is the only mammal found in the Trans Fly ecoregion , but not in northern Australia . It is found in the southern part of New Guinea south of the Fly River . Rising sea

levels due to an increase in global temperature caused a land bridge that once connected Australia and New Guinea to be covered up with water . A 2007 study conducted by the University of New South Wales suggests the bronze quoll is closely related to the western quoll , their ancestors diverging with the separation of land masses .

The western quoll or chuditch ( *D. geoffroii* ) is restricted to the Jarrah Forest and the central and southern Australian Wheatbelt . The western quoll is believed to have once occupied 70 % of Australia , but because of cane toads , predators , habitat destruction , and poison baiting , it is now less abundant .

The New Guinean quoll ( *D. albopunctatus* ) is found throughout most of New Guinea . It tends to live at an elevation of about 1 @, @ 000 m ( 3 @, @ 300 ft ) , and is not found in the south @-@ western lowlands , although it can be found on Yapen Island .

The eastern quoll ( *D. viverrinus* ) is now considered extinct on mainland Australia ; the last sighting there was in the 1960s . But it does inhabit much of nearby Tasmania , where it can be found in rainforests , heathland , alpine areas , and scrubs . It can be found near farms , as it eats pasture food . The eastern quoll can also be seen in the Mount Field National Park .

The tiger quoll or spotted tail quoll ( *D. maculatus* ) , lives in south @-@ eastern Australia . It tends to prefer rock dens more than dens made out of wood . In a study submitted by Belcher and Darrant in 2006 , the habitats of tiger quoll were directly related to the amount of prey found in the area . Gullies and drainage ditches were used quite often by the quolls , and ridges with rocky outcrops were used to make the rock dens the animals enjoy . The species in Queensland has declined rapidly and is now absent from the Brisbane region . Important strongholds for the population occur in the Blackall / Conondale ranges , Main Range , Lamington Plateau and the McPherson and Border ranges .

The northern quoll ( *D. hallucatus* ) could be found in the northern third of Australia a century ago . Presently , it resides in high rocky areas and areas with heavy rainfall . It is abundant on the minor islands surrounding northern Australia . In 2003 , northern quolls were translocated to Astell and Pobassoo Islands for conservation reasons . Genetic analysis indicates it is the earliest offshoot from the ancestors of other quolls .

#### = = Description = =

Adults are between 25 and 75 cm ( 9 @. @ 8 and 29 @. @ 5 in ) long , with hairy tails about 20 to 35 cm ( 7 @. @ 9 to 13 @. @ 8 in ) long . Females have six nipples and develop a pouch during the breeding season , which opens toward the tail ( with the exception of the tiger quoll , which has a true pouch ) when they are rearing young . Their coats are brown or black , with some colour variants in between . They have bright pink noses and long snouts . Their natural lifespans are between two and five years ; the larger species tend to live longer than the smaller . Quolls are solitary , nocturnal animals . The average weight differs greatly depending on the species ; male western and eastern quolls weigh about 1 @. @ 3 kg ( 2 @. @ 9 lb ) and females 0 @. @ 9 kg ( 2 @. @ 0 lb ) . The tiger quoll is the largest , with the male weighing about 7 kg ( 15 lb ) and the female 4 kg ( 8 @. @ 8 lb ) . The northern quoll is the smallest , and the male weighs on average 400 to 900 g ( 14 to 32 oz ) , and the female 300 to 500 g ( 11 to 18 oz ) .

#### = = Distribution and habitat = =

The quoll is indigenous to mainland Australia , New Guinea , and Tasmania . The six species were once widely distributed across the three land masses , but are now restricted to only a few areas . Although primarily ground @-@ dwelling , the genus has developed secondary arboreal characteristics . Each species of quoll lives in distinct geographical areas . The tiger quoll and eastern quoll are exclusively mesic zone species , that is they inhabit moister habitats . The western quoll also inhabits mesic habitat , but has adapted to arid regions across inland Australia , while the northern quoll inhabits tropical habitat of high rainfall .

## = = Behaviour = =

The quoll is a carnivorous marsupial . It is primarily nocturnal , sleeping in hollowed @-@ out logs or rocky dens and coming out to hunt during the night , though on rare occasions it can be seen looking for prey during the day . It is mostly ground @-@ dwelling , but it is not uncommon to see a quoll climbing a tree . The quoll marks its territory several kilometres away from its den . A male 's territory often overlaps many females ' territories , and male and female quolls only meet for mating . Quolls have communal toilet areas , usually on an outcropping used for marking territory and social functions . These communal latrines may have up to 100 droppings in them .

The quoll is a mostly solitary creature , limiting contact with others to mating or other social activities such as using the latrines .

## = = Diet = =

The quoll is mostly carnivorous ; the smaller quolls primarily eat insects , birds , frogs , lizards and fruit ; the larger species eat birds , reptiles , and mammals , including echidnas and possums . The tiger quoll 's diet is dominated by mammals such as brushtail possums , rabbits and hares . The exact mix is variable depending on the availability of prey after bushfires , and can include carrion or bandicoots when food is scarce . The other species of quoll have also been known to eat carrion . The quoll 's paws and vibrissae allow it to reach into small burrows to find prey . The quoll hunts by stalking . Depending on the size of its prey , the quoll may leap or pounce on it . It pins small prey down with its front paws while devouring it , and jumps onto larger prey , sinking in its claws and closing its jaws around the neck . The quoll can obtain all the water it needs from its food , making it quite adaptable during droughts or other periods of water shortage .

## = = Reproduction = =

Mating occurs during the winter months . Once a female quoll has been impregnated , the folds on her abdomen convert into a pouch that opens at the back . The gestation period is 21 days . A baby quoll , or pup , is the size of a grain of rice . Up to 18 quolls are born in each litter , but only six survive the first two weeks . The survivors stay in their mother 's pouch for eight weeks , suckling on one of the mother 's six teats for milk . During the ninth week , the pups venture out of the pouch and onto the mother 's back , where they remain for six weeks . The quoll reaches maturity when it is one year old , and has a natural lifespan of between two and five years . A 2008 study of the pouches of tiger quolls reported the pouches ' appearance ' were reliable indicators of the quolls ' reproductive status : during the follicular phase , pouches were found to be red and have many secretions . After ovulation , pouches became deep and wet . Researchers can use this information to determine where a female quoll is in her ovarian cycle , which is anticipated to be helpful in breeding management .

## = = Threats = =

Cane toads were introduced into Queensland in 1935 ; their numbers have since grown exponentially . These poisonous toads pose a significant threat to the northern quoll , which may die after consuming one . The Department of Sustainability , Environment , Water , Population and Communities has stated that cane toads are highly invasive and are major threats to the quoll 's survival .

Predators such as foxes and cats prey on quolls and compete with them for food . For example , both quolls and foxes catch and consume rabbits . Since the introduction of foxes , the rabbit population has dropped dramatically . Foxes have been eradicated from many of the islands off the coast of Australia in an effort to protect the quoll .

The quoll is suffering badly from urbanisation , housing development , mining development , and expansion of agricultural lands . Habitats are also being destroyed by large herbivores trampling the

grass and overgrowth , making camouflage difficult . Forest fires and weeds also contribute to habitat destruction .

The poison sodium monofluoroacetate is commonly used in Australia to control pests such as European rabbits , foxes , feral predators , and wild dogs such as dingoes . It is cooked into meat which is put into the wild for the animals to ingest . The poison is extremely toxic to wild dogs and other pests , but considerably less so to quolls . Size is a main factor in how the poison will affect a quoll ; larger quolls will suffer no ill effects from eating one piece of prepared meat containing sodium monofluoroacetate , but will suffer if they eat more than one within a short period of time . One piece of meat may be lethal to female and juvenile quolls . Since the quoll is a carnivore and will readily consume any meat left out , it is at high risk from the poison . The meat should be buried at least 8 cm ( 3 @. @ 1 in ) underground , but has been found under minimal soil that a quoll can dig around to get to it . Poisoning is currently being investigated , as the number of quolls protected from predators by the bait may be much more than those which ingest the poison and die .

= = Conservation efforts = =

Since 1770 , all Australian quoll species have declined in number owing to habitat loss caused by urbanization . The northern quoll is threatened by toxic cane toads , but a University of Sydney project revealed in 2010 is teaching them to avoid eating the invasive amphibians . In 2008 , the Northern Territory Wildlife Park in Australia recorded their first litter of quoll pups in the park . The quolls bred well in captivity , with over 15 litters in the 2008 breeding season alone .

In late October 2011 , a litter of five tiger quoll pups was born at Wild Life Sydney in Darling Harbour , Australia . The pups were born to inexperienced parents , both just one year old . The reason for the young parents was because older male quolls can become violent and kill the female if they do not want to mate . By breeding one @-@ year @-@ old quolls , there was no threat of violence . Four of the quoll pups will be sent to other zoos or wildlife parks across Australia , but one , which the researchers named Nelson , will stay at the centre to become an " ambassador for all quolls " .

Fox control programs have benefited the western quoll . The Department of Environment and Conservation ( Western Australia ) monitors western quoll populations in the Jarrah Forest as part of its faunal management programs , as well as ongoing research into fox control , timber harvesting , and prescribed burning . The Perth Zoo has been monitoring a successful captive @-@ breeding program since 1989 . It has successfully bred more than 60 western quolls , most of which it transferred to Julimar Conservation Park , with proposals to translocate to Wheatbelt reserves and Shark Bay .

The bronze quoll is kept in Wasur National Park and Tonda Wildlife Management Area . More research on distribution and threats is needed for further conservation .

Creating a native pet industry in Australia related to quolls could aid in their conservation . However , concerns exist about this methodology in regards to animal husbandry , conservation benefits , and other issues . Some scientists believe that keeping quolls as pets could aid in their long @-@ term conservation , but further research is needed on this topic to conclude whether this is true or false .