NEW

PetsRADAR

DOGS & CANINES

OVER 650 FASCINATING FACTS & TOP CARE TIPS INSIDE

DISCOVER THE FAMILY AND ANCESTRY OF MAN'S BEST FRIEND

THE DOMESTIC DOG

Understand these loyal companions better

CANINE SUPERHEROES

Meet the dogs that go above and beyond

WILD DOGS AND WOLVES

Learn about the various subspecies and variations

+ DOG-TRAINING TIPS & TRICKS

Digital Edition

FUTURE

FIFTH EDITION

Welcome to

PetsRADAR

DOGS & CANINES

As a proud dog-dad to a beautiful German Shepherd named Vinnie, I know first-hand just how much of a huge place dogs take in the hearts of their owners and families. Dogs have a unique ability to know just how we're feeling; they provide us with fun and exercise in the good times, and emotional support and loving care when things aren't going so well. They're faithful companions who are always ready and willing to play or even work with us, so it's all too easy to forget the wild origins of our canine companions.

From the dachshund to the Doberman, all dogs share the wolf as their common ancestor, who are themselves part of a much larger canine family including jackals, dingoes and foxes. Each member of this family shares a physical resemblance along with the social skills and heightened senses that help them survive. This book will help you discover more about the different canids, from the ones that play fetch to the ones that mercilessly hunt their prey in packs. Turn the page to learn more about this fascinating family.

If you'd like more advice on pet care and animal health, pay us a visit at PetsRadar.com. The love and dedication that owners and pets share for each other is at the core of what we do. From making the right choices around pet diet and health care to upgrading pets' lifestyles with the latest accessories and pet-related technology, PetsRadar.com is the place for expert advice for happier pets.

Dave Harfield
Editor, PetsRadar.com

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FUTURE

PetsRADAR

DOGS & CANINES

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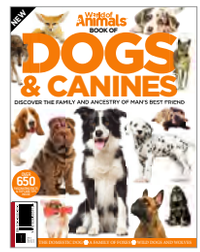

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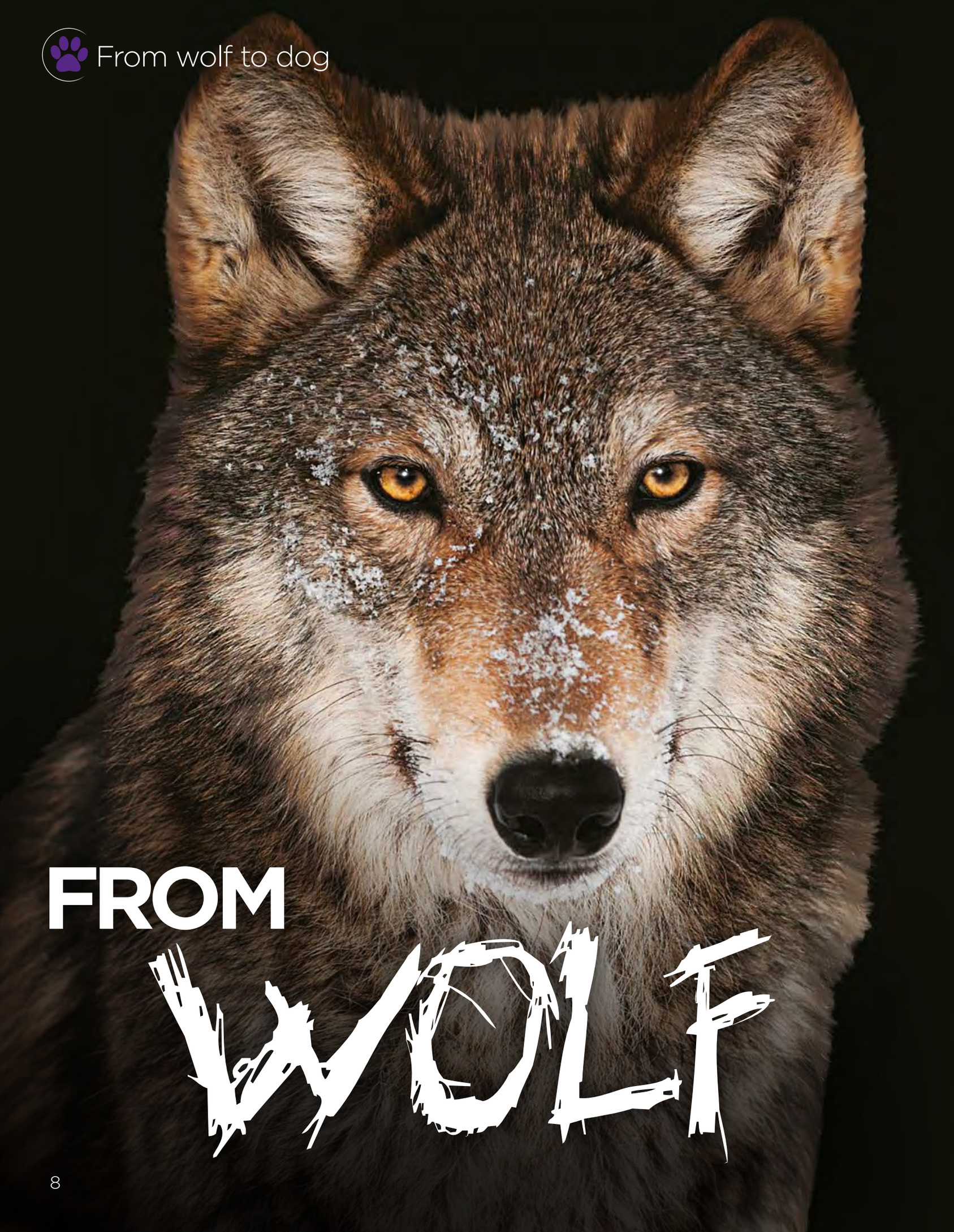

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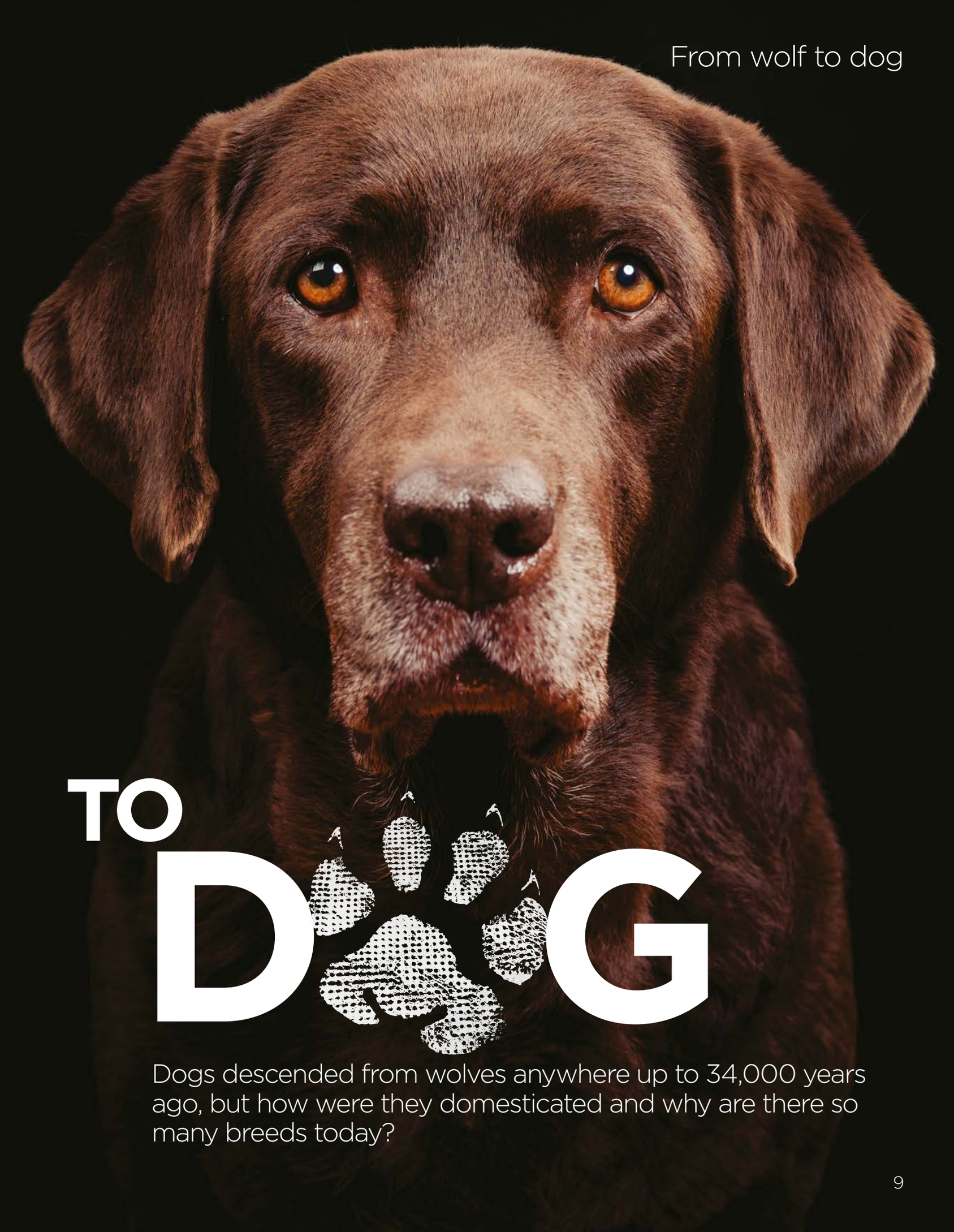
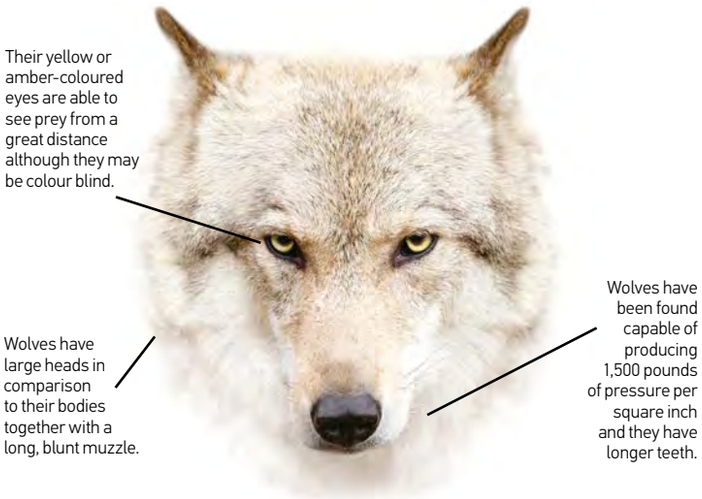


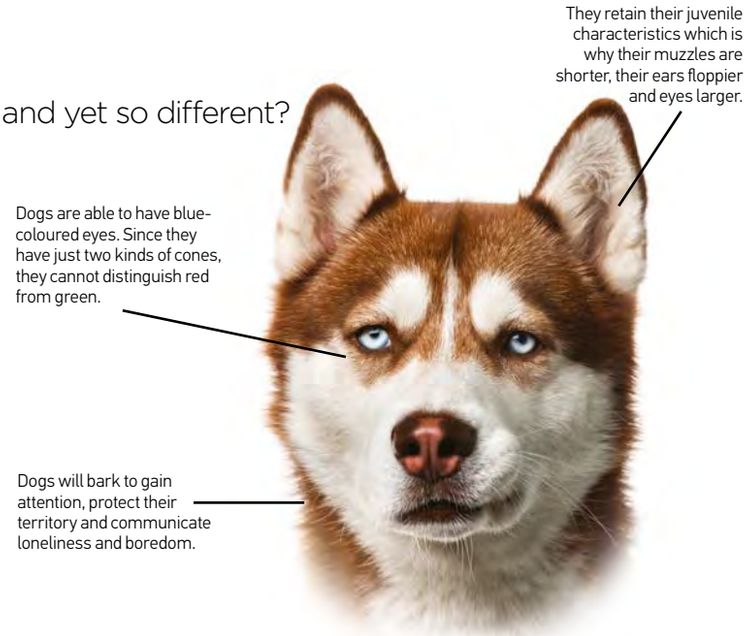
TO DOG

Dogs descended from wolves anywhere up to 34,000 years ago, but how were they domesticated and why are there so many breeds today?

Wolf vs Dog

Just what makes these fascinating animals so similar and yet so different?





Wolves are intelligent animals which live in nuclear family groups, hunt and scavenge in small packs and are well-equipped to survive the most extreme of environmental conditions. These nocturnal creatures need large amounts of energy, which they gain from the prey they hunt. They have a ravenous appetite and they can tear at meat using their large, curved teeth and powerful jaws. They can also go for long periods without eating. Born blind and deaf in the early-to-late months of spring, they also develop much faster than dogs. They'll begin socialising with other wolves when they are just two weeks old – half the time of their domestic descendants – and they'll be walking and exploring, too. Before long, they'll be howling rather than barking to communicate with one another.

While wolves have a uniform appearance, dogs are incredibly diverse. There are 400 different breeds, some big, some small, some friendly, some fierce, but each one is loyal and social with an intelligence said to be on a par with a two-year-old child.

Indeed, a dog has a brain some 30 per cent smaller than a wolf, but, unlike wolves, they are able to form a strong bond with man. While they may establish hierarchal orders with other dogs and be accepting of strangers, they know their place within human society. As such, the domesticity of dogs has changed their eating habits, making them more adapted to life as omnivores. Their chase instinct is more playful since they do not have to hunt for their food.

How closely related are they?

It has long been thought that dogs descended from the grey wolf of Central Asia and that 95 per cent of all of the dogs in the world have descended from the same three females. It's a fact that dogs are so genetically similar to grey wolves that they share 99.96 percent of each other's DNA but that shortfall is enough to make them markedly different in both looks and temperament, especially when we take into account human intervention and domestication over the many years dogs have been our best friends.

That said, the matter is not clear cut since a study in 2014 appeared to paint a very different picture. Back then, US researchers sequenced genomes from grey wolves based in China, Croatia and Israel – three areas where dogs are believed to have originated. They did the same for two modern dog breeds – an Australian dingo and central African basenji – before concluding that dogs did not directly descend from wolves but had a common ancestor which has since become extinct.

This has led to a growing belief that dogs and wolves split from their ancestor between 9,000 and 34,000 years ago and that our furry friends are actually more closely related to each other than they are to wolves. Even so, the link between dog and wolf remains, albeit perhaps further back in the evolutionary chain.

Shiba Inu is the dog breed most genetically close to the wolf

Domestication through the years

Scientists have long debated when and where dogs were first domesticated. Recent studies show wolves may have been domesticated in China 34,000 years ago, migrating through Eurasia 14,000 years ago.

Dog bones were found in a grave belonging to a 50-year-old man and a women in her early 20s in Germany, dating back 14,708 years – evidence of an early dog-human relationship.

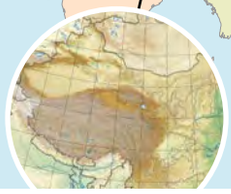
Drawings dating to 12,000 years BCE in the ancient temple of Gobekli-Tepe in Turkey could be depicting domesticated dogs although it's not certain. The poem The Epic of Gilgamesh from 2100 BCE describes goddess Innana with seven hunting dogs.

Where did they come from?

Plotting the locations of some key archeological finds of ancient domestic dogs

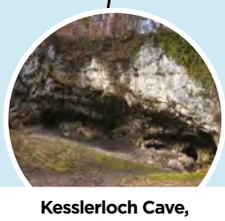
Razboinichya Cave, Siberia
33,000 years ago
A skull, mandibles and teeth of a dog were discovered in 2011, with archeologists confirming through DNA analysis that it belonged to one of the oldest known ancestors of the modern dog.

Goyet Cave, Belgium
31,700 years ago
The skull of the oldest found dog in the world was unearthed in the Goyet Cave. Its muzzle was shorter than that of a wolf and it pointed to the first modern people to occupy Europeans having domesticated dogs.



Nanzhuangtou, China
12,790 years ago
This site is where the earliest dog remains in China were found, which could mean the people of Nanzhuangtou domesticated the animal. It could be the earliest domestic animal in China.

Danger Cave, Utah, USA
9,000 years ago
Dog bones found in Danger Cave are thought to form the earliest evidence of domesticated dogs in the New World. It's also one of the Great Basin's oldest human sites.



Kesslerloch Cave, Switzerland
14,600 years ago
Researchers found a jaw fragment of a dog in 1873 which was finally radiocarbon-dated in 2010. Similarly-aged dog fossils were also found buried at Bonn-Oberkassel in Germany.

Wolves are rarely seen alone, unless they're young males hoping to establish a pack

In 27 to 116 BCE, Marcus Varro, a Roman farmer, advised that dogs be kept on farms since they could keep a watch at night and he showed ways of training puppies.

Turnspit dogs were mentioned in *Of English Dogs* in 1576 and their role was to run on a wheel to turn meat. Dogs were also trained for conflict, most notably during World War I.

The House of Commons introduced the Protection of Animals Act 1911 banning dogs pulling carts in the UK. It ensured dog and other animal owners had a duty of care.

How did wolves become pets?

From wild animals to tame fluffy friends, domesticated dogs have found their way to human affection

For dogs to have become domesticated, one fact is irrefutable: they must have come into contact with humans at some point in their history. Scientists are doing their utmost to crack the precise details of their origins but with dogged determination, the pieces are starting to come together.

Contact with wolves is thought to have begun with the emergence of human settlements as many as 34,000 years ago. People began to live in close-knit groups thanks to better communication and new advances in materials and agriculture, while the cold climate was diminishing food supplies so a pooling of resources was deemed necessary.

Since many of the settlements were in habitats that had pre-existing populations of wolves, these animals began to grow used to living in close proximity to us two-legged creatures. In fact, it's thought that they approached humans rather than the other way around, feeding from the leftover meats that were discarded on the outskirts of such communities. Humans tolerated their presence because the wolves helped to remove rotting food and provided a natural defence against outsiders.

What happened next, though, is largely unknown. Some believe humans took in puppies from birth to tame them while others reckon some (but not all) wolves dropped their defences and came to rely on the discarded waste of humans, eventually gaining a trusting mechanism. This could have grown from a realisation that if they posed no threat to humans – and indeed were friendly – it would gain them some delicious rewards.

As a result, they became less aggressive and their appearance began to alter. They developed an uncanny ability to read human gestures which was vitally important in their usefulness to man. Humans liked their loyalty and the dogs began to accompany them on hunts. They became faithful guardians, protecting herds and dwellings and becoming so revered, some Egyptians mummified them upon death.

Gradually, they began to be kept in the home becoming a great part of the family – but only in more recent times. Women in Victorian England enjoyed keeping miniature dogs and the idea of having them around the house stuck. Today they remain great companions, valued for their friendship and skills.

BELOW Dogs have generally such good temperaments that they can be trusted with children

From the rottweiler to the chihuahua, the variations between breeds is extreme

The selective breeding of modern dogs

How trends and desires have shaped man's best friend

Selective breeding – the choosing of male and female animals and plants with particular, favoured characteristics – began with the domestication of dogs. Ancient humans picked out certain phenotypic traits such as a loud bark which would have been helpful for the protection of themselves and their property. They would have ensured these animals bred with other dogs, replicating the chosen characteristic among their offspring.

It's unlikely the ancient humans knew that, in doing so, they were artificially influencing the selection of dog genes but it worked to their advantage. Dogs were selected for their herding abilities, for example, or their strength to pull carts. Hunting dogs were selectively bred so that their sense of smell (as in the case of bloodhounds) or sight (as with greyhounds) was enhanced. It meant those sniffing out prey developed smaller legs which helped keep their nose to the ground as well long, lower set ears to sweep scents towards their nose. Those selected for sight had longer legs for a better sightline and they could pick up a graceful speed as they hunted down hare, foxes and deer. As needs came and went, dogs were introduced and mated out: the Talbot, Molossus and Kuri, for example, became extinct.

In the 19th century, selective breeding exploded in popularity, particularly in Victorian England. Appearance became important thanks, mainly, to the industrial revolution which changed the way people lived and sidelined centuries of agriculture. People kept their dogs and and took them in as pets to be looked after and pampered. Designer dogs became popular.

Kennel clubs were formed to selectively breed suitable specimens and records of canine bloodlines began to be kept. Dogs were categorised by breed – that is, animals which display certain uniform physical characteristics due to the conditions imposed on them by humans. There are now 340 breeds recognised by the World Canine Club, with a great variety within each and stark behavioural traits such as herding, hunting and companionship.

Dogs today

Dogs have played many roles over the years. They have helped humans carry out every-day duties, they have become status symbols, provided security and protection to their owners and been used to show strength. They were seen as a gift from the gods by ancient civilisations and they have proven useful in the military and police forces.

Today, they continue to work acting as guide dogs for the visually impaired and hearing dogs for the hearing impaired. They can cheer up those who are incapacitated and be used to rescue stricken people in disasters. Dogs are used to hunt, pull sleds and track lost people. They can sniff out drugs at airports and even entertain, as Pudsey, the winner of 2012's *Britain's Got Talent* showed.

But they have also grown to become loyal family pets that are drawn to humans like no other animal on Earth. It's perhaps a throwback to their ancestral wolf line: dogs enjoy their human packs and allow us to assume the role of leader. Today, 750 million people around the world have a dog and there are eight million dogs in the UK alone. They can lead a pampered life (the average dog naps for 52,958 hours over its lifetime – that's more than six years) but they provide great companionship.

Domesticated dogs are labelled as 'man's best friend' for a reason

Concerns of selective breeding

Today, there are four types of dog breed. Pure breeds have a documented pedigree; cross-breeds are bred from two or more breeds; mixed breeds, sometimes referred to as mongrels, are those which have not been intentionally bred; and natural breeds have developed over time. But although selective breeding has changed the face of man's best friend many times over this past century-and-a-half, it is not without controversy.

By breeding dogs to have unique physical and mental traits and with the trend for designer dogs still persisting, many are highly inbred. This has produced serious genetic defects among bloodlines, making some breeds more susceptible to illness. While it has created dogs of vastly different appearances, there can be inherited blood disorders, diseases of the immune system, hearing and vision loss, a greater risk of cancer and heart problems.

German shepherds are likely to suffer chronic eczema and dalmations are far more likely to be deaf than other dogs. English bulldogs have changed so much over the past century that they suffer breathing difficulties, skin allergies, mobility issues and reproductive problems, requiring a need for urgent cross-breeding. Such little variety is caused by a small initial pool of founding dogs with very specific traits.

From wolf to dog

Is it a dog?

These domestic dogs have been crossbred with wolves to create a domestic hybrid

Saarloos Wolfdog
Dutch breeder Leendert Saarloos crossed a male German shepherd dogs and a European wolf in the 1930s, creating a lively yet reserved canine which has long legs, ears like a dog and a pack instinct.

Czechoslovakian Vlcak
A German shepherd crossed with a Carpathian wolf, this wolfdog has become useful in search and rescue operations. It has the physical build, head and hair of a wolf, and shares many physical attributes.

Hierran Wolfdog
The origin of this wolfdog is unknown but, originating on the Canary Island of El Hierro, it bears many similarities with wolfs including its erect ears and strong build.

Did you know?

Dogs cannot breed with all animals in the biological family Canidae: the somatic cells of the red fox, for instance, have 38 chromosomes rendering the breeding of fox-dogs impossible.

Cross-breeding between wolves and dogs

In 1989, the South African police force decided that it wanted to create a more aggressive dog so it crossed their trained animals with wolves in a bid to create a wolf-dog hybrid. It worked a treat because dogs and wolves belong to the genus *Canis*, and both their bodies are made up of 78 chromosomes grouped into 39 pairs, making them close relations. But while that was deliberate, hybridisation can occur in the wild with no human intervention at all and it is a growing concern since interbreeding is affecting the wolf population and even threatening the wolf as a species.

The main concern is that hybrids are polluting the genetic pool, leading to the possibility of fewer 'pure' wolves. The problem is that wolves are finding themselves in closer proximity to pet dogs as human habitats get closer and closer and scientists worry that breeding between the two can remove some of the traits inherent in wolves. The animals can lose the wild instinct which threatens their ability to survive and they can also become unpredictable and dangerous. Added to the fact that there is no rabies vaccine for wolfdogs as yet, and it's clear there are also worries about their future wellbeing.

"The animals can lose the wild instinct which threatens their ability to survive"

BELOW While they might look cute, puppies of wild canines with domestic dogs are a threat to the species

What other canine hybrids exist?

What happens when domestic dogs start to encroach on wild canine territory? Golden jackals have shown the capability of breeding with domestic dogs, but only in captivity under controlled environments. However, hybridization is a serious threat to populations of wolves, coyotes and dingoes.

The coydog

Coyotes and dogs are genetically close enough to produce a fertile canid hybrid. This is a common occurence, and coyote DNA is becoming more dog. The Eastern coyote, for instance, is a hybrid made up of 62 per cent Western coyote, 14 per cent Western wolf, 13 per cent Eastern wolf and 11 per cent domestic dog. However, the population is stable and even growing.

Dingo hybrids

There has been so much hybridisation between the dingo and the domestic dog that the vast majority of dingoes are now mixed-breed. This has proven to be a real threat to the future of the species, as there few 'pure' dingoes left with solely dingo heritage. This has resulted in an increase in variety in colour patterns and build, blurring the species' typical characteristics.

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The domestic dog

Man's best friend has been our sidekick for thousands of years – but just when did we first invite them into our homes? Check out the past and the present of these beloved pets

"Dogs are so genetically similar to wolves that they share 99.96 per cent of each other's DNA"

© Thinkstock, Alamy

DOG AND MAN

Humans and dogs have long proven to be the very best of friends

As the car pulls up, young Max runs to the window, his tail wagging and his eyes wide. He hears the key in the door and he runs in circles, barking and leaping before heading at speed towards you as walk in, his wet nose rubbing your face in delight. It's happens day after day, the excitement never waning. But that's why dogs are man's best friend, and it's a true sign of the unique bond that exists between us.

Science explains it well. The licking is a throwback to dog's evolution from wolves – something we clearly see when wolves greet each other with a slurp to each other's faces – while their place in our families is down to their desire to live in a pack. They become anxious and worried if they are separated from us and they enjoy our company when we return. With no understanding of voluntary detachment, the bond only gets stronger.

As history has shown, this has been beneficial to both sides. Dogs enrich our lives, having come out of the wild and into our homes, and they have embarked on a fantastic sociological journey. They have proven useful in helping man gather food and feel protected, and have aided us in our day-to-day lives. They are marvellous pets and companions and have proven vital in aiding the military, law enforcers, health professionals and patients.

By becoming accustomed to our gestures and facial expressions and with scientific evidence that jealousy is a common trait along with morality and possessiveness, dogs have proven themselves to be both loyal and complex. In many ways they know us far better than we think we know ourselves, and by always being there for humans, they are the greatest gifts we could ever hope for.

"They have proven useful in helping man gather food and feel protected, and have aided us in our day-to-day lives"

Where did it start?

Humans and dogs have had a close relationship for many thousands of years

Trying to pinpoint when dogs started to become man's best friend has been a bone of contention for quite some time but, currently, scientists believe it could have been anything between 14,000 and 34,000 years ago. One suggestion is that nomadic hunter-gatherers began to domesticate the wolf cubs that they caught while another is that they got closer to human settlements and began to domesticate themselves over time, proving themselves to be valuable companions for mankind.

Dogs would have helped their owners to hunt, while offering protection and companionship, but there is evidence that the people grew to revere them. In 2015, researchers discovered burial sites in catacombs south of Cairo that were filled with 8 million mummified animals, most of them dogs, which suggests that they were being given a chance to go on to the afterlife.

In Ancient Rome, lapdogs were a symbol of status and fashion, proving popular among the privileged classes and their children (even helping attract fleas away from their owners). Much Roman mosaic art also depicted dogs, including one such example at Pompeii that was recently restored. And so it went on. William the Conqueror introduced the Talbot to England in 1066, and throughout the Middle Ages, kings, nobleman and church officials prized their purebred dogs.

Indeed, over the years, dogs have assumed many roles from aiding hunts to being used as a source of power (for example, turnspit dogs being used to turn meat on a spit). In Tudor times, dogs proved effective footwarmers, and in the Victorian era, they pulled carts before such a practice was banned. It shows how vital dogs have been to human life over the centuries and why there is such a special bond between us.

Why dogs?

Humans and dogs are great at living together, creating a very special and unique bond

As any owner will tell you, dogs make fantastic pets. There are as many as 80 million dogs in the USA, 8 million in the UK and a growing number in other countries all around the world. China in particular has seen a huge rise in canine companions with 62 million now registered as pets. Given the country once banned dogs from cities, that's a very impressive number.

But why are they so popular and why do humans connect with them on such a deep level? Going some way to answer that question was Allen McConnell, a researcher at Miami University in Ohio. In his study into this special relationship titled *Friends With Benefits*, he looked at the positive consequences of pet ownership and found that dogs increased people's feelings of self-esteem and belonging.

He is not alone in coming to such conclusions, though. In 2016, a research team at Manhattanville College in New York found dog owners scored high in feelings of well-being while in 2007, Deborah Wells from Queen's University, Belfast found dog owners tended to have lower blood pressure and cholesterol levels, most likely because they took their pet for regular walks.

What is perhaps more intriguing is a study by animal behaviourist Takefumi Kikusui from Azabu University in Japan. He said the levels of oxytocin, which is a hormone that allows us to form close relationship bonds, rose in both humans and dogs when they gazed into one another's eyes. Such human-canine bonding is said to arise because dogs are similar in nature to us.

Humans see dogs as part of the family. We lavish the same attention on them as we do children. Dogs fit in well because they, like us, as territorial, social, co-operative and operate in packs or family units. There is actually a train of thought that suggests that dogs domesticated us as much as we domesticated them. In that sense, there has been a long-lasting symbiosis at play that is unlikely to ever be broken.

Cats vs dogs

Although cats have been our "purr-y" friends for more than 9,000 years, they are still not as domesticated or as loving as dogs. Researchers at Washington University School of Medicine found domestic and wild cats were largely similar except for genome variations in memory, fear and reward-seeking, while neuroscientist Dr Paul Zak showed the 'love hormone' oxytocin increased by just 12 per cent among cats encountering their owner.

Do dogs understand us?

When we talk to our dogs, they really can decipher what we are trying to say to them

Ask a dog to fetch your slippers and its likely to potter off, grab them with its mouth, bring them over to you and set them down by your feet. Or at least it would if it was well trained. For just as we treat dogs as a family member, talk, play and issue commands, we find that they are very receptive to our voices and body language. They appear to want to please us, if only to gain their rewards, and they seem to make a special effort to understand what we're trying to communicate and encourage them to do.

But are they really understanding us? If the results of a study by scientists in Hungary are to be believed, then yes, it would appear that they are. The researchers scanned 13 dogs in an MRI scanner and monitored their brains while they spoke to them. Not only did they discover that the dogs were processing language in the same way as us – that is by using the left side of the brain to figure word meaning and the right to process intonation – they were able to combine the two to figure the overall meaning.

So when praise was given in a flat tone, the dogs would only process it in the left side of the brain. When the word was spoken in a tone that indicated true emotional praise, it sparked the right side too. But if the same praising tone was used with a word they didn't understand, it appeared to confuse them. The researchers concluded that the dogs could work out what was being said as well as how it was said.

Sense of smell
Dogs use their acute sense of smell to understand how we are feeling, picking up on our pheromones to detect is we're fearful perhaps. They can even sniff out cancer.

Reading our expressions
Dogs are able to tell our facial expressions apart, although it is not certain whether this is due to domestication or because of their past experiences.

Understanding our body language
Studies have shown that by picking up on social signals from our body language, dogs can better work out what we want them to do.

How dogs are assisting disadvantaged humans

Therapy and guide dogs are helping millions of people every year

Many people find dogs are able to combat loneliness and, by showing love and affection, they can make humans feel happy. It makes them the perfect animal for use in hospitals, hospices, nursing and retirement homes since they can offer a high level of affection, comfort and emotional support to those in need.

Therapy dogs are trained to help lift the spirits of patients and improve their social and cognitive functions. They are used within structured health care programmes to speed up healing post-surgery and they are great at calming autistic children.

The best therapy dogs are those that are calm and possess exceptional temperaments and great control. It's important that dogs don't overwhelm a patient with excessive affection or react badly if a human is poking or squeezing them. Dogs can also help to lower a person's blood pressure and reduce anxiety. But that's not all: some dogs are able to turn people's lives around.

This is certainly true of guide dogs for the blind and visually impaired. They act as a human's eyes and aid mobility as well as becoming a faithful companion. They are trained to have impeccable manners and avoid distractions. They are also taught intelligent disobedience: this allows them to ignore commands that would put their handler in danger.

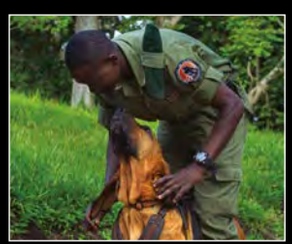
Serving dogs: Dogs who help society or serve the law

Some dogs prove their mettle in the call of duty

Search and rescue dogs
A dog's nose separates air for breathing from scent-containing air, processing the latter via 300 million receptors. Search and rescue dogs use an odour image in their brain to locate humans.

Sniffer dogs
Such a keen sense of smell is also great for detecting a host of substances, from illegal drugs to blood and even explosives. They can also be trained to find termites, bed bugs and mould.

Police dogs
German shepherds are typically used as police dogs, with evidence of canines used for law enforcements since the Middle Ages. They are trained to bite and hold criminals until the handler says otherwise.



Anti-poaching dogs
Anti-poaching dogs in Africa have begun taking to the skies, abseiling or parachuting into areas where poachers are thought to be highly active. They are vital to global conservation efforts.

© Thinkstock; NaturePL; Getty

BABY STEPS

From small bundles of fur to a contender for man's best friend, the first eight weeks of a puppy's development are crucial to the rest of their lives

We've all had that reaction at some point: seeing someone's new puppy and uncontrollably wanting to cuddle the stuffing out of these clumsy little fluff balls. With their floppy ears, constant curiosity, buckets of energy and cuteness to match, they are truly irresistible. Most of us think their journey towards doghood starts when we first bring them to their new homes after leaving the litter, but puppies have already had a lot of growing up to do in their first few weeks.

At around eight weeks old, a puppy will have gone through three crucial stages of cognitive, physical and emotional developments before finally being mature enough to leave their litter and venture into the world.

Their first 14 days consist of innate responses to warmth, food, sleep and attention. Devoid of all senses, mum is their guide in this unfamiliar new environment. This is called the Neonatal Period. After two weeks, they enter the Transitional Period. Their ears and eyes will be fully open and their cognitive development can begin. Social skills begin to advance, made more noticeable due to the noisy nature of this growth, with plenty of practice in growls and tail wagging.

The Socialisation Period allows us to witness the stereotypical puppy-like behaviours come into their own. From three to approximately 12 weeks old is the most influential time in a puppy's life as they become highly reactive to their surroundings and experiences. They will begin walking, barking, exploring, and getting into mischief, so expect lots of chewing as their baby teeth come through.

At eight weeks, and after being checked over, vaccinated and microchipped by a vet, these little balls of playfulness are ready to be adopted, and take on that precious job of becoming man's best friend.

Look who's barking!

The first few weeks of any newborn puppy's lives are critical, with many obstacles to overcome. How they start in life is crucial to how they continue to develop after leaving the litter

Pre-Natal stage

Just before giving birth, mum will start to nest and her behaviour will begin to change. Every dog is different, but symptoms can include restlessness, heavy panting, vomiting and constant cleaning of her anogenital region. When she is ready to give birth, she will finally settle in her nesting area, and there she will stay for the next few days even after the puppies are born, only leaving to eat or relieve herself. Labour can last anywhere from an hour to a full day. It varies from dog to dog and is dependent on all factors including their size, age and breed.

Neonatal stage: Birth – *7 days*

The first seven days of the pup's life see the most noticeable change in the pup's physical development. But this can also the most dangerous period for a new-born as they are susceptible to all manners of harmful scenarios, including illness, drops in temperature, rejection, and accidental suffocation. After birth, the pups are completely dependent on their mother for warmth, food and hygiene, as she licks their anogenital region to help them urinate and defecate. Their eyes and ears are closed and they rely on their weak sense of smell and taste alone.

STATS
Senses: Almost completely devoid.
Independence: They rely completely on their mother for food, warmth and stimulation. Mental capacity is limited.
Social skills: They are capable of making small whimpering sounds to signal to their mother for their needs. They rely on their littermates for warmth.

BIRTH

Week 1

Meet the parents! Poppy and Teddy are Cavachons: a popular cross breed of a Cavalier King Charles Spaniel with a Bichon Frise. Can you spot them among their puppies?

Neonatal Period: *7-14 days*

Over the next seven days they will begin to look more puppy-like as their eyes begin to open and their ears unfold. Some simple social coordination skills are developed at this time, many beginning to stand and toddle. They will start to assert some dominance over each other, especially where feeding is involved. Eating around once every two hours, puppies at this stage spend the majority of their time sleeping which is vital for their growth development.

STATS
Senses: Vision and hearing is poor. Improved sense of smell and taste.
Independence: Improved mobility as they learn to stand and toddle.
Social skills: Social hierarchies begin to emerge.

Week 2

The Transitional Period: *2-3 weeks*

At this stage, the pups will show noticeable social development as they start to exhibit more adult characteristics. They will begin to socialise with their littermates more by play fighting and reacting to changes in their environment with growls and wagging their tails. They will also start to show an interest in semi-solid foods and will be able to lap water from a dish, but will still continue to nurse from their mother. Puppies can relieve themselves without the aid of their mother from around two weeks old.

STATS
Senses: Improved vision and hearing. Puppies will react to changes in light and noises.
Independence: Puppies develop interest in semi-solid foods. Can relieve themselves independently.
Social skills: Will interact with their environment and siblings. Will learn to play-fight, growl and wag tails.

Week 3

The Socialisation Period: *3-4 weeks*

A puppy's confidence and personality is influenced heavily in this stage as they begin to exhibit emotional reactions such as shyness and fear. They will start to notice what is outside of the whelping box and will even start plotting their escapes. It's a good time to start expanding their area, creating a bit more space for their rapid growth in size and curiosity.

STATS
Senses: Vastly improved all-around senses. Emotions are developing as their cognitive advancement becomes evident.
Independence: They will show signs of wanting to leave the whelping area, trying to follow mum.
Social skills: Any emotional traumas/ rewards at this stage will affect their personality and confidence in later life.

Baby steps

ADOPTION

Week 7

Week 6

Week 5

Week 4

The Socialisation Period: *7-8 weeks*

After this stage, puppies will almost be ready to leave the litter. Their mother will have finished the majority of her caring duties with the puppies being fully independent. However, she will continue to teach them certain social skills. If the puppy leaves its mother or siblings before around eight weeks old, they may not develop adequate social skills. Positive encouragement is key, as any trauma that occurs at this stage can be carried with them through their adult lives.

Once they leave the litter, they will be ready to face the next phase of their lives; requiring lots of love, encouragement and the occasional chastising from their new surrogate family in order to form the unique bond between them and their human parent.

STATS
Senses: Can begin to detect emotional states of others. Will begin to respond to their name and can detect and remember different people, animals and environments.
Independence: Fully independent of their mother. Fully weaned and are able to take solid food and can be almost/fully house trained.
Social skills: They will adapt fully to their new home, environments, experiences and family members providing they are positively encouraged at all times.

The Socialisation Period: *6-7 weeks*

Pups will experience their first trip to the vets to be vaccinated around this time. They will have a full health check including worm and flea treatment. The vet will fully check them over to make sure they are in good physical and emotional health. They will now have all the appearances of a typical puppy and will greet their littermates with tail sniffing and nose touches. Breeds with pointed ears will see this change more noticeably at this time, with their ears beginning to lift and uncurl.

STATS
Senses: Will have a full set of milk teeth and all senses will be almost fully developed.
Independence: Everyday situations such as car journeys, socialising with other animals and separation practice is encouraged in small doses.
Social skills: Emotional development has advanced and the pup can now start to learn certain commands such as sit and stay.

The Socialisation Period: *5-6 weeks*

Their relationship with humans will continue to develop and some puppies will even start to respond to simple house-training commands and routines. Mum will chastise the more dominant pups at times, as bullying at this stage can affect the shyer pup's confidence later in life. They will be actively eating dry food and will be almost fully weaned from their mother.

STATS
Senses: They will have full developed sense of smell and taste; they will be almost weaned from their mother.
Independence: Although they have not yet had their first vaccinations, they can be taken outside, providing interactions that could lead to infection are minimalised.
Social skills: Some pups may exhibit signs of over-dominance. This behaviour needs to be monitored so the less dominant pups can develop their confidence.

The Socialisation Period: *4-5 weeks*

Puppies' individual personalities will emerge and their social hierarchies become more apparent amongst their siblings. They will begin to recognise different people and respond to sounds and voices. They will be almost weaned and will start to take puppy formula/soft foods regularly throughout the day. They will begin to groom themselves, and when they are not sleeping, they will get themselves into all sorts of mischief as their confidence and independence grows in abundance.

STATS
Senses: Further developed senses; can visually recognise people.
Independence: Interest in their environment and the situations around them will illicit full emotional responses from the pups.
Social skills: The more dominant pups' personalities establish the 'pecking order' for the other pups.

© Thinkstock; Alamy

WHO'S A GOOD BOY?

A puppy training masterclass

A new puppy is a bundle of fun, and when you bring them home for the very first time, their roly-poly mischievous nature is hard to resist. When the pups are this young they can seemingly do nothing wrong, but if you don't correct bad behaviours from the very beginning, it can lead to problems in the dog's (and in your) later life. That being said, there is always room for improvement and every dog can be trained, no matter the age. It's just slightly easier to do it from puppyhood.

Every puppy needs to master the basics – learn his name, how to sit, stay and come, house training, learning not to chew household items and adapting to everyday situations without getting scared or upset (such as the postman coming). For many household pets, once these have been mastered they are on the road to being excellent, well-behaved companions. However, if you want to train your puppy to do a more specialist job, you need to start early. Dogs are incredibly receptive and intelligent, and they really love to work and learn with us. The bond you form with your little pooch through regular training will really help your dog to work with you throughout its life, as trust is very important.

Depending on the breed, puppies are fully grown at around 18 months old. This is when they can start doing more physical training if you want to do it with them. There are so many fun things that you can do with your dog like agility training, flyball, dog games and tracking/scenting work. All of this enriches your dog's life and helps the pair of you bond even further, which can help with further training in the home too.

"Dogs are incredibly receptive and intelligent, and they love to work and learn with us"


Who's a good boy?

First things first

Before taking the plunge, here are some key things to consider when inviting a dog into your home

Getting a dog is incredibly exciting, but it's not a decision to be taken lightly. First of all you need to think about your lifestyle and what kind of breed is best. Do some research and call some breeders for advice if you're unsure – they will be happy to help.

When you've found the pup of your dreams, the next step is to visit the breeder. A good breeder will show you the pups in their home (or in their kennels, always ask to see the kennelling conditions if you're unsure) and let you meet the puppies' parents. Never buy a puppy from a 'neutral' environment such as a public car park or a pet shop – always make sure you see the pup with its mother and litter mates.

Before you bring the little guy or girl home, make sure you have all the equipment it will need, and that you've prepared your house as a safe environment. Ensure you have a cosy bed, plenty of chew toys (puppies *need* to chew – better a toy than your shoes) and think about putting a baby gate across a doorway or even buying a playpen to create a safe and enclosed area for the young pup to stay in as they adjusts to life in their new home.

Puppy checklist

Before the pup arrives, here are a few key tasks to get done

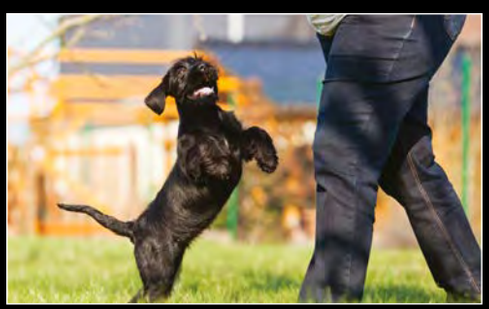
- ☐ Research pups and see breeder
- ☐ Plan where the pup will live
- ☐ Read up on training and physical needs
- ☐ Devise toilet training routine
- ☐ Buy equipment, eg bed, toys, food
- ☐ Plan the best time to get the pup, eg school holidays

Bad behaviour

They might seem cute now, but these behaviours spell trouble for the future

Biting
Puppy teeth are sharp! Discourage your dog form biting you by letting out a high-pitched yelp (like a dog would) when he bites you hard.

Chewing
Puppies need to chew, but try to guide your pup into chewing tasty dog chews (treats or toys) instead of the furniture. Keep plenty around and praise him for chewing them.



Jumping up
Discourage this by not rewarding it with attention. If your puppy jumps at you, ignore them until they are calm and then give them plenty of fuss and treats.

Basic skills

Here are three key things that every puppy needs to learn

Their name

Start by saying the puppy's name, and when they look at you, mark the behaviour with a word ("yes" or "good"), and give treats and fuss. Repeat in various situations and keep rewarding. Hearing their name ought to turn your pup's attention to you. Don't use it when telling off as they may associate name calling with punishment. Use another word for bad behaviour, like "no".

Toilet training

Every pup has accidents, but it's important for them to learn to do their business outside. Form a regular routine and take your pup out to a designated 'toilet spot' outside every hour and immediately after they wake up from a nap. Repeat a command (such as "toilet") and then once the pup does their thing, reward. Following their natural urges should not be associated with punishment and shame.

Socialisation

This is absolutely essential for your puppy. They need to be exposed to as many different people, animals, places, sounds, smells and situations as possible when young so that they aren't scared or nervous when they're older, as nervous dogs can sometimes turn to aggression as a defence mechanism. Make an effort to take them with you and experience as much of the world as possible.

ABOVE Treats are the ultimate bargaining chip for good behaviour

BELOW While being stern is very important to raising a well-behaved pup, positive reinforcement is key

Am I ready for a puppy?

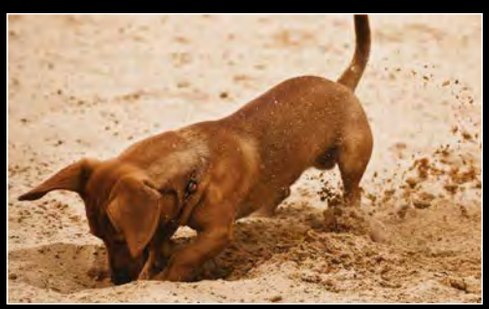
It's important to be honest with yourself whether you have the time and budget to give proper care and attention to a puppy and whether you're up to the challenge. Do your research about what to consider, and spend time looking at the option of adopting a rescue dog as this could possibly be a better fit for you and your family.

Training methods

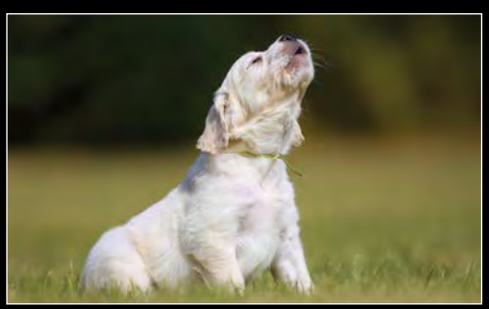
Dog training should always be positive and reward-based with treats and praise – never use fear or intimidation to get a dog to work for you, as it creates a fearful dog. You can use clickers, which are small hand-held devices that make a 'click' when pressed. It's a distinctive sound that lets the dog know that they've done something right.

As soon as your dog completes a task, use a word (like "yes" or "good") or use a click then follow it up with a tasty treat (the tastier the better) and plenty of praise. You can also use 'bonus rewards' where every now and then you give the dog something really tasty and make a huge fuss of them – it's a great way to make the dog keen to work.

> "Never use fear or intimidation to get a dog to work for you"



Digging
Pups may do this to drain energy when they're bored, so more exercise could be in order. You can also try re-directing the dog by engaging them in a different game.



Barking
First try to understand why the dog is barking then remove the stimulus. Try making a specific noise (eg say 'ah' sharply) to distract the pup then reward them when they quieten down.

Separation anxiety
Train your pup to be okay while you're away by rewarding them for quietening on their own at home, and giving them things to keep them occupied (like a treat-filled Kong) while you're out.

Agility training

When your puppy is old enough, taking them to agility training (or any other social dog group) can be a great way to give your dog extra exercise, interaction and fun. It's an obstacle course for dogs, made up of jumps, tunnels and platforms that you and the dog have to navigate together – the dog takes their direction from your body language. This strengthens your bond because you have to work together as a team. A stronger bond will mean that your pooch will listen to your commands better in all other areas of your training.

Dogs have a natural desire to hunt and chase, and an agility course challenges their mind and body in the same way that charging through the undergrowth after a rabbit might in the wild. Agility training is open to absolutely any dog, regardless of their size, breed or age, as long as they are in good health. It doesn't matter whether you just want to have a go for fun, or if you have Crufts within your sights – the agility course is open to all. If you're interested in having a go, check out the contact information below!

WWW.AGILITYNET.CO.UK
Agilitynet - This website collates tips, news, competitions and helpful kit and supplies

WWW.THEKENNELCLUB.ORG.UK
The Kennel Club - Here you will find advice on all the different aspects of owning and training a dog

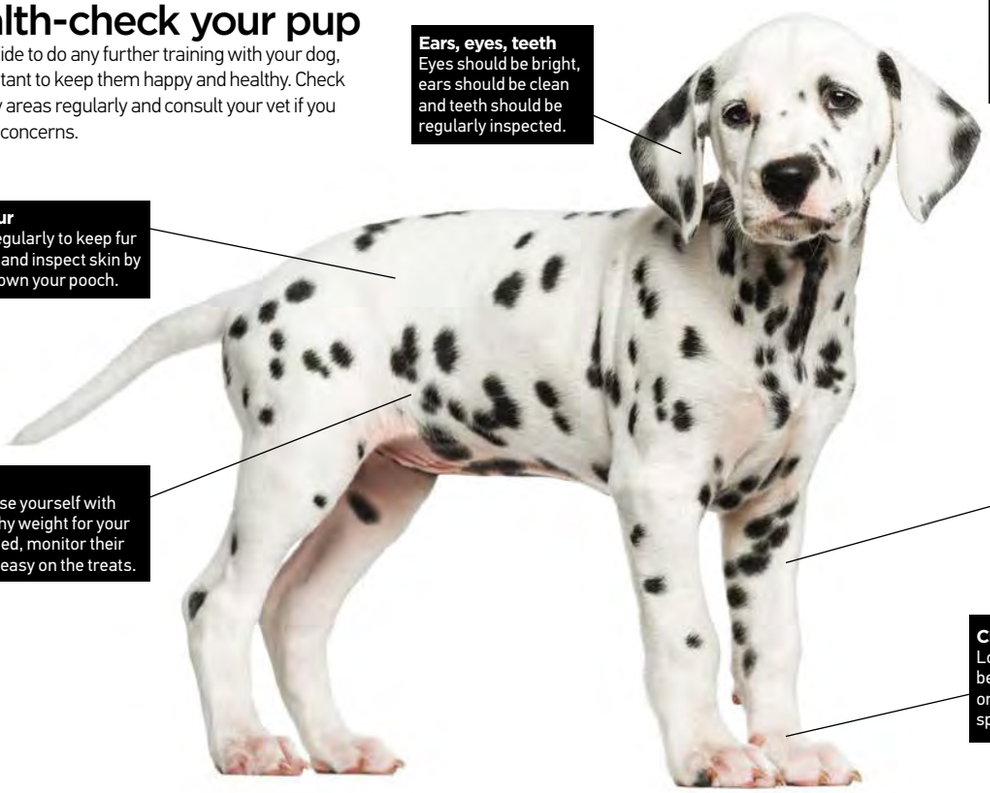
WWW.AGILITYCLUB.ORG
The Agility Club - The largest Kennel Club registered agility club will guide you to a well-trained pup

Other training to try

If your dog is up for something different, there are all kinds of fun things you can do together. Flyball is an amazing high-speed competitive sport where dogs compete in teams, but you can join a club to have a go for fun. Canicross is cross-country running with your dogs and there are events all across the country. Or you could test your dog's senses with gundog training, or even make them into a hero with search and rescue training. Dogs are incredible animals to have fun with, so get out there.

Health-check your pup

If you decide to do any further training with your dog, it's important to keep them happy and healthy. Check these key areas regularly and consult your vet if you have any concerns.



Ears, eyes, teeth
Eyes should be bright, ears should be clean and teeth should be regularly inspected.

Skin & fur
Groom regularly to keep fur in check, and inspect skin by patting down your pooch.

Weight
Familiarise yourself with the healthy weight for your dog's breed, monitor their food and easy on the treats.

Movement
Keep an eye on your dog's movement for any signs of lameness or stiffness.

Claws & Paws
Look out for matted fur between toes, sores on pads and broken or split claws.

"Check these key areas regularly and consult your vet if you have any concerns"

Dog School

We caught up with Sharon Arnold, the owner of Frome K9 Training Centre, a 'dog club with a difference' in Wiltshire, and Cheryl Blake, one of the dedicated trainers.

What kind of classes can owners do with their new puppy?
With a brand-new pup you can do the Kennel Club puppy foundation course, as well as foundation agility, scent work and even search work.

What kind of things owners and dogs progress to after they have finished an initial puppy course?
There's so much! You can do the Kennel Club Good Citizens course, try agility training, working trials (which is civilian police dog work), you could give flyball a go (this is a fast and furious relay race over hurdles to collect a ball from a spring-loaded box). If that doesn't sound like your thing there's always competitive obedience (following commands with high energy and precision), tracking (following a set trail), field trials (working gundogs), water rescue, lure coursing and weight pulling.

What kind of dog and person are they suited to?
Absolutely anyone can take part, and with a dog that wants to get involved in doing that bit more – there are no set breeds (of dog or person!) everyone is welcome.

What are the benefits of doing these things with your dog?
It's a hobby, also a social life and the benefit is having a well-trained dog that is a pleasure to take out. Also, if you do Kennel Club awards, some hotels will offer discount. It's good for your health being out and active and most all of good training builds an incredible bond with your dog and gives you unconditional love.

If people would like to know more, how can they find out extra info or advice on training their dog?
You can definitely ask your vet for advice, or try internet searches – the Kennel Club register clubs that have registered trainers. Word of mouth is always good too – there's nothing better than personal recommendation so ask around for a great club.

ABOVE
With the right training, dogs are capable of incredible feats

© Alamy; Thinkstock; Dreamstime

SUPERDOGS

The humble pet dog has so much more to offer than just a walk and a belly rub; enter the world of the canine superhero and learn if your dog could have what it takes

SUPERPOWER DOGS

We talk to the producers of an epic new 3D film called SUPERPOWER DOGS now in production about the incredible powers of our furry friends, from jumping out of helicopters to avalanche rescues

It's no secret that we absolutely love dogs. And why shouldn't we? They are faithful companions and loving pets – but when you are lucky enough to meet a superdog, these beasts are also ultimate lifesavers.

The oldest fossil of a pet dog was found in the 1970s and is dated at 33,000 years old. It's likely to be a domesticated wolf – one of the ancestors of our own furry friends, and stands as a testament to the evolutionary journey that humans and dogs have made together. "Tame wolves approached camp and realised that there was food to be had," explains Dominic Cunningham-Reid, dedicated dog whisperer and one of the producers of *Superpower Dogs*, a new 3D giant screen film in production. "A mutually beneficial relationship [developed] in terms of guarding and alerting to danger. We have the oldest inter-species relationship in history." Another of the film's four producers, George Duffield, agrees. "Dogs are the most extraordinary creatures in the world. Without them we wouldn't be the humans we are," he exclaims. "The superdogs are the working dogs – search and rescue dogs, service dogs, avalanche dogs, tracking dogs, fire dogs, they are the best of the best. We are making a movie about the Olympic heroes of the dog world."

It's incredible what humans are capable of teaching dogs, and just how well these canines respond. Dominic explains, "Urban search and rescue is particularly amazing because they train just the nose so that the dog can seek out live human smell only. If you imagine in an earthquake, the amount of odours that are out there, from open sewers to animals. The only odours that they're looking for is a breathing human being." George adds, "it's important to understand that the brain of the dog is different from ours, and the olfactory system of the dog is 13 per cent of the brain whereas it's less than one per cent for us." But super-sniffing isn't the only amazing power of our four-legged friends. They also have keen eyesight and acute hearing, not to mention a complex sensitivity and understanding of humans.

All of our dogs have these incredible powers hidden under their fur, but what makes a good working dog? "Any dog that's ball-obsessed is a good start" Dominic tells us; "they need to have drive and a lot of energy. We are learning more about dogs all the time. Dogs want to cooperate, they love the rewards, they love the work, and we've learnt to communicate."

So how does the film aim to convey the super senses of dogs? "We are going to build a special camera that shoots 250 degrees (which is the amount that dogs see)," George explains, "and change the picture in a way to show you what a dog sees. We will visualise scent and we will do this on a screen 100 foot [30 metres] high and in 3D. We have a huge amount of respect for dogs," he concludes, "and that's part of our mission – to improve the status of dogs worldwide."

"We are going to build a special camera that shoots 250 degrees and change the picture to show you what a dog sees"

Understanding your dog's behaviour

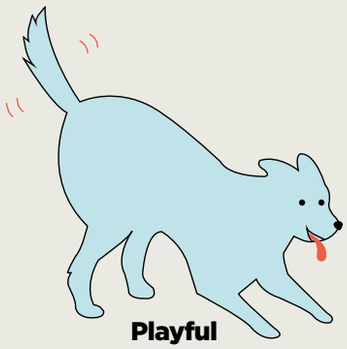
Your dog can tell you plenty about its mood with just a few simple actions

Relaxed

The tail is down and loose, and his weight is flat on all four feet. Your dog's head is high, mouth is slightly open and his tongue might hang out – all the signs of a happy dog!

Alert

When he's alert and focused, your dog will lean forward with his head held high. His mouth will be closed, his eyes spread wide and ears pricked up in concentration.



Playful

Your dog may hold this position before breaking into a bouncy run – bowing with his front legs flat on the floor. His tail will wag and his pupils will be dilated, mouth open and tongue out.

Superpower Dogs is an epic family adventure film about extraordinary real-life canines. Filmed in 3D and presented in association with the California Science Center, it will hit giant screen and IMAX theatres worldwide in Spring 2018. It will showcase amazing search and rescue dogs as they brave earthquakes and avalanches, bring animal poachers to justice, protect us from danger and lift our spirits.

344

The number of dog breeds recognised by the Fédération Cynologique Internationale (World Canine Organisation). All of these breeds are the same species, Canis familiaris

100M

Dogs can differentiate smells in concentrations 100 million times lower than humans

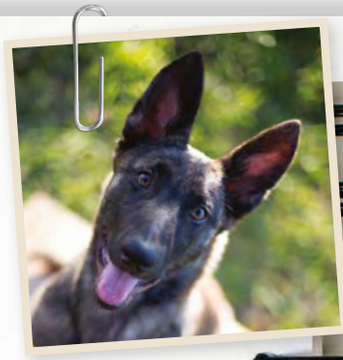
18+

The number of muscles that move a dog's ear, which is what makes them so expressive

68km/h

The top speed of a greyhound, the fastest breed of dog

Doggy diaries



We spoke to producers George Duffield and Dominic Cunningham-Reid about their upcoming 3D film *Superpower Dogs*. The movie will follow the progress of a search and rescue hero puppy in training, and as filming begins, you can follow the progress of their star Halo on their Facebook page.

Can you tell us about the* Superpower Dogs *puppy and its role in the film?

Dominic: Our key narrative is the story of a puppy going through urban search and rescue school where she will learn her superpower – to learn her nose. We will be filming her over about two years and hope she graduates!

George: We started filming recently, which is an exciting time. We found a puppy called Halo in Florida, belonging to a handler called Cat who works for the Miami-Dade Fire Rescue service.

What is Halo's background and what breed of dog is she?

George: Halo is a four-month-old Dutch shepherd, quite unusual actually. She's a very exciting dog and so far (although she's so young and it's so early in the process) she's showing great promise.

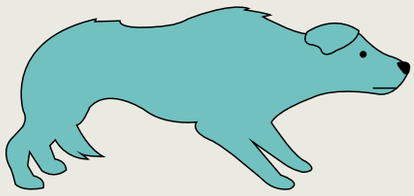
Dominic: All the shepherd types are well suited to urban search and rescue. Dutch shepherds are different from German or Belgian shepherds – they have that sort of hyena look! They're lovely dogs, and almost became extinct in WWII but were brought back from the brink.

What kind of training will she be going through?

George: It's a two-year rigorous training programme, administered by various different certification bodies in the US. The final exam is run by FEMA (Federal Emergency Management Authority). If this works, we will follow Halo as she is trained all the way up to being a fully-fledged search and rescue dog.

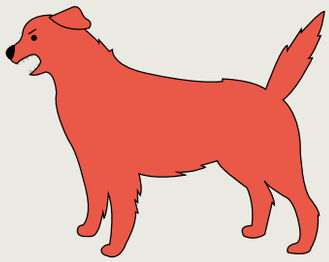
To read the full interviews with the film producers and to find out more about Halo's training visit www.animalanswers.co.uk.

www.facebook.com/superpowerdogs



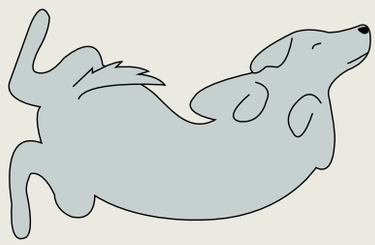
Fearful

When your dog is worried or scared, his ears will be back and flat to his head. The fur on his back may stand up, his hackles will raise and his tail will be tucked between his legs.



Aggressive

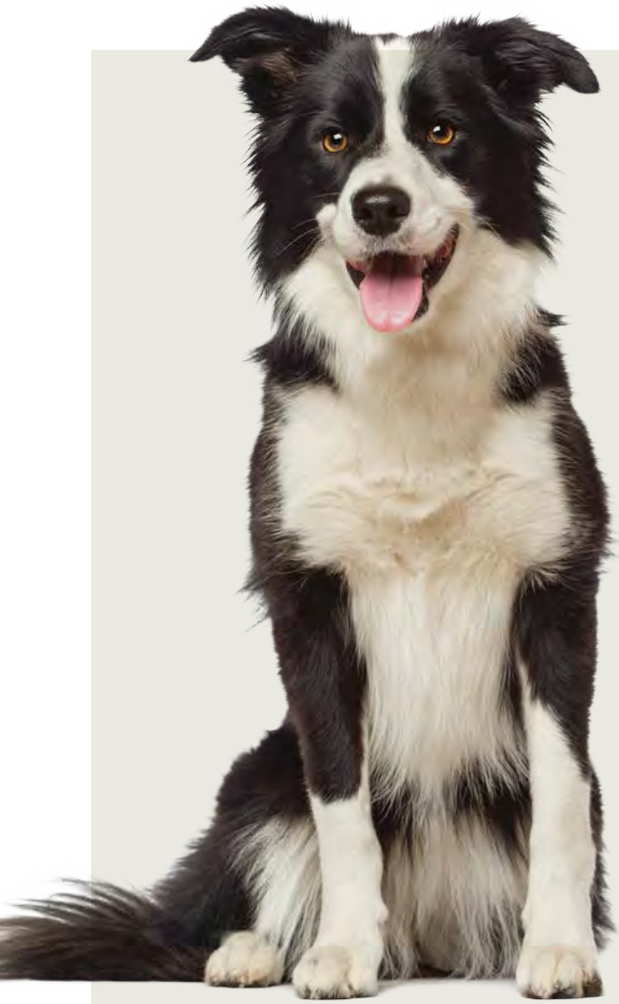
When your dog shows aggression or dominance, he will have a stiff-legged stance and a rigid tail. He may wrinkle his nose or curl his lips, and show his teeth and gums.



Submissive

To show submission, your dog will lie on his back and show you his belly and neck. His eyes will be closed and his mouth relaxed, and he will avoid eye contact.

HERO HOUNDS TO THE RESCUE



HERDING DOGS

Dogs have been bred to work for humans for thousands of years, and specific breeds such as border collies, Australian shepherds and even corgis are super agile and very clever. Helping farmers and livestock owners to round up their animals, herding dogs are capable of taking small instructions in the form of words or whistles and interpreting them to round up the flock. Without the dogs to help, this would be a difficult job.

THERAPY DOGS

Therapy dogs visit hospitals, care homes or individuals to provide a source of soothing animal interaction. Studies have shown that petting a dog lowers heart rate and blood pressure, reduces levels of the stress hormone cortisol and promotes the release of the feel-good hormones serotonin and oxytocin. Dominic describes a therapy dog called Ricochet: "She teaches disabled kids and war veterans to surf. People who are a bit broken and lack confidence, when they lay underneath her on the surfboard they completely bloom."

SLED DOGS

The thick double-layered coats, tough feet and hard-working attitudes of breeds such as Siberian and Alaskan huskies and Alaskan malamutes make them perfect sled dogs. These dogs can work as a pack under the direction of their 'musher' who shouts directions and instructions at the leading dogs. These then set the pace for the rest of the team and guide the sled. Modern-day sled racing is a popular sport, but these dogs have long been a necessity to allow humans living in remote, snowy locations to get around.

AVALANCHE RESCUE DOGS

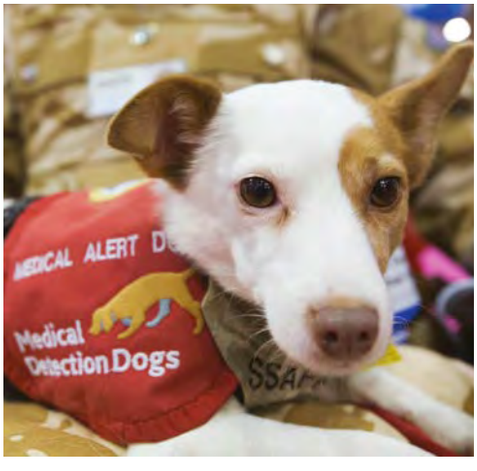
"Avalanche rescue dogs are all different breeds," George tells us. "In Canada they do 'long lining' where they take the helicopter off the ground with the dogs and handlers dangling beneath on a wire, fly them straight to the avalanche and drop them onto the field." Avalanche dogs search for build-ups of human scent, as trapped people are likely to be panicking and sweating. They then follow the smell until it intensifies, before starting to dig. Dogs can search one hectare (2.5 acres) in 30 minutes, whereas it would take 20 humans four hours. 90 per cent of avalanche victims survive if recovered in the first 15 minutes, so it's easy to see why these rescue dogs are so important.

WATER RESCUE DOGS

All dogs love to swim, but none come more prepared for water rescue than the Newfoundland. "They're members of the Italian coast guard" Dominic tells us, "and are super swimmers – they're considered the diesel engines of the seas. These dogs have webbed feet, thick coats, are very good in cold water but utterly cute and quite fearless. They can tow 40 times their body weight and they can swim a good four kilometres [2.5 miles]." Using dogs for rescues at sea saves crucial time – with the assistance of the dog, a handler can resuscitate a victim while still in the water.

GUIDE DOGS

Guide dogs can be trained to help with everything from a trip to the shops to doing the laundry for people with impaired sight. Training begins from a very young age, and the dogs are taught to ignore distractions, avoid obstacles, judge height and width and deal with traffic. Pups are then paired with their new owners on the basis of the owner's size and lifestyle – the dog must be a perfect fit to be able to help to its full potential. Once the guide dog has its master, their working partnership



MEDICAL ALERT DOGS

Medical alert dogs provide everyday help to people with serious health conditions and can be trained to deal with a huge array of scenarios. A diabetes alert dog can sniff out minute changes in their owner's blood sugar levels and raise an alert. Similarly, allergy alert dogs can tell their owner of any products that contain a specific allergen. There are even dogs that can pick up certain cancers.

"Dogs can hone in on a scent even when there are thousands of tastier smells around them, and follow it to its source"

SEARCH AND RESCUE DOGS

Search and rescue dogs are used by emergency services across the world to find missing, lost and injured people. The dogs find their quarry by air scenting, trailing and tracking. In ideal conditions, dogs can pick up a human scent from 500 metres (0.3 miles) away. George explains, "One [handler] was telling us about being in Haiti – making decisions based upon what the dog is telling you. You've got this rubble pile and the dog is telling you there's someone alive under there. You don't want to devote your team to digging if a dog is wrong. The ability for a dog to detect between life and death is incredible."

© Alamy; Ardea; Corbis; Dreamstime; Thinkstock

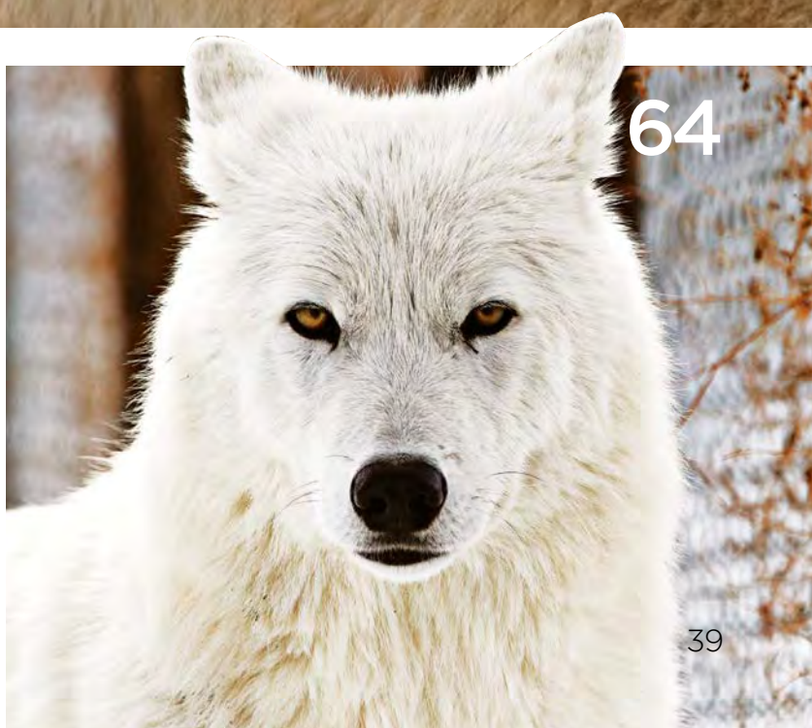
DETECTION DOGS

You may have seen drug detection dogs at airports, but they are also used to track humans – even hunting down poachers in Kenya – as well as explosives, firearms and diseases. Using their advanced olfactory organs, dogs can hone in on a scent even when there are thousands of tastier smells around them, and follow it to its source. "Bloodhounds are *the* nose of the dog world," Dominic tells us. "They have an extraordinary ability to track scent. Their entire physiology is built for that – their long ears waft the scent off the ground into their noses. They can follow somebody 120 miles [190 kilometres], which is remarkable."

Wolves

They are as feared as they are admired, but wolves are even more complex than myths, legends and folklore suggest. Discover the various subspecies and their incredible lives

"Wolf packs function more like human family groups; two parents in charge of their children"



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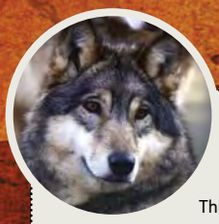


Eastern timber wolf

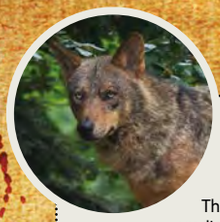
Canis lupus lycaon, United States and Canada

This wolf was the first subspecies of grey wolf to be recognised in the United States. Living in forested regions of northeastern states such as New York and Maine as well as regions of Canada, this wolf hunts mostly moose, white-tail deer and smaller animals like beavers. These wolves are slightly smaller than their grey-wolf relatives.

Arctic wolf

Canis lupis arctos, Arctic North America & Greenland

Living in the frozen north,arctic wolves have shorter snouts and ears than other wolf subspecies to conserve heat. Their fur and colouring is adapted for their wintery home in northern Canada and Greenland, with a thick and snowy white pelt perfect for staying warm and staying hidden when hunting. These wolves mostly hunt muskox, arctic hares and caribou.



Iberian wolf

Canis lupus signatus, Portugal & Spain

The Iberian wolf was almost eradicated in Spain during Franco's rule, when the killing of these wolves was encouraged, but not populations are on the rise. These wolves have a distinctive grey, brown and fawn colouring, with strong black stripes on their front legs which has influenced their Latin name 'signatus' which refers to the word 'marked'.

Mexican wolf

Canis lupus baileyi, USA & Mexico

Known as 'El lobo', this endangered subspecies once roamed the borderlands between USA and Mexico, but were hunted to almost extinction in the 1970s. After a careful captive breeding program, individuals have been released into the wild in Arizona, USA. Mexican wolves are small, around half the size of the North American grey wolf, with long legs and a sleek body.

Red wolf

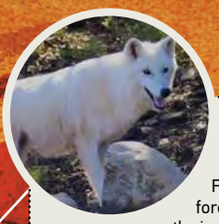
Canis rufus, southern USA

This reddish-coloured wolf, now found only in North Carolina, was once thought to be one of the only distinct species from the grey wolf on North America (not a subspecies like the other wolves listed here). But recent extensive DNA testing has now proven that the red wolves are likely to be genetic hybrids of the grey wolf, possibly as a result of breeding with coyotes.

Arabian wolf

Canis lupus arabs, Middle East

A very small wolf, this subspecies lives in some of the most inhospitable environments on Earth – the mountainous arid and semi-arid desert fringes of the Middle East. Once found roaming across the Arabian Peninsula, the Arabian wolf now only exists in small numbers in Southern Israel, Oman, Yemen, Jordan and Saudi Arabia. These wolves dig deep burrows in the sand to escape the heat.



Tundra wolf
Canis lupus albus, Europe, Russia

Found across in various populations across forested tundra zones, this wolf makes it home on the icy, frozen regions of Eurasia ranging from Finland to Russia's most eastern point. Tundra wolves are a large subspecies, equalling their grey wolf cousins in size and they have long, thick coats of dense fur for which they have been hunted.

Eurasian wolf
Canis lupus lupus, Europe

This subspecies is one of the largest of the grey wolf and has the largest home range, roaming forests and grasslands of France, Germany, Sweden and Norway, with the largest populations being found in Poland and Romania and across eastern Europe. The Eurasian wolf's fur is often coarser than that of their American cousins and they have longer, broader skulls.

Himalayan wolf
Canis lupus chanco, India, China, Mongolia, Tibet, Nepal

Found roaming the foothills of the Himalayas, this wolf has comparatively short legs and an elongated snout as well as white colouring around its chest, throat and stomach – something that isn't seen in other wolf subspecies. The Himalayan wolf also has very thick, almost woolly looking fur, which has led to it being named the 'woolly wolf'.

WOLVES OF THE World

As the dog's closest relative, subspecies of these amazing creatures can be found across the globe. Assemble the pack and let us introduce you...

What makes a wolf?

With so many different subspecies, wolves are a very diverse group

Wolves belong to the genus 'Canis', along with domestic dogs and other dog-like species like coyotes and jackals. There are only two true wolf species: the grey wolf and the Ethiopian wolf.

It was previously thought that the red wolf was also a separate species but scientific genetic analysis has revealed that red wolves are in fact a genetic hybrid of grey wolves and coyotes. The Ethiopian wolf is also under some debate as to whether it should be a member of the jackal family, rather than classified as a wolf. You can find out more on page 88.

As the ancestors of our faithful domestic pooches, wolves are undoubtedly dog-like in their appearance. It's thought that the modern grey wolves evolved in Asia within the last 1 million years. All of the many grey wolf subspecies are quite similar in terms of their appearance and behaviour – you certainly couldn't mistake them for anything but a 'wolf' – but on closer inspection their differences are also numerous, often featuring specific, key adaptations to their environment. As more and more genetic research is carried out on different subspecies populations, more light is shed on their taxonomic relationships to other subspecies and the way that they live and interact with their own specific environment.

GREY WOLF
Canis lupus
Class Mammal

Territory Northern hemisphere
Diet Carnivore
Lifespan 6-8 years
Adult weight 30-80kg (66-176lbs)
Conservation status

EX EW CR EN VU NT LC

LEAST CONCERN

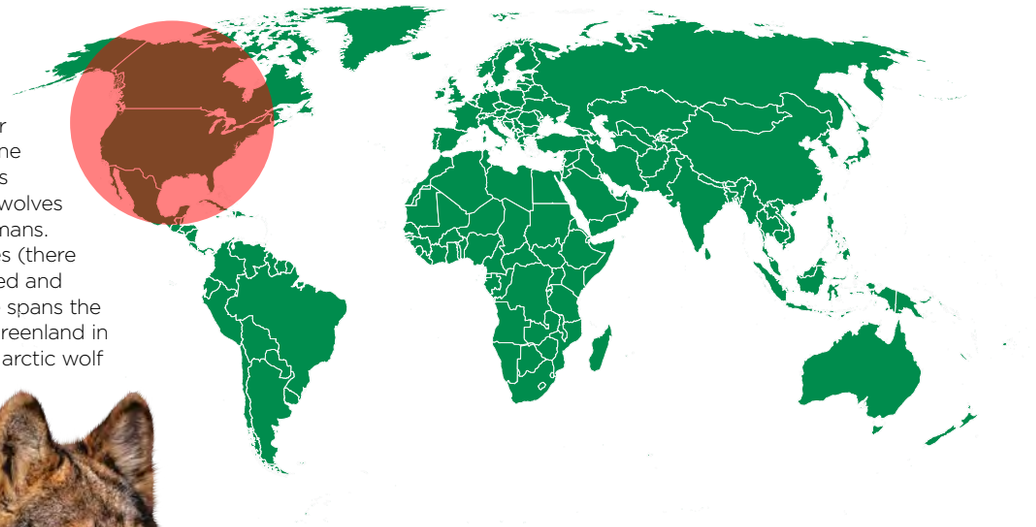
Where is wolf territory?

With so many different subspecies, wolves are a very diverse group

Wolves have evolved to live in a wide range of habitats, and a thriving wolf pack needs space. Wide-open ranges as well as plenty of prey and places for the wolves to make dens and take shelter are all part of a perfect habitat. This is such a versatile species that as long as these basic needs are met, a wolf can adapt to many different environments. Many wolves live in forests and mountainous woodlands. However, subspecies like the Arabian and Mexican wolves are adapted to living in bush or scrubland in soaring temperatures. Conversely, Arctic and tundra wolves live on frozen ground and hunt in snowdrifts.

Each pack keeps a home range that they patrol daily and mark with urine and scent from glands in their tails. The wolves are a key part of their environment: they monitor the populations of prey animals which in turn ensures that the habitat is not overpopulated and resources aren't overused for other species.

The Americas



Wolves were once widely distributed in America, but by the 1930s hunting had hugely depleted their numbers, and by the 1970s wolves inhabited just one per cent of their former range. Conservation efforts have taken place since, and the biggest threats to wolves remain to be habitat loss and competition with humans.

Alongside the grey wolf there are five subspecies (there is some debate, however, populations can interbreed and it's difficult to differentiate species) and their range spans the entire continent from Alaska, across Canada and Greenland in the North to the relative warmth of the South. The arctic wolf has few natural predators and is the only wolf subspecies that is not endangered. In contrast, the rare Mexican wolf, which lives in Arizona and New Mexico, USA, is fighting for survival.

MEXICAN WOLF
Canis lupus baileyi
Class Mammal

Territory Southern US states
Diet Carnivore
Lifespan 10 years
Adult weight 30kg (70lbs)
Conservation status

EX EW CR EN VU NT LC

ENDANGERED

The Mexican wolf

Known as 'El lobo', this wolf subspecies was once one of the most numerous throughout the southern US states and Mexico. After being hunted, trapped and poisoned for decades, in 1973 the last remaining individuals (reportedly there were five left in the wild) were captured in the USA. There hasn't been one sighted south of the border since 1980. A breeding programme was designed to bring the lobos back from the brink, and in 1998 11 wolves were released back into the wild in Arizona.

Fast-forward almost 20 years and the lobo population is slowly recovering. There are around 300 of these wolves in captivity, and around 80 in the wild. Mexican wolves have now been given 'endangered species' protection and its hoped that the population will continue to grow.

As America's smallest wolf subspecies, lobo wolves are about the size of a German shepherd dog – that's roughly half the size of grey wolves! They have greyish brown fur, often with flecks of cream, and form much smaller packs than they grey wolf cousins – often with just one breeding 'alpha' pair, a few yearlings and the most recent pups. They hunt together and eat elk, deer and smaller animals like rodents. ¡Delicioso!l.

Great plains wolf

This wolf is the most common subspecies in North America. Most of the members of this subspecies live in mainland Canada and northern territories of the USA, but there is one distinct population of this species that is most intriguing: the coastal wolves of British Columbia's temperate rainforest shores.

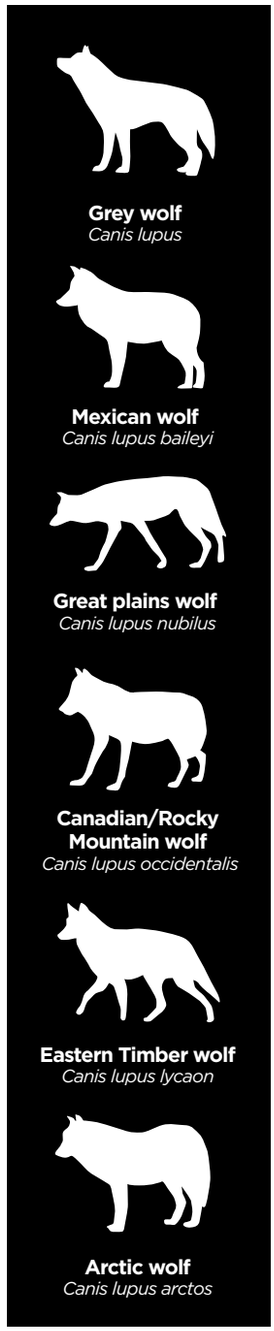
These wol ves live on the shoreline. Instead of the moose and deer that mainland wolves hunt, the 'sea' wolves get 75 per cent of their diet from the ocean: seals, salmon, even the odd squid. Capable of swimming between the islands of British Columbia, the sea wolves have a reddish coat and are a little smaller that the mainland great plains wolf. The live in the thick forests on the water's edge, digging deep dens within the tree roots. Genetic analysis has also proven that this unique community of wolves may even be a distinct subspecies of its own.

GREAT PLAINS WOLF
Canis lupus nubilus
Class Mammal

Territory North America
Diet Carnivore
Lifespan 20-25 years
Adult weight 23-80kg/60-110bs
Conservation status

EX EW CR EN VU NT LC

ENDANGERED

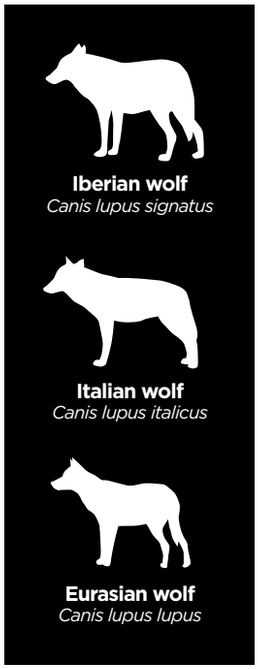


Europe

The story of wolves in Europe has run much the same as their plight across the pond. Once thriving in their habitat, human fear of attacks, livestock loss and a general stigma of wolves as the enemy ravaged the population. However, conservation efforts over the last century have ensured that wolf subspecies in Europe are on the rise, particularly those of the most numerous subspecies, the Eurasian wolf.

In Spain and Portugal, the small and nimble Iberian wolf neared extinction in the 1970s but now, 40 years on, these wolves are widespread across the north-western Iberian Peninsula.

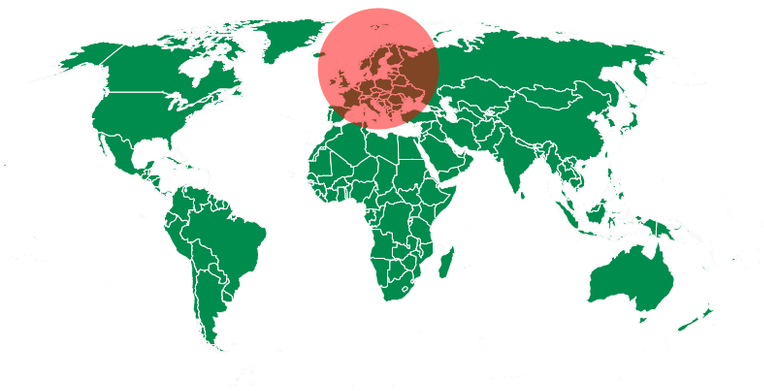
The Italian wolf, which was first named as a subspecies in 1921, roams regions of the Italian Alps and the Apennines, down the length of Italy. This wolf was also severely depleted, but thankfully modern numbers are stable.



Iberian wolf
Canis lupus signatus

Italian wolf
Canis lupus italicus

Eurasian wolf
Canis lupus lupus



The Eurasian wolf

The most widespread subspecies of wolf is the Eurasian variety, referred to as the 'common wolf'. These wolves are generally larger and stockier than their other European cousins with broader skulls and thicker, coarser hair than their American counterparts. Their colouring is greys with hues of tan, brown, black and white and they're found in Northern and Eastern Europe and throughout Asia and Russia.

The last wolf in the UK was shot centuries ago, but there are some propositions for re-introducing the Eurasian wolf to areas in Scotland to maintain deer populations.

These social animals feed on mammals such as wild boar and deer. As top predators the wolves need a very large area to live in and as humans encroach on wolf territory, issues arise. The main threats to Eurasian wolves are human interference and habitat loss. If human involvement causes prey to diminish, the wolves may seek out domestic livestock, which can lead to them being persecuted.

EURASIAN WOLF
Canis lupus lupus
Class Mammal

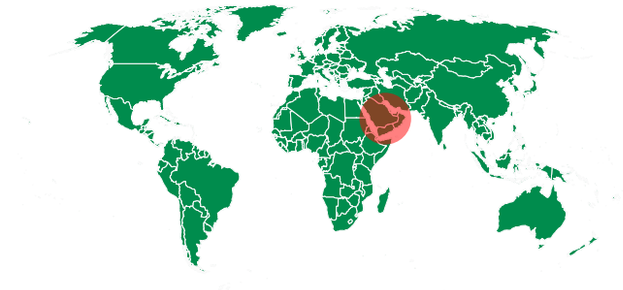
Territory Europe, Asia, Russia
Diet Carnivore
Lifespan 7-10 years
Adult weight 58kg/130lbs
Conservation status

EX EW CR EN VU NT LC

LEAST CONCERN

Wolves of the Middle East

It's a long way from the misty mountainous forests that many people associate with wolf habitat, but the deserts of the Middle East are home to a few hardy wolf subspecies



Arabian wolf

Canis lupus arabs

This is one of the smallest wolves, but the largest canids in the Middle East. Perfectly adapted to survive desert heat these endangered wolves are usually solitary – this conserves energy without having to hunting to feed and entire pack.

Indian wolf

Canis lupus pallipes

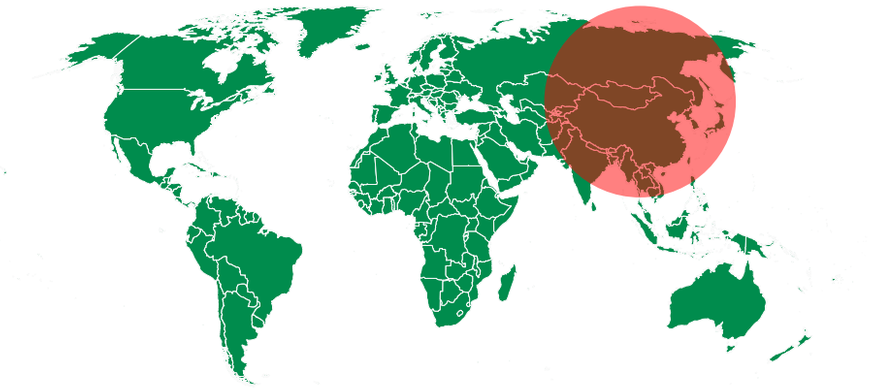
Ranging from Israel to the Indian subcontinent, this small wolf is often mistaken for a fox. Like the Arabian wolf its fur coat is short and thin in summer, but retains a ridge of long fur down the spine to protect from the suns rays.

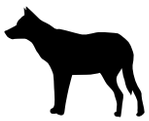
Russia and Asia

There are four main subspecies that roam the colossal landmass of Russia and Asia. Eurasian wolves, the most common of the wolf subspecies can be found throughout the continent, interspersed by populations of the more rare subspecies. These groups of animals are able to interbreed, and so sometimes identification can be tricky!

As is the case with wolves across the world, these creatures have been heavily hunted in the past due to clashes with human habitual areas.

This is very often due to hungry wolf packs tracking down livestock. The Soviet government ordered for wolves to be hunted and slaughtered in the earlier part of the 20th century, but the wolf population was able to recover slightly when humans took their conflicts away from the culling of wolves.





Eurasian wolf
Canis lupus lupus

Tundra wolf
Canis lupus albus

Tibetan/ Mongolian wolf
Canis lupus chanco

Steppe wolf
Canis lupus campestris

Steppe wolf

These wolves roam the vast swathes of grassland known as steppes in areas such as Kazakhstan, Turkmenistan and Russia. These wolves are also known as 'Caspian Sea' wolves because they are found in regions bordering this body of water. Their diet is mostly the hooved-mammal type prey of other wolf subspecies, but due the geography of their home range, the steppe wolf also hunts Caspian seals – a species that the wolves are known to surplus-kill.

Smaller than the Eurasian wolf, these steppe subspecies have coarser and shorter fur. Unlike their other Siberian cousins these wolves are usually a sandy or greyish colouring to match their habitat.

Regarded as a nuisance and a pest by locals, they has been hunted for many years and is now endangered.

STEPPE WOLF
Canis lupus campestris
Class Mammal

Territory Central Asia, Russia
Diet Carnivore
Lifespan 20-25 years
Adult weight 40kg/88lbs
Conservation status

EX EW CR EN VU NT LC

ENDANGERED

Tibetan wolf

Also known as the 'woolly wolf' for its thick and almost woolly-looking coat of fur, the Tibetan (aka Mongolian) wolf is an elusive canine. This wolf is known to live in mountainous Turkestan, throughout Tibet and Mongolia, in northern China and even as far as the Korean peninsula. Its woolly fur is due to a dense undercoat of hair that provides insulation against the mountain chill, which is then covered with an outer layer of much thicker protective hairs.

As well as their amazing fur, this subspecies of wolf is expertly adapted for its craggy home. Tibetan wolves tend to either hunt single-handedly or in very small packs or two or three. Without a big pack to take down large prey, this means that these wolves eat smaller mammals such as marmots and hares and perhaps the odd sheep or goat.

Due to the morphology of this wolf's jaw that is very similar to that or domestic dogs, some scientists believe that this wolf subspecies may be the most likely ancestor of man's best friend.

TIBETAN WOLF
Canis lupus chanco
Class Mammal

Territory East Asia
Diet Carnivore
Lifespan 7-10 years
Adult weight 3kg/70lbs
Conservation status

EX EW CR EN VU NT LC

ENDANGERED

©Nature PL, Alamy, Thinkstock

All About Grey wolves

The wild ancestors of the domestic dog are hated, feared and have been hunted for centuries. However, these resilient animals are built to survive and are making a comeback

Incredible family bonds

Wolves form strong pair bonds and spend several months preparing for their new arrivals

Grey wolves are family-orientated animals, and form close bonds within the pack. The alpha pair are usually the only two animals that breed and are bonded for life, continuing to produce cubs each year.

Preparation for the new arrivals starts early and in the winter hormone levels in both sexes start to rise. The female is the first to demonstrate her interest, remaining close to her mate and resting her chin or paw on his body. The male responds by scent-marking, ensuring that all rival wolves know that this female belongs to him.

After up to two months of bonding, the pair are ready to mate and again it's the female that initiates courtship. She pursues her companion, encouraging him to mate with her. When he complies, the pair can remain together for over half an hour.

If the female falls pregnant, her cubs will be born in just two months, so there is little time to prepare. Established packs often have an existing den for the female, but if the parents are new, or the old den has been lost, damaged, or destroyed, the wolves will need to dig a new one.

The female is entirely responsible for digging the den, but if she has older cubs, they may help her out. Wolves live in snowy, often damp environments, and there's significant risk of the den flooding as the snow melts, or in the spring rains.

In order to protect their vulnerable young from the chill of a water bath, the dens are specially shaped. They slope down at the entrance and then up again on the inside. This provides a safe internal island for the young cubs, which can be born in litters of up to 14.

The first few weeks of life

Wolf cubs are born blind, deaf and tiny. This makes them entirely dependent on their mother for food, warmth and protection for the first few weeks in the world.

It takes around two weeks for the cubs to open their eyes and at first they are unable to walk properly. Instead they simply use their front legs to crawl about inside the den.

By just three weeks old, the cubs are completely transformed, so with their eyes wide, ears perked up, and voices ready to communicate, they start to venture out of the den. They will start to meet the rest of the pack, who they will be close with for the next few months.

Folded ears
Adult wolves have pointed ears, but their cubs begin life looking much more like dogs. As they grow, their ears start to prick up a bit.

Blue eyes
When wolf cubs open their eyes at around two weeks old, they are piercing blue. As they grow older, the colour gradually changes to the tawny orange of adult wolves.

Instinct
Wolf cubs practise communicating early, using whines and whimpers to get the attention of their mother, and even trying to howl.

In the den

The pack members work together to dig a secure den for the dominant female and her cubs

Pack assistance
For the first few weeks, the wolf cubs survive entirely on milk supplied by their mother, but as they get older, they start to eat solid food. The cubs are too small to join the rest of the pack on hunts, so prefer to stay near to the entrance of the den. All members of the pack join in to help, either bringing meat directly back to the den, or regurgitating swallowed food for the cubs to eat.

Nurturing mother
Unless resources are particularly abundant, it's usually only the dominant female in the pack that gives birth to a litter. She cares for her cubs alone for the first few weeks, remaining in the den with them to provide them with much-needed body heat and a constant supply of milk to sustain them as they grow.

Waterproofing
The entrance is steep, but inside the chamber curves upwards again, preventing flooding if water runs in.

Limited movement
Very young wolf cubs aren't able to support their own body weight, so crawl around inside the den using just their front legs. By the age of three weeks, they are able to walk to the den entrance and peer outside.

Inside a grey wolf

These savage endurance hunters have bodies built for stamina and survival. With insulated, waterproof coats, long legs and bone-crushing jaws, these pack animals have taken control of some of the most extreme environments

GREY WOLF
Canis lupus
Class Mammalia

Territory Northern Hemisphere
Diet Carnivore
Lifespan 7 years
Adult weight 20-80kg / 44-176lbs
Conservation status

EX EW CR EN VU NT LC
LEAST CONCERN

Big brain
Wolf brains are 1.5 times bigger than those of domestic dogs.

Keen nose
A wolf has around 40 times as many smell receptors in its nose as humans, and can smell us from over a mile away.

Strong jaw
The bite force of a grey wolf is much greater than that of a similarly sized dog like a German shepherd.

High lung capacity
Wolves are built for endurance, and have deep chests. Their big lungs maximise the amount of air they take in with each breath, helping them to outrun their prey.

In-built grip
The pads on a wolf's feet are thick, cushioned and covered in bumps, helping them to grip the ground.

Dewclaw
Each of the front paws has an extra digit known as the dewclaw.

Digital ball
Plantar ball
Claw

No collarbone
Wolves don't have collarbones connecting their front legs to their sternum. This means their legs cannot move from side to side at all, only front to back, making them extremely efficient runners.

INFANCY

Birth of cubs *0 months*
When wolf cubs are born in the spring, their ears are curled over and their eyes are fully closed.

Open eyes *2 weeks*
After ten days, the cubs start to open their eyes and begin tentative exploration of their family den.

Open ears *3 weeks*
As the cubs grow, they become increasingly curious. Their ears start to prick up and they look and listen at the entrance to the den.

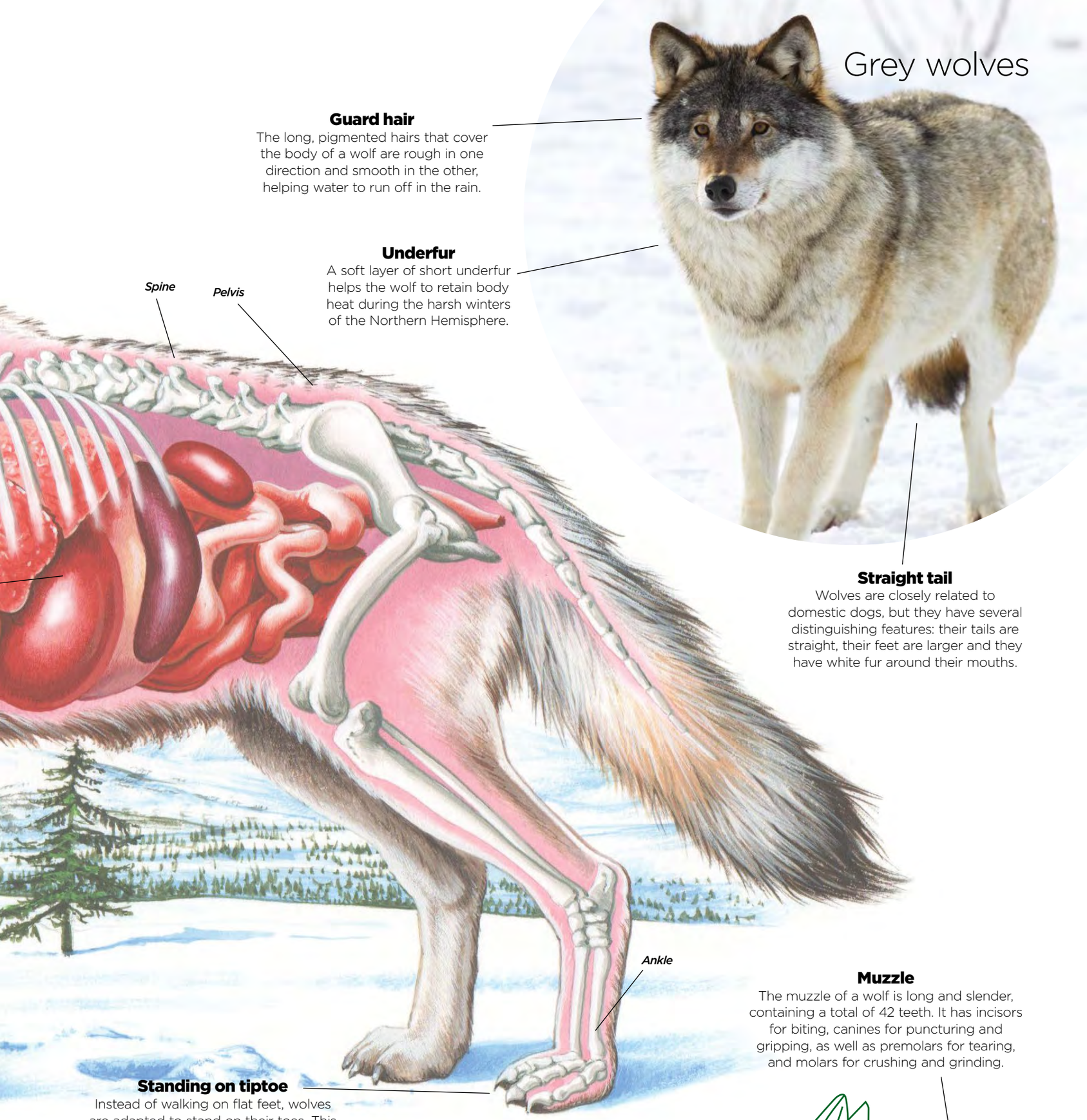
JUVENILE

Meeting the pack *3-4 weeks*
As soon as the cubs are strong enough to leave the den, they begin socialising with the rest of the pack.

Close to mum *4-10 weeks*
For the first few months of their lives, the cubs remain near the safety of their mother and the den, feeding often.

Solid food *10 weeks*
The pack bring meat back for the growing cubs. By around ten weeks old they are less dependent on milk.

Grey wolves



Guard hair
The long, pigmented hairs that cover the body of a wolf are rough in one direction and smooth in the other, helping water to run off in the rain.

Underfur
A soft layer of short underfur helps the wolf to retain body heat during the harsh winters of the Northern Hemisphere.

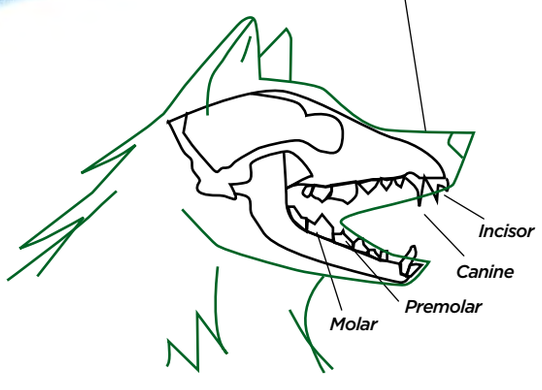
Spine

Pelvis

Straight tail
Wolves are closely related to domestic dogs, but they have several distinguishing features: their tails are straight, their feet are larger and they have white fur around their mouths.

Ankle

Muzzle
The muzzle of a wolf is long and slender, containing a total of 42 teeth. It has incisors for biting, canines for puncturing and gripping, as well as premolars for tearing, and molars for crushing and grinding.



Standing on tiptoe
Instead of walking on flat feet, wolves are adapted to stand on their toes. This elongates their legs, enabling them to make much longer strides.

MATURITY

Part of the pack *1 year*
After they reach around a year old, wolves often remain with their family pack. They will eventually help to hunt and raise the next generation.

Alpha status *2-3 years*
When wolves reach sexual maturity, they leave their pack in search of a mate, becoming the heads of their own family unit.

Raising a family *3-7 years*
Wolves are thought to mate for life and partners will stay together in close co-operation to raise successive generations of cubs.

LEFT Each wolf pack is structured around a dominant breeding pair, who direct hunting efforts and defence against rival packs

Alpha male
Wolf family structure means that dominant males don't need to fight to maintain their position as the head of the pack and instead can focus their energy on hunting and territory defence.

Life revolves around the pack

For these intelligent and sociable animals, the wolf pack functions like some human family groups

Once thought of as living in a strict hierarchy, led by an alpha male and female, it's now known that wolf packs function more like human family groups, with two parents in charge of their children. Most packs are relatively small, consisting of under ten individuals.

Wolves engage in rough play fights to determine their position in the social structure. Dominant animals point their ears forward, bare their teeth and growl to assert their authority, while more-submissive members of the pack respond by holding their ears flat, putting their tails between their legs and rolling over to expose their stomachs.

Much of the vocal communication of wolves shows similarities to the domestic dog. When hungry, lonely, or in pain, they will whimper and whine for attention – when angry, they will growl and bare their teeth. They don't often bark, but they'll use a gruff call to signal danger.

The dominant breeding pair leads the hunts, but often allow their younger pack mates to do most of the work. By combining their efforts, the pack can tackle large animals, like elk and bison, using a characteristic technique to intercept these enormous herbivores. They run through a herd, watching for any signs of weakness. The wolves isolate a weaker target from the rest of the group. They'll then bite at its legs, flanks, face and tail. Wolves prefer to feed on the rich internal organs and well-developed leg muscles.

Each wolf needs several miles of terrain to hunt enough prey animals, so the pack travels frequently, often covering over 20 kilometres (12 miles) in a day.

Competition among rival packs is fierce, so wolves make regular boundary patrols. Any wolves straying into the wrong area risk confrontation. They announce their presence with a howl, holding their heads to the sky and allowing the sound to carry for up to 16 kilometres (ten miles) across the landscape. When one wolf howls, others in the local area respond. Packs come together in a mournful chorus, each individual pitching their howl on a slightly different note to create a swell of sound that gives the illusion the group is much larger.

Submissive wolves
Any wolf straying into the wrong area risks confrontation. When submissive, wolves lower themselves before dominant pack members, tails tucked between their legs.

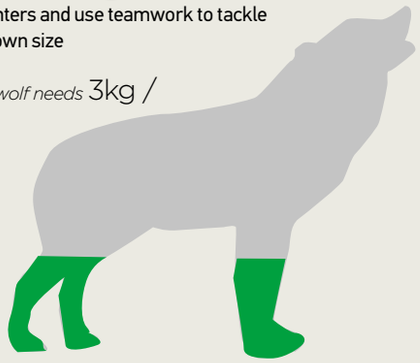
"Competition among rival packs is fierce, so wolves make regular boundary patrols"

Diet and feeding

Wolves are efficient hunters and use teamwork to tackle prey many times their own size

An average male grey wolf needs 3kg / 7lbs *of food per day*
That's 7-25% *of its body weight.*

Occasionally they supplement their diet with beavers, mice, and other rodents.



Home of the wolf

Although associated with the snowy tundras of Canada and Russia, grey wolves aren't dependent on a cold environment for survival and can thrive in forest, grass, or even desert

Grey wolves are native to the Northern Hemisphere and once ranged across North America and Eurasia. However, humans and wolves have had a tense relationship and although dogs are now considered man's best friend, their wild cousins are regarded with much less affection.

Wolves used to live across most of the United States, feasting on deer and bison, but the arrival of European settlers decimated the prey animal populations and wolf numbers started to decline. As wolves tried to obtain enough food, there was increasing conflict with human farmers and in the early 20th century aggressive anti-predator measures were brought in by federal and state governments in the western USA. The remaining population was trapped, shot, poisoned and was driven into the remote wildernesses. Extensive culling also took place in Canada and continued until the 1960s, but in the wilds of the tundra the wolves managed to cling on. Population numbers there are now among the highest in the world.

Without wolves, prey animal populations go unchecked, so the return of wolves to abandoned habitats, like the remote mountains of North America, will help to restore the natural balance of the ecosystem. Reintroduction programs are ongoing and the wolf populations in America are slowly returning to their natural homes. One of the major success stories is Yellowstone National Park, which after a period of 70 years without wolves is now home to hundreds of healthy breeding adults and their young.

However, the largest grey wolf populations of all are found the farthest from human intervention. Most inhabit the snowy wastes of the far north, but some have colonised an environment even less forgiving.

In 1986 reactor four at the Chernobyl Nuclear Power Plant ruptured, coating the surrounding countryside in radioactive fallout. The entire city of Pripyat was abandoned and a 30-kilometre (19-mile) exclusion zone was marked out, inside which no human can live to this day.

Almost 30 years later, the buildings have been left to ruin and nature has retaken the land. Beavers, moose, and deer have moved in to take advantage of the uninhabited countryside. In this area of abundant food, free from human interruption, even with dangerous levels of radiation, the wolves are not only surviving, they are thriving.

Environmental factors

Wolves living on the boundary of civilisation face several environmental threats

Hunting
Wolves are still hunted for their pelts, for sport, as a form of environmental control, or simply self defence. Farmers will still often protect their livestock from wolf attacks.

Agriculture
In Europe and parts of the USA, vast areas of land are turned over to farming, leaving little room for grazing animals, or the wolves that feed on them.

Starvation
Wolves require a good supply of prey animals in order to survive. If the populations start to decline, they can gradually succumb to starvation if no food sources can be found.

Injury
Wolves tackle large and dangerous prey, like bison and deer, and many die as a result of traumatic injury. Herbivores might look gentle, but their powerful bodies can shatter bones.

While the two dominant female and male wolves direct the hunt, they leave younger members of the pack to the chase

Grey wolves and humans

At the boundaries between the wilderness and human civilisation, wolves and people continually come into conflict. The most successful wolf populations are found far from human settlements. Humans and wolves have a long history of violence, but the relationship has also been one of the most beneficial in the history of mankind.

All domestic dogs are descended from European wolves. The exact dates are still debated, but it's thought that domestication occurred sometime between 10,000 and 32,000 years ago. At this time our ancestors were still hunting and gathering to obtain food, and in the wilds of Europe and Asia they would have encountered packs of wolves. It's thought that a mutual relationship gradually developed between the hunters and humans, and that the animals would follow us closely waiting for scraps of meat.

Gradually, humans began breeding the animals, selecting the cubs based on favourable traits, such as temperament, size and appearance, then over the course of the last few thousand years wild wolves have been transformed into hundreds of breeds of domestic dog.

Nearest neighbours

Grey wolves are spoilt for choice when it comes to prey animals nearby in their local neighbourhood

Moose
As the largest species of deer, and taller than the average man, moose are formidable animals. Wolves rarely take on adults, which can weigh more than a ton, but in the spring the new calves provide an easier meal.

Elk
Male elk can be over 2.7 metres (nine feet) tall and are some of the largest animals in North America. They once ranged across the continent, but are now found mainly in the western mountains.

American bison
These majestic animals used to cover the American plains, but European settlers destroyed over 50 million of them in the 19th century. Today there are around 200,000 bison in the USA, mainly living in protected areas.

Beaver
These rodents make their homes around rivers and streams. They might not provide much meat, but they're far easier to hunt. In some places they make up around 60 per cent of a wolf's diet.

Corbis, Rex Features, Ardea, The Art Agency: Ian Jackson, Sandra Doyle, Thinkstock, Malene Thyssen, FLPA, Alamy

THE HIDDEN WORLD OF THE WOLF PACK

Wolves' social intelligence, empathy and affinity creates something bigger than the individual – it's the power of the pack

There is no other animal in human history that has both enjoyed and endured such a pronounced love/hate relationship with people as the grey wolf. Observers have perceived similarities between wolf and man for centuries. The earliest known cave-paintings on the American continent depict two parallel hunting parties in eerily similar formations. One features a stick-figure wolf pack; the other portrays men. Across the Atlantic ocean in southern France, the 32,000 year-old Chauvet Cave has preserved astounding examples of human wall-art, along with the interwoven footprints of an eight to ten year-old boy and his apparent companion – a fully-grown 'wolfdog'.

At the other end of the spectrum, those wolves who resisted the pull to domestication, and didn't join the subspecies we collectively call 'dogs', have endured merciless persecution, and even local eradication by humans. The factor that makes them prime candidates for both our love and hate, is perhaps their defining feature; life-or-death loyalty to one another.

Why are packs so important?

Director of the UK Wolf Conservation Trust, Tsa Palmer, has worked with wolves for 40 years. She tells us why pack life is essential

Tsa Palmer and her team of four directors, four staff and over 70 volunteers, operate the UK Wolf Conservation Trust in Reading, Berkshire (**www.ukwct.org**). Here they keep 'ambassador wolves', providing interaction opportunities and funding international projects to make sure wolves survive into the future.

Tsa puts pack life into perspective quite simply. "They've got it figured out – mastered survival of the fittest – but they've done so while still managing to care for each other deeply." She mentions that in the wild, pack sizes fluctuate greatly, and can be as small as five individuals, so roles aren't as cut-and-dried as traditionally thought. Despite this, even in large packs comprising of the offspring from many seasons, they always present an integral family unit. "Compared, say, with lions, where one – the strongest – male mates and produces offspring with many females, wolves have a much more refined strategy. It's the fittest parents; the best of both worlds; and the other pack members pull together to provide the best support. And they're incredibly tactile – lots of bonding goes on between them – especially when they aren't on the move".

"Wolves are incredibly wary creatures, and subordinates often take the role of tester, going ahead to see what's happening," Tsa tells us. The 'testers' reconnaissance mission saves the wolf pack from putting the valuable breeding male and female into particularly risky situations, meaning that the pack's genes not only survive to be passed along by the strongest and most intelligent, but that those who eventually disperse and form packs of their own are already proven survivors themselves.

"Often, mothers don't join in hunts, as the risk to her or her unborn cubs would be too great," explains Tsa. "As the highest-ranking pack-member, she still gets her pick of the available food – she needs it as she's carrying the next generation of the pack."

However, the in-built instinct to fight for dominance seems especially obvious in females. According to Tsa, captive females at the Trust's headquarters have to be monitored carefully as they come into adulthood. At around one to two years old – the age at which wild wolves would disperse or be forced to leave the pack – females are given an opportunity to move on to other, suitably vetted conservation organisations. Otherwise, potentially deadly rivalries can occur, as the she-wolves' natural instinct is to win over the male, mate and rule their own pack for good.

"Even in large packs they always present an integral family unit"

6 rules of a successful pack

Each successful pack follows a few unbreakable rules to maintain strength

1. Follow the parents' lead

Within any given wolf pack, mum and dad know best, and it isn't a democracy. The main rule of pack society is 'obey your parents'. Only the strongest and most intelligent male and female will breed and produce offspring. Often, this breeding pair are unrelated, and the bulk of their offspring become subordinate members of their pack until they are ready to move on. Any male or female can become dominant, but doing so usually means leaving their parents and looking for other wolves.

2. Maintain feeding positions

To maintain their positions, breeding pairs will always have access to the choicest parts of any kill. Wolves can consume almost all of a carcass; often leaving just a skull. Although the whole pack may run down a large animal, the best parts – the fat, brain, heart and meat of the rump and shoulders – will be consumed by the parents. Less dominant wolves will impatiently stand off, occasionally whining. The lowest ranking member may be literally left with skin and bones, in some instances.

3. Fight for respect

Dominance displays by pack leaders help to cement the hierarchy. Although continual forcing to the floor, mounting and chasing can appear brutal, it doesn't cause resentment. During a 2009 study carried out by world wolf authority Dr. David Mech, a male was tranquillised for examination in the middle of prolonged domination over his maturing pack-mates. While he was unconscious, the subordinates he had been 'bullying' defended him, mounting a concerned watch.

4. Lead from behind

The 1995 reintroduction of wolves to Yellowstone National Park, USA (following a 69-year absence) gave researchers led by Rolf. O. Peterson a chance to watch packs forming from scratch. What they discovered, is that while the breeding pair would rouse the pack for action, or display 'non-frontal leadership' (changing travel direction from a rear position), lower-ranking females related to the breeding female often headed up the pack while scouting or hunting. It seems that while decision making is temporarily entrusted to other mature females, the dominant pair can always overrule, even from the rear.

5. Create new alliances

Between five and 20 per cent of the wolf population in any given area can be made up of individuals 'dispersing' – leaving the pack they were born into, to form or join a new one. This generally happens at one to two years of age, as sexual maturity is reached, but adults occasionally split from a pack too. Some individuals have been known to join a pack – or find a mate and start their own – over 500 miles from their parents. This reduces the chance of inbreeding, and explains how wolves can quite quickly colonise massive areas, availability of food allowing.

6. Leave scent trails

A dominant animal without sufficient subordinates is simply 'bold'. Leadership brings changes in behaviour in wolves who make it to the top. Dominant wolves – particularly males leading good-sized packs – will urinate frequently; sometimes at two-minute intervals while roaming. The 'cocked leg' seen in dogs is a hangover from what wolf biologists call raised leg urinations. These clearly mark out territorial transits and boundaries, giving some indication to neighbouring packs that there is an established pack in the area.

How wolves communicate

Wolves use scent, sounds and sign language to send messages. Up close, expression, posture and position communicate pack rules

Vocal communication is essential for wolves to exchange information instantly, and barks, growls and whines all have different meanings. Growling and barking warn wolves not to overstep the mark, either when disrespecting the dominant male or approaching a strange pack. Whines are a form of submission.

Wolf howls have several different functions and are usually made from the very heart of a pack's territory. Howls serve as communication between temporarily separated pack-mates, celebration when wolves are reunited or a ritual before leaving for a hunt. Body language communicates a wolf's intentions, so when a wolf wants to play it will perform a 'play bow'. By raising its rear end and stretching out its front paws a wolf invites others to play. When a wolf folds its ears back it is a sign of fear and readiness to fight.

Powerful and proud posture
A dominant wolf will stand at full height, legs straight and holding its head and ears high, literally appearing to look down on others. Most telling of wolves' mental picture of their own importance is the tail. In bold, dominant animals it will be held up at least horizontally.

Active submission – posing as pups
'Active submission' involves appeasement behaviour, identical to pups begging for food. The submissive wolf excitedly approaches, then licks the underside of the dominant animal's muzzle, careful to keep their head lower than that of the higher-ranker.

Passive submission – rolling over
'Passive submission' is the ultimate display of subordination. By lying on its side or back, a wolf presents its vulnerable flank and soft underbelly. Usually, this ends quickly – with a sniff of the genitals – but submissive trespassers are occasionally killed.

Grinning – a wolf's warning
When a wolf feels threatened or angry, it will pull back its lips to show those impressive teeth in full. In most cases where this is a direct challenge – at a carcass or in a struggle for position – one will back down, avoiding conflict and potential injuries.

Gang warfare

Hierarchy rules within a pack usually keep wolves from fighting among themselves, but what happens when one pack encounters another?

Generally, wolves prefer psychological warfare to actual combat. Hunting, struggling with prey and even maintaining status within their pack are especially tough for an injured wolf, and every physical fight carries this risk. Instead dominant wolves clearly demarcate their territories with urine, scat, scratchings and secretions from glands near their anus and genitals. As a further 'keep out' signal, the infamous wolf howl also advertises the presence and size of a pack in the area to potential rivals.

However, fierce rivalries can develop between packs, especially in areas with an abundance of prey animals and suitable denning sites. In Yellowstone Park, biologist Rick 'wolf man' McIntyre has witnessed a deadly 18-year, multi-generation feud between two packs, battling for the Lamar Valley.

The 'Druid pack', a group of released wolves, chased an established pack out in late 1995. 'Mollie's pack' (named after US Fish and Wildlife Service Director Mollie Beattie) were the first wolves reintroduced to Yellowstone, and researchers believed that they would hold their territory, causing further releases to spread out rather than take on this strong, well-rooted pack. Instead, the newly formed Druids raided – purposely singling out, tracking down and killing the Mollies' breeding male. This forced the survivors to retreat 25 miles to the Pelican Valley, a harsh area where the only regular prey were massive, hard-to-kill bison. From here, frequently deadly skirmishes at the borders ensued. However, in 2013, the alpha male from the Druids lost his mate to hunters. Perhaps because the remaining females were his daughters and nieces, '755' left the Druids, and began courting an 'enemy' female, '759', from Mollie's pack. Like a canine Romeo and Juliet, the pair – now in danger from both sides – mated, beginning the process of establishing a third pack in this hotly contested area.

"Rick 'wolf man' McIntyre has witnessed a deadly, 18-year feud between two packs"

Physical fights carry very real dangers – an injured wolf's survival chances aren't great

Wolves will fight relentlessly to guard their territory

First pick of meat
The dominant wolves begin to pick apart their kill first, while the others eagerly await their chance to take a bite.

Battling a scavenger
Wolf prey is under the constant threat from roaming scavengers, and if the invading animal outweighs the wolf pack, they may decide to flee.

Waiting its turn
When the alpha male is finished, lower ranking wolves are allowed to eat. The risk of meeting scavengers only increases, so they feast as fast as possible.

© Alamy, Corbis, Getty, Rex Features, Thinkstock, Hendrik Gheerardyn

Roles of the hunt

Co-operation is critical when packs encounter larger prey. Tactics vary but teamwork is the strength

Wolves cover huge distances in search of prey; there is even a Canadian saying "a wolf is fed by its feet". But 'a' wolf (in the singular) is unlikely to eat anywhere near as well as those who are part of a pack. This said, wolves are indeed highly efficient; moving with a "tireless ground-eating trot", and will generally only hunt animals that they can force to run from them. Most large herd-dwelling ungulate prey (elk, caribou, deer, moose and even bison) are – at first – stealthily stalked. The pack gets as close as it can without being discovered. Once an attack is launched, the herd will be harassed and chased, to assess which are the weaker individuals. These are then targeted, and pack members begin to employ tactics.

Some wolves will attempt to head the prey off, occasionally causing bulkier, panicked animals to fall over, potentially injuring themselves. Other pack members will bite and tear at specific parts of the prey animal. Elk are attacked from the rear and side until they slow enough for the wolves to tear the nose and throat. Caribou are taken head-on, often brought down by the face and neck. Deer are grabbed by the rump, and mounted by successive pack members until they collapse. Bison are bitten in the thigh, isolated from their herd and then nipped, harried and chased until exhausted. The wolfpack's combined effort offers the only possibility of killing such huge, powerful prey.

This ability to take down animals ranging from a 20 gram mouse to a 500 kilogram-plus bison makes a wolf pack a formidable predatory force, often causing concerns over livestock and game safety where wolves occur. However, wolves identify, isolate and ultimately eat the old, sick or otherwise weak individuals, contributing to herd health.

In a wolf pack, the parents get all the best parts of a kill, leaving lower ranks with barely anything

ARCTIC WOLF
Canis lupus arctos
Class Mammal

Territory Canada
Diet Hares, birds and insects
Lifespan 7-10 years
Adult weight 80kg (176lb)
Conservation status

EX EW CR EN VU NT LC

LEAST CONCERN

BUILT TO SURVIVE: THE ARCTIC WOLF

Braving snow storms, traversing frozen terrain and tracking down food in one of Earth's most desolate environments, arctic wolves are nature's defenders of the north

Wolves are some of the most intelligent and successful predators around, using their supreme brainpower and close-knit social structures to thrive as pack animals in multiple continents. Yet many don't realise that the empire of the wolf stretches into territory that most animals don't dare to enter, let alone live in.

The Arctic Circle is no playground. In this frozen polar wasteland, ferocious blizzards rage and the darkness of night takes hold for months on end. Indeed, the arctic is one of the only places on Earth where humans rarely venture. The animals that live here may have to endure the deadliest weather nature is capable of, but they are blessed with a separation from mankind that keeps their world blissfully untouched by the harmful encroachment of urbanisation.

In the absence of people, arctic wolves have become the rulers of the permanently frozen north. A subspecies of the more widespread grey wolf, these canines have mastered the art of life in the arctic tundra. They are resilient enough to stick out the toughest winters, smart enough to track down and kill impressively large prey, and sociable enough to live among their fellow wolves in small, complex communities.

There are still mysteries about the arctic wolf that humans haven't been able to solve. How did they first arrive in such an isolated world, and why were their grey wolf ancestors driven into the coldest part of the northern hemisphere? Are the two wolves ultimately the same animals living in different climates, or should we consider the hardy arctic wolf as its own unique subspecies? And how were these canines able to bounce back from extinction in eastern Greenland, reclaiming a territory that was unjustly taken from them? The answers all lie northward. Do you dare to run with the wolves?

The arctic wolves have evolved to survive in the harsh conditions

Three things to know about arctic wolves

A system called countercurrent heat exchange keeps the arctic wolf's insides warm. Cold blood leaving extremities like the paws is heated by warm blood entering it. Penguins also use this heat-retention method.

As they're able to withstand conditions that most other predators can't, arctic wolves have enormous territories to hunt in. However, colder weather also means less prey, so they hunt in packs to secure larger meals.

Grey wolves have yellow or amber eyes, while arctic wolves have developed brown irises. The darker shade acts as sun protection for the eyes, helping to counteract the sharp solar glare caused by snow.

Masters of adaptation

To thrive in the Arctic, these canines call on some amazing evolutionary traits

Despite being incredibly similar to the grey wolf in terms of DNA, arctic wolves have a number of physical adaptations that help them to survive in one of the world's harshest wildernesses.

The temperature of the Arctic tundra habitat that these wolves call home rarely reaches higher than -30 degrees centigrade. It's so cold here that the ground is permanently frozen, in a state known as permafrost.

Arctic wolves call upon a variety of evolutionary advantages to get by in this frigid landscape. Their most obvious defence against the cold is their white coat of fur. This comprises of two layers – a short first layer that helps to form a waterproof barrier against the skin, and a longer outer layer that grows thicker as the winter months progress. The result is a powerful form of insulation, capable of keeping the arctic wolf warm in some of the bitterest conditions imaginable.

Beneath the fur lies a thick reserve of body fat, which builds up during summer when food is more abundant. As well as providing an extra insulating layer against the elements, this fat helps the arctic wolf to survive for long periods without eating during the lean winter months.

Since their paws are constantly in contact with the frosty and frozen ground, arctic wolves have fur on their feet to prevent frozen toes and maintain grip on slippery terrain. And with smaller ears than their grey cousins, the arctic wolf avoids losing heat from its head due to the minimised surface area in contact with the cold air.

Lights out

Arctic wolves emerge from months without daylight bright eyed and bushy tailed

While most animals can only withstand the extreme climate of the Arctic tundra in summer, the arctic wolf lives there all year round. Other than the icy weather, arctic conditions pose a challenge to the wildlife in the form of unusual seasonal daylight patterns. During summer, the sun shines for 24 hours a day, whereas winter plunges the arctic wolf's habitat into several months of unremitting darkness.

So how do arctic wolves make it through the blackness of winter? Partly thanks to their excellent eyes. These contain more rods – photosensitive cells that specialise in low-light situations – than the average mammalian eye. What's more, wolves have large pupils which allow them to pick up on any available light and see through the dim – they can therefore use natural illuminations such as the moon or the northern lights to navigate their way through the dark.

Even more impressive than the arctic wolf's eyesight is its tremendous sense of smell. Like other dogs, their noses can pick up on scents that humans don't even register – their smelling ability is said to be at least 1,000 times better than ours. This means they can sniff out prey from over a mile away, and follow their noses through the dark to find their food, which is impressive in itself.

Scent serves an important role within the wolf pack. Each wolf can identify its fellow pack members by the way they smell. Arctic wolves also use scent to convey social status, health conditions and even emotions.

"Even more impressive than their eyesight is its tremendous sense of smell – it is said to be at least 1,000 times better than ours"

Due to their habitat, arctic wolves live in complete darkness during the winter

Arctic vs grey: the key differences

Fur colour

The arctic wolf's majestic white coat is an obvious aesthetic difference that helps to distinguish them from grey wolves. Their snow-coloured fur is a useful adaptation for camouflage in the icy tundra. Despite their name, the colour of grey wolf fur can vary from reddish brown to jet black.

Facial features

The arctic wolf's shortened muzzle is another adaptation that helps to minimise exposure to the cold air. Their ears are smaller than the grey wolf's for the same reason. While both arctic and grey wolf pups are born with blue eyes, these develop into a golden amber colour in grey wolves and a darker shade of brown in arctic wolves.

Size

While arctic wolves are generally smaller than grey wolves, they are bulkier and more compact overall, meaning that less of their bodies are exposed to the cold air. The extra fat reserves stored by arctic wolves adds to their weight, and their thick coats make them appear larger in winter.

Life in the pack

The common stereotype of the lone wolf isn't typical of the arctic variety. These charismatic canines are social animals, and their success as a species is largely down to their behaviour as pack animals.

Litters of arctic wolves usually contain two or three pups, and their parents work together to keep them safe and well-fed, doing everything they can to ensure that their offspring survive into adulthood. Breeding takes places once a year, and is usually restricted to the alpha male and female of the pack. This prevents the group from becoming too large, thereby reducing the need for food supplies to be spread thinly.

The alpha pair play an important role, deciding when and where the pack should hunt. They are consequently the most respected members of the wolf pack, and are usually the first to feed on prey that has been successfully killed by the group.

Arctic wolves prefer to establish their rank in the pack through psychological confrontations rather than physical ones. However, fights do occur between rival wolves seeking alpha status. A high ranked wolf establishes dominance by holding its tail high and baring its teeth, while submissive pack members keep their mouths closed and their tails between their legs.

No food is off limits for the unfussy arctic wolf, from old bones to regurgitated flesh

On the hunt

Roaming the vast arctic wilderness for food requires tight teamwork and a strong stomach

Like other pack animals, arctic wolves work together to take down prey several times their size. Musk oxen are their primary target, but they will also hunt caribou and moose if the chance arises. Other arctic animals such as hares, seals, and lemmings are small enough for an individual wolf to hunt alone. The remains of animals that other predators have killed will also be scavenged when possible.

With the tundra being a largely lifeless environment, arctic wolf packs travel for hundreds of miles to track down food. Indeed, the territory of an individual pack can span over 1,000 square miles – larger than the average territory of an ordinary grey wolf, which typically consists of under 100 square miles. During the winter, it is common for arctic wolves to follow herds of migrating mammals as they make their journey south. The wolves choose their targets wisely, preying on the smallest and weakest members of a herd to reduce their risk of injury and maximise the chance of a successful kill.

Arctic wolf pups are too small to hunt for the first few weeks of their life, so survive on scraps and regurgitated meat provided by their parents and other wolves. With only a single litter of pups per pack, the whole group helps to provide for the babies. By the time they're ten weeks old, young wolves begin to follow the adults on their hunting trips and learn to become apex predators.

In the land of wolves

Living away from humans has its advantages, but arctic wolves aren't entirely safe from danger

Wolves have had their range narrowed significantly due to human interference. Grey wolves have lost a third of their original territory – they are now extinct in many places where they used to thrive, including parts of western Europe, Mexico and the USA.

Luckily, the arctic wolf faces less persecution than other members of the lupus species. This is partly due to the remoteness of their populations – dwelling in largely uninhabited areas such as Northern Canada, Alaska, Greenland and Iceland means the white wolves rarely come into contact with humans, and therefore pose less of a risk to settlers or domestic animals. They are currently classed as Least Concern on the IUCN's Red List of threatened species.

While arctic wolf populations are healthy on the whole, the canines have had a rough history in certain parts of their range. A population in east Greenland was decimated by hunters in the 1930s, who poisoned the area's entire population to prevent the wolves from interfering with their fox hunting expeditions.

While it is difficult for arctic wolves to make a comeback due to their small litter sizes and infrequent breeding, the animals have managed to make a recovery in east Greenland. After a 40-year absence, a few wolves were spotted roaming the area in 1978, and they have been gradually repopulating the area ever since.

It is thought that human vehicles may have helped the animals to reclaim their lost territory, with wolves from north Greenland following tracks left by military sleds and forming new packs in the homes of their eastern ancestors.

Climate change is now among the arctic wolf's most pertinent threats. Although they are adaptable predators, prey species like musk oxen and arctic hares find it difficult to cope with extreme weather variations, and this has reduced the wolves' food supply.

Family ties

Classifying the arctic wolf as its own subspecies has proved problematic for some scientists

It is clear that there are many physical differences between the common grey wolf and arctic wolves. Yet the question of whether the arctic wolf should be officially considered a subspecies of the grey wolf has become a hotly debated topic among taxonomy experts.

British zoologist RI Pocock first described the arctic wolf as a separate subspecies in 1935. After examining the skull of a wolf discovered on Melville Island in Canada, he concluded that it was different enough from the mainland-dwelling grey wolf to be considered its own subspecies.

A separate group of scientists led by CM Chambers later disputed Pocock's premise, publishing a paper in 2012 that suggested the arctic wolf's genetic differences with the grey wolf were not clear enough for a subspecies to be recognised.

This was considered controversial, and when a review commissioned by the United States Fish and Wildlife Service investigated further, it found that Chambers' research was not thorough enough to be considered scientifically accurate.

As such, it is still acceptable to describe the arctic wolf as a subspecies of the grey wolf. Whether you agree or not, the canine's obvious white colouration and remarkable cold weather adaptations should be enough to differentiate between these two impressive predators.

Experts still disagree if the arctic wolf is a separate species

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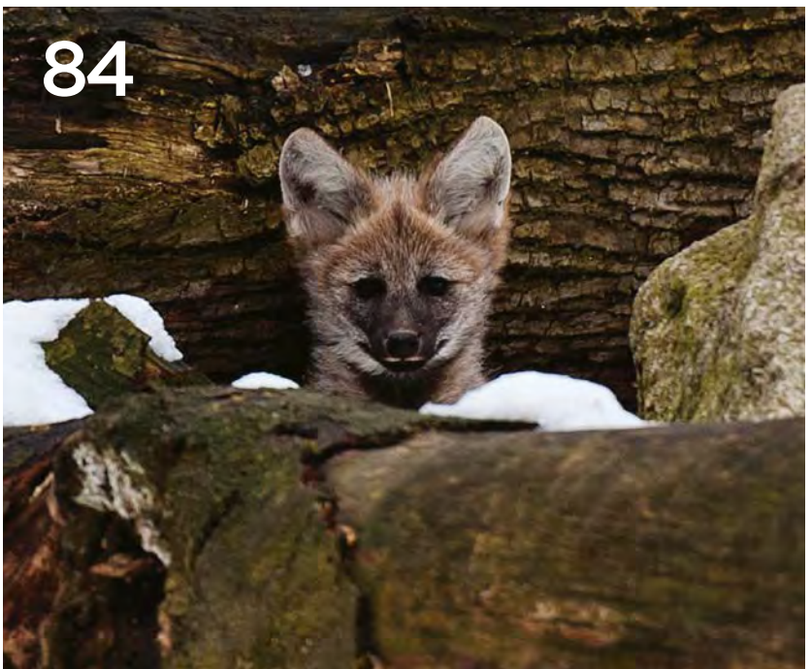
Wild dogs

Your dog's wild cousins include far more than just the grey wolf; discover the wild canids that roam every corner of the Earth, and find out what makes them such successful predators



72

The apex predator of Down Under, the dingo has quite the legacy

"Canines show a remarkable ability to learn and adapt their behaviour according to their environment"

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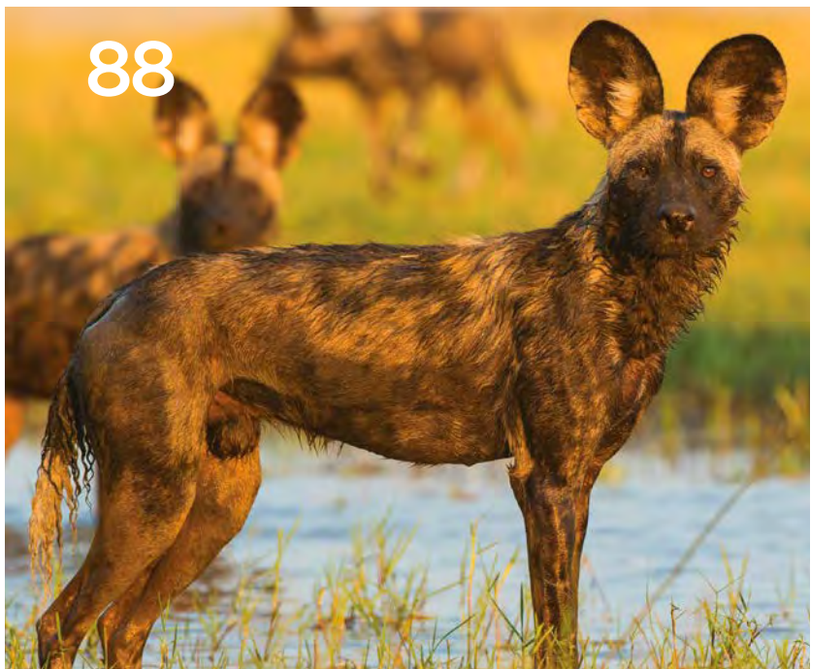

DINGO
Canis lupus dingo
Class Mammal

Territory Australia and Southeast Asia
Diet Carnivore
Lifespan Ten years
Adult weight 20 kg/44 lb
Conservation status

EX EW CR EN VU NT LC

VULNERABLE

THE LEGEND OF THE DINGO

Get to know the wild dogs that have adapted to make Australia their home and ingrained themselves into life Down Under despite some very challenging conditions

Prowling across its habitat in the arid lands of Australia, mouth open and tongue dangling, the dingo sniffs the ground, lifts its head and keeps its eyes peeled for prey. It spots a joey in the near distance and makes its approach but, suddenly, the roo is alerted and makes its escape, hopping away. Undeterred, Australia's native dog runs after it at high speed. And then it leaps, aiming for the throat and bringing its prey down. In an instant, it's obvious that this is no domestic dog. It's wild, and very much fending for itself.

The dingo has long been a fascinating animal with its wolf-like nighttime howl and dog-like features. It is found roaming grasslands, forests and deserts in Australia, eating mammals, scavenging carcasses and proving to be a very effective hunter. Since it was introduced Down Under many thousands of years ago, it has learned to survive and thrive, needing only to live near a plentiful food supply and have enough water for a daily drink. At the same time, it has become hugely significant to Australian culture and many people's way of life.

While the dingo is shy and causes a nuisance to farmers, it has a history that stretches back to a spiritual role in Aboriginal life. The animal is connected to holy places, rituals and stories that have been passed from generation to generation. And yet dingoes have their troubles, too. Largely unprotected, they are vulnerable and undergoing some potentially dramatic genetic changes. Here then, is the legend that splits opinion yet may one day never be the same again.

Wild dogs

"The dingo has adapted well to different environments and their numbers thrived"

Erect ears
Dingo ears are permanently sticking upright and they are also rather large and pointed. Their sense of hearing is acute.

A wider head
Researchers from the University of Sydney noted that dingoes have a wider head and longer snout than dogs and that their skull height is shorter.

Long, sharp teeth
As wild carnivores, dingoes have larger canine teeth than dogs. They also have a bite force quotient of 125, which is greater than that of a lion.

Short fur
A dingo's fur is short leading to a bushy tail, and its colouring assists with camouflage. The fur tends to be darker in the forests and lighter in arid habitats.

Long legs
With their long, lean and muscular legs, dingoes are able to reach staggering speeds of up to 48km/h (30mph), which is slower than a wolf but around the same as a dog.

Where did they come from?

Mystery continues to surround the origins of the dingo and how they ended up in Australia

Scientists are not entirely certain how dingoes came to be but it's generally accepted that their origins can be traced to the Asian grey wolf and that they subsequently descended from the East Asian domestic dog. More recent studies have concluded that the dingo should be classified as a separate species and that there is no ancestral relationship with the wolf at all. One thing is certain, they were introduced to Australia at some point in the relatively recent past.

Evidence points to domesticated or semi-domesticated dogs arriving on the continent from South East Asia at least 3,500 years ago. An archeological finding of a dingo fossil dates back to that period, although genetic research has found they could have arrived around 1,500 years earlier. They are likely to have been transported by seafaring people, possibly to help them hunt or perhaps even as a source of food. But at some stage, some of the dogs escaped into the wild where they rapidly learned to look after themselves.

Before long, they began to reproduce, spreading across Australia in great numbers and evolving into what we can see today as the modern dingo. Since then, the dingo has adapted well to different environments and their numbers thrived, but researchers believe they competed for prey with the carnivorous marsupial known as the thylacine, leading to that animal's decline and eventual extinction. They would also travel with Aboriginal tribes. By the time Europeans were arriving in the 1800s, dingoes were most certainly firmly established.

Dingoes are thought to have caused the extinction of the carnivorous marsupial the thylacine

Who let the dogs in?

Dingoes inhabit South East Asia as well as Australia, and it is this fact that enables us to point to the possible migration path that the dingo's domestic dog ancestor could have taken.

There is now strong DNA evidence put forward by researchers Melanie A Fillios and Paul Taçon that points towards the animals having perhaps originated in China before eventually finding themselves migrating south-east, eventually reaching Borneo and then being given a safe passage into Australia by travelling hunter-gatherers from Sulawesi.

The alternative scenario is that Indians migrating to Australia introduced them, yet dingoes do not have multiple copies of a gene that allows them to digest the starch found in farmed grains whereas dogs do. It suggests the dogs that became dingoes were not around agricultural people such as the Indians, which goes a long way to ruling out this path.

How the dingo is perceived today

Although the dingo has legendary status in Australia, they are not universally loved. In fact, attitudes towards them can sometimes be quite the opposite. Since dingoes are opportunistic carnivores, they prey on many of the country's diverse range of animals including kangaroos, wallabies, wombats, rabbits, birds and reptiles. But they also kill and eat domestic livestock, most notably sheep and calves, angering farmers to the point that they'll shoot and poison them.

To keep the dingoes away from the fertile south-east areas of Australia, the authorities decided to build what became the world's longest fence in the 1880s. At one point it stretched 8,614 kilometres (5,353 miles) in length, but it is now 5,614 kilometres (3,488 miles), cutting through acres of arid land and monitored by patrol teams. It has been mostly effective in keeping Australia's largest mammalian carnivores at a distance.

That said, some experts suggest that farms could benefit from the presence of dingoes. A study at the University of Adelaide in 2014 said they could keep the numbers of kangaroos in check, thereby ensuring there is more vegetation available for cattle to eat. Environmentalists and biologists also tend to agree that the dingo is a part of the native Australian fauna, while the state of Victoria stands alone in formally protecting the animal.

And yet there are still restrictions and much bad press. People in Tasmania, Queensland and South Australia are banned from owning them as pets, for instance, while dingoes were at the centre of a strange criminal case in 1982. Michael and Lindy Chamberlain claimed that dingoes had taken their baby while they were camping at Uluru (also known as Ayers Rock), but they ended up being jailed for her murder. Their names were cleared 30 years later when a coroner ruled they had actually been telling the truth.

Even so, dingoes are part and parcel of Australian culture and they are very much respected among the Aboriginal people, who have woven the animals into their culture and law for thousands of years. Early European colonists noted they were using dingoes for a number of purposes including as watch dogs and blankets, for even in the wild, dogs have the capability of being man's best friend.

Biggest threats

Humans are arguably the greatest threat to the dingo since they are often determined to be pests. Dingoes have been listed as a threatened species in the state of Victoria since 2008.

While related to the first point in many respects, habitat loss is a major threat to the survival of dingoes. Humans are continually encroaching into their space as populations rise.

Bird of prey are also a danger for dingoes. Young dingo pups are vulnerable to being picked off by predators from the air. That said, dingoes are known for stealing the prey of eagles.

It has been said that 90 per cent of the wild dogs in Australia today cannot actually be called pure dingoes, but hybrids, since they have long been cross-bred with domestic dogs.

How dingoes ensure their survival

Although young males may lead a solitary life, dingoes typically live in packs of around 12 animals. Classed as apex predators since they are at the top of the food chain, they hunt for their tasty meals, either scavenging, stealing or begging from humans or going out alone for smaller prey. But if there is a larger prize in sight, they will opt to hunt in larger numbers, launching at the throat of a kangaroo, perhaps, having diligently pursued it with support from their pack.

Dingoes are not afraid of travelling for their food and have been known to cover as many as 60 kilometres (37 miles) in a single night. They are able to climb trees thanks to their flexible wrists and they will store the remains of any food underground for later. But although they will also eat fruit and berries if need be, scientists have also discovered they will – if desperate – rip at the carcasses of other dingoes. The animals will also ensure only the healthy specimens of their pack are fed, leaving the old and weak to starve.

"Dingoes are part and parcel of Australian culture and they are very much respected"

A dingo captures a bearded dragon in Australia

Spreading the word

A look at the methods dingoes use to communicate with each other

Like domestic dogs, dingoes are able to bark but they certainly don't do it very often. If they do, it is to communicate a warning and is sharper and more abrupt.

Dingoes prefer to howl and have several types: some flat, some long and persistent, and some with short rising and lowering tones. Groups can howl simultaneously.

If a dingo is looking to show its dominance, it will growl with its mouth firmly closed. It will use the same sound for defence if it feels threatened.

As well as verbal communication, dingoes are able to sent mark just like a domestic dog and will do so using chemical signals from their faeces, scent glands and urine.

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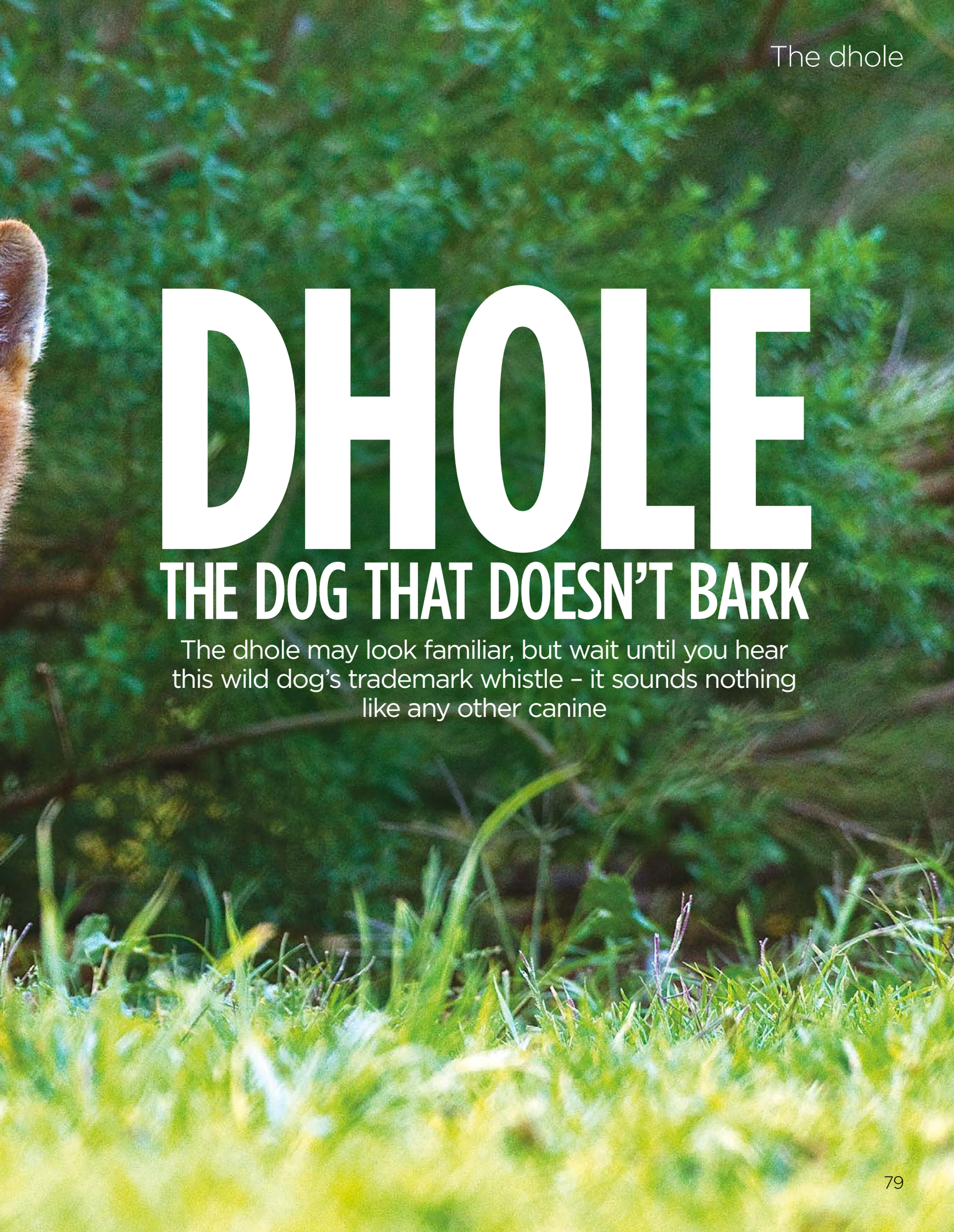


DHOLE

THE DOG THAT DOESN'T BARK

The dhole may look familiar, but wait until you hear this wild dog's trademark whistle – it sounds nothing like any other canine

Meet the super pack

Dholes are strategic and cunning pack hunters

Dholes are sociable animals, with an instinctive understanding of their place within a pack. The intricate social structure of their groups makes them efficient hunters, using the power of teamwork to take down prey they could never catch alone.

Each pack has an alpha male and an alpha female, who are usually the only members to reproduce. The rest of the group consists mainly of males, in varying degrees of status, and a smaller number of females. Despite this, dholes are less hierarchical than wolves, show little aggression to each other (though dominance is expressed), and have been observed playing with enthusiasm, displaying strong bonds and family relationships. Perhaps the most notable expression of their empathy is that they let their young feed off a kill first, rather than favouring the dominant members' needs, as is so often the case in the animal kingdom.

Dholes are also less territorial than wolves, and there is little friction between packs; young members can join other packs without much of a struggle. Despite showing little pack rivalry, dholes claim huge territories of up to 88 square kilometres (34 square miles). The social aspects of the dholes' lives in groups are peaceful, but it's the way that they use their numbers during hunting that has earned them a fearsome reputation.

These pack hunters frequently break into smaller groups during hunting. They know how to exhaust, corner, and confuse their prey, and will often entrust a few members with the duty of distraction, while others sneak up from behind. During the chase, these fast and nimble canids will slow down their prey by wounding them where it counts – eyes are gouged, genitals are ripped and hamstrings are torn to bring them to a halt. The dholes' ruthlessness does not stop there: they often eat their prey alive.

DHOLE
Cuon alpinus
Class Mammalia

Territory Central and eastern Asia
Diet Rodents, hares, ungulates
Lifespan 8-12 years
Adult weight 15-20kg (33-44lb)
Conservation status

EX EW CR EN VU NT LC

ENDANGERED

The forgotten dog

Considered a pest due to their taste for cattle, the dhole was hunted to near extinction in the 20th century

You might be surprised to learn that while there are an estimated 3,000 tigers left in the wild, there are thought to be less than 2,200 dholes left. Estimates of population sizes are difficult though, due to their elusive nature and the small amount of research done on their behaviour and numbers. One thing researchers can agree on is that the population is decreasing, mostly due to habitat loss, culling, depletion of their natural prey and even diseases transmitted by domestic dogs.

Dholes are currently protected and categorised as Endangered by the IUCN Red List, but there was a time that these beautiful and remarkable dogs were considered a pest. For most of the 20th century, the dhole was feared across many Asian countries, and was hunted relentlessly. Even today, the canines are frequently blamed for depleting the tiger's prey base, and hunting domestic fowl. Herders often poison carcasses of their livestock – an act that can wipe out an entire pack immediately.

Despite this, there has been a limited effort to protect or conserve the dhole, partly due to a lack of awareness about the species among the general public. Although they are legally protected in the countries where they are found, the laws are poorly enforced. The dhole is not as famous or iconic as the tiger or panda, which is why it is often referred to as the 'forgotten predator'. The few conservation programmes that are in place often focus on improving the relationships with local communities through information and insurance, as well as reimbursements for lost livestock.

BELOW
Dholes have disappeared from almost their entire range over the last 50 years

The whistling dog

The dhole cannot bark – but that doesn't hold it back from making a racket

It's generally accepted that the domestic dog's bark is a learned behaviour – while wolves and other wild canines are capable of making bark-like sounds, they are seldom observed making these vocalisations to communicate in the wild. But if you were to hear a wolf during a hike in the woods, you would immediately recognise it as a wolf, and it would sound very similar to your pet husky.

If you were to hear a dhole in the wild, however, your first thought would probably go towards your pet parakeet. As odd as it sounds, dholes make strange, high-pitched noises that sound like a bird's whistling. They are capable of producing a huge range of sounds that could actually beat dogs and wolves in their variety. They whine, scream, whistle, howl, growl, squeak, sing and hum – which is why a pack of dholes can sound like a canine orchestra.

Unfortunately, dholes are extremely rare and often fear human company. In fact, they are among the hardest animals to track. The few researchers devoting their time to this shy creature often spend years hoping for a sighting, and catching and putting a tracking collar on an individual is nigh impossible.

How exactly the dhole came to develop these noises is not yet known due to limited research on the rare species. It is widely assumed that the high-pitched whistling is used for hunting communication – in thick vegetation, where vision is poor, the dogs whistle to one another to keep in contact while they carry out a team attack. However, some researchers have proposed that they also use their vocal talents for social interaction. Dholes are very hard to identify as they spend so much time in packs, but it may be possible to tell individuals apart by their distinctive calls.

"They whine, whistle, howl, growl, squeak, sing and hum; a pack of dholes can sound like a canine orchestra"

ABOVE
Dholes have one less molar on each side of their mouths than all other members of the Canidae family

Dhole doppelgängers

Fox
The dhole is small, lean and nimble. Built for speed, its anatomy is similar to that of many foxes, particularly the red fox. The fox would outrun the dhole in a sprint, but the dhole would win an endurance race.

Domestic dog
Though dholes have shorter lower jaws and fewer molars than domestic dogs, they share an endearing trait: they will wag their tails in excitement when they are reunited with their pack members.

Wolf
The wolf is larger and stockier than the dhole, and shows far more aggression both within a pack and towards other packs. While dhole packs have several females, wolf packs usually only admit one.

African wild dog
A close cousin of the dhole, the African wild dog has many behavioural traits in common with it, including advanced pack hunting strategies and a strong sense of community within a pack.

Hyena
Despite some physical similarities with the dhole, the hyena is actually not a canine at all. It's part of the Hyaenidae family in the Feliformia suborder – which also includes big cats, mongooses and civets.

Dhole and man

Aside from hunting tactics, the dhole shows signs of insight and learning

As many pet owners will know, canines often show a remarkable ability to learn and adapt their behaviours according to their environment. While domestic dogs developed the capability to read our body language as a species, and show signs of learning through tricks and commands, the dhole has also become familiar with human behaviours and habits – and learned to stay away from them.

In an award-winning documentary by Krupakar-Senani, *Wild Dog Diaries*, a particular pack of dholes living close to an indigenous human settlement was tracked for over 12 years, showcasing their elusive nature. As the researcher, accompanied by a tribesman for guidance, observed the dhole pack hunting, they noticed the wild dogs abandoning their prey right before the kill. Confused by this behaviour, the researcher asked his indigenous friend whether he'd seen this before. With a shrug, the tribesman stated that hunters from his community frequently followed the dhole and stole their kills. The dhole had soon learned that any prey in the near vicinity of humans was not worth hunting, and abandoned their attempts when they sensed the humans' presence.

Dhole are extremely social creatures, and young individuals learn vital skills through play

© FLPA; Getty; Nature PL; Thinkstock

Dhole attacks on humans are very rare; the canines tend to avoid human contact where possible

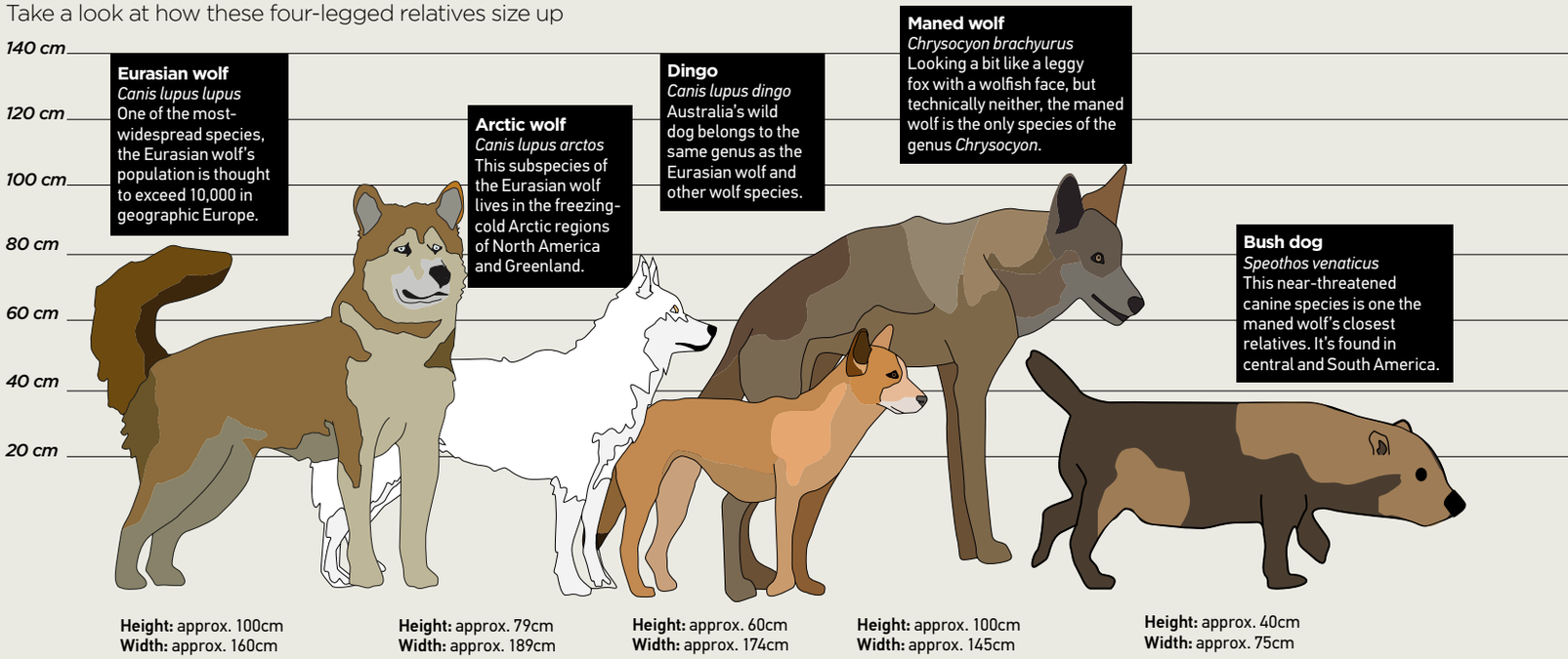
"Dhole have become familiar with human behaviours and habits – and learned to stay away from them"

LONE WOLF

Stalking through its vast South-American territory, the maned wolf is unique in more than just appearance...

Size comparison

Take a look at how these four-legged relatives size up



On the grasslands, savannahs and swamps of South America roams a lone, large and particularly leggy hunter. With elegant long limbs, a rich, rusty-coloured coat and large, bat-like ears, the maned wolf resembles a super-critter made of the best bits of other animals – and it carries this look rather well. The wolf gets its name from the usually black ruff of fur around its neck and upper back that can stand on end to make it look much larger when threatened. However, even the name is deceiving, as the maned wolf isn't really a wolf. Despite its foxy-looking features, it's not a fox either – it is the only surviving species of the genus *Chrysocyon*, but rests within the same subfamily as true foxes and wolves, although not directly related.

The long, thin snout of this wolf is framed by its huge ears – these are held erect to provide excellent hearing and can also swivel around to pinpoint the location of prey, helping the wolf hunt. The maned wolf's slender frame is perfectly adapted to its grassland home. The beautiful long legs that have earned the animal numerous nicknames, such as stilt-legged wolf, are amazing for stealthily picking a path through the tall grasses of the South-American plains, making it a delicate and accomplished predator. However, don't be fooled by their length – the legs aren't made for running, but rather trotting with a jaunty, energy-saving gait. The legs on the same side move together, not alternatively of each other.

Unlike their wolfish cousins, maned wolves do not live in large packs. They aren't sociable at all, preferring to be solitary, nocturnal hunters that use excellent night vision to track down their dinner. During the first six months of the dry season, the wolf will hunt and eat small rodents such as mice or wild guinea pigs. It will also feast on other options such as birds, reptiles and insects if the opportunity presents itself. When the rainy season arrives, the maned wolf breaks away from the typical habits of its carnivorous canine relatives and survives almost solely on fruit and vegetation.

Maned wolves will only occasionally gather together and are mostly solitary

Foraging for fruit also takes place at night, as the wolves rest in the grass and thick shrubs during the day. Their favourite meal is a tomato-like fruit, lobeira, known locally as 'fruta de lobo' which translates as 'fruit of the wolf'. Many people believe that in eating this fruit, the wolves are protected from a parasite known as the giant kidney worm, to which they are very susceptible.

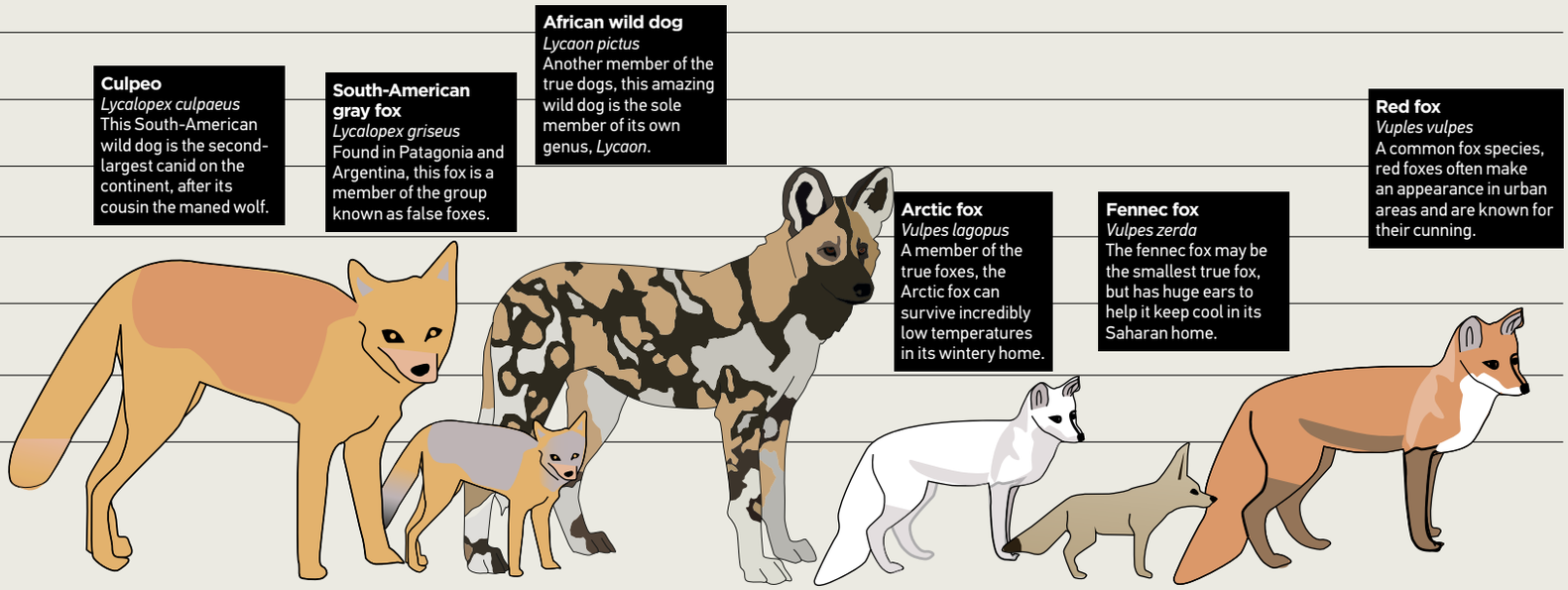
Although the wolves play an important part in this ecosystem by spreading the seeds of the fruit through

MANED WOLF
Chrysocyon brachyurus
Class Mammalia

Territory Brazil, Paraguay, Bolivia, and Argentina
Diet Small mammals, reptiles, vegetation
Lifespan Up to 16 years
Adult weight 23kg / 50lbs
Conservation status

EX EW CR EN VU NT LC

NEAR THREATENED



"The maned wolf's slender frame is perfectly adapted to its grassland home"

their droppings, their food may still be very widely dispersed. An adult wolf needs a territory of up to 26 square kilometres (ten square miles) to survive. Mated, monogamous males and females of the species can share a territory, but as the expanse of land is so large they rarely meet and interaction is kept to a minimum.

To keep out rival wolves, each territory is marked heavily using urine and faeces, which as you'd expect has a very distinctive smell! Keepers of maned wolves in captivity have told of how their urine smells strongly like skunk spray, or even worse! This pungent scent has also earned the wolf the less-endearing nickname skunk wolf. Another method of protecting their home ranges is letting out bark-like noises, known as roar-barks. They use these at dusk to warn other wolves that they ought to keep away from the area.

Mating season sees the most social interactions between maned wolf individuals. Between April and June mated pairs come together, and females give birth to between two and five cubs 65 days later. Pups are born black and get their brilliant rusty-red colouring after around ten weeks old and classic, gangly, maned-wolf legs at around ten months. Males often take part in raising the pups and have been witnessed regurgitating food for their litter.

Maned wolves have no real predators and their most significant threat comes from human interaction. The reduction of habitat through clearing for agricultural land, and some deforestation, affects their need for large territorial areas. There is also the impact of living closer to human settlements. Many maned wolves are killed on roads and the threat from domestic dogs is always present, as they may pass on disease or chase the wolves, putting them under extra stress.

It's thought that pups stay with their mother until they're about a year old

© Alamy, Dreamstime, Corbis

Endangered African wild dog

AFRICAN WILD DOG
Lycaon pictus
Class Mammalia

Territory Southern Africa
Diet Antelope, wildebeest, zebras
Lifespan 11 years
Adult weight 18-36kg (40-80lb)
Conservation status

EX EW CR EN VU NT LC

ENDANGERED

Despite being one of the few carnivores that rarely fight among themselves, the African wild dog has become an endangered species whose future looks bleak. There are thought to be less than 5,000 left in the wild and numbers are falling rapidly. Due to their large ranges, wild dogs often overlap with human communities, who treat them like vermin or hunt them for bushmeat

The causes of extinction

Extermination

Of all the threats to African wild dog populations, their treatment as vermin is the most catastrophic. Traps, poisoned food and firearms are used to wipe out local packs in areas where humans have expanded. In fact, these practices have become so severe that the African wild dog has been all but eradicated in northern and western Africa.

Hunting

Large sections of Africa are affected by poverty and other social factors that have seen a boom in the 'bushmeat' trade. Since wild dogs are relatively passive and often move in packs of ten or more, they are easily caught in snares. Packs work as teams to survive, so the loss of one member can be devastating for the others.

Habitat destruction

Something as seemingly simple as human expansion has had a devastating effect on the ranges, pack sizes and general populations of the African wild dog. Normal habitats have driven packs into isolated pockets, while the introduction of new diseases has also contributed to the species' steady decline.

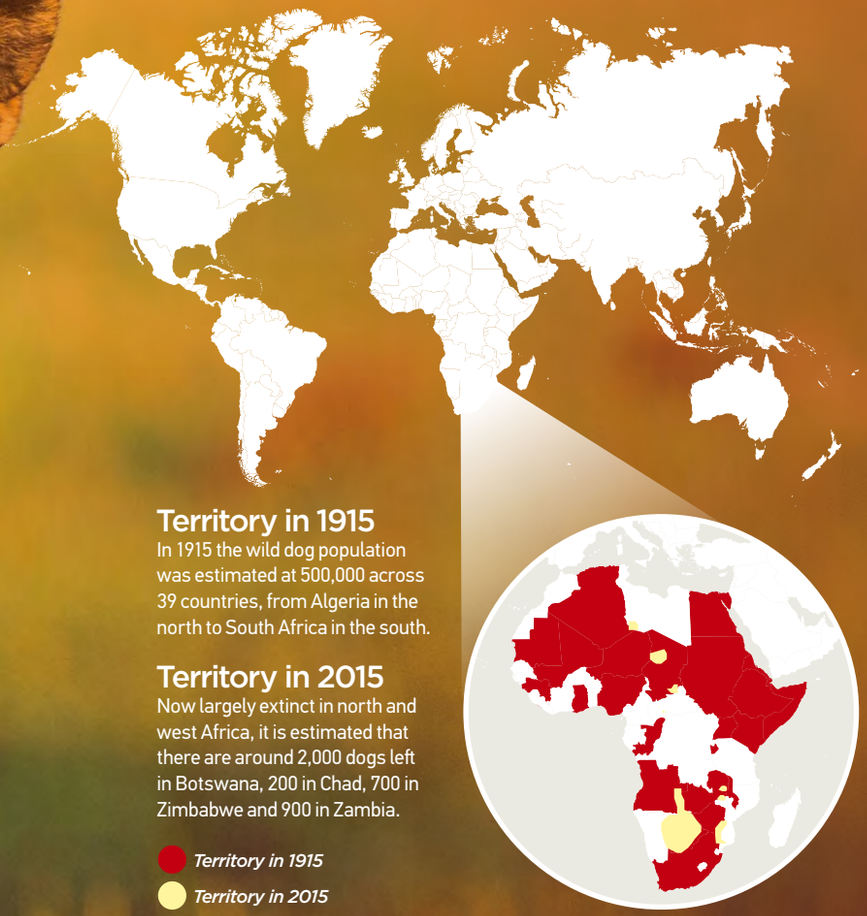
What you can do...

WWW.AWDCONSERVANCY.ORG

If you want to learn more about wild dogs, you can travel to wildlife parks and reserves supported by the African Wild Dog Conservancy in Kenya. Donating to conservation projects and helping to spread a positive message helps, too.

The decreasing habitat

A century ago, human populations were not as widely spread across Africa and so did not encroach on wild dog territory as much as they do in the modern day



Territory in 1915

In 1915 the wild dog population was estimated at 500,000 across 39 countries, from Algeria in the north to South Africa in the south.

Territory in 2015

Now largely extinct in north and west Africa, it is estimated that there are around 2,000 dogs left in Botswana, 200 in Chad, 700 in Zimbabwe and 900 in Zambia.

Territory in 1915

Territory in 2015

3 reasons why we should save this species

Unlike many other species of mammal, the African wild dog male will stay with the natal group they grew up in – even when they reach maturity. On the other hand, females will often leave the group upon maturity to seek a pack elsewhere.

When it comes to preparing for a hunt, the African wild dog has a rather playful and unusual quirk. Members of the pack will start circling, yelping and brushing up against each other.

For an animal that has been driven with ferocity onto the endangered list, the African wild dog is a remarkably non-aggressive hunter. Upon a kill, infants are allowed to feed first, while the rest of the pack will share the carcass without fighting.

Expert view: the future of the African wild dog

Dr Robert Robbins and Dr Kim McCreery are co-directors of the African Wild Dog Conservancy, which aims to help improve wild populations in Kenya and other sub-Saharan countries by taking an adaptive grassroots approach

While their numbers suffered greatly over the 20th century, a number of national conservation projects are now working hard to protect existing African wild dog numbers and provide them with the safety to slowly expand. For Dr Robert Robbins and Dr Kim McCreery of the African Wild Dog Conservancy, a big part of this will involve educating local communities and helping them coexist with these wild packs.

"Our conservation programme in Kenya focuses on wild dogs in an area that is not a major tourist attraction, but rather primarily where people and wild dogs coexist on communal lands," says Dr Robbins. "This is a community-based effort to educate and inform people of all ages, including students, herders, villagers and local public officials, about wild dog myths, natural history, and the similarities they share with human families."

But for many, the stigma surrounding wild dogs means that thinking of them as anything other than pests is a big shift. Dr McCreery believes that changing attitudes is vital, since these wild dogs are just as important to Africa's ecosystem as any other creature.

"Well, we really like wild dogs and respect them in their own right," she adds. "As part of the web of life that all of us are connected to, we take the scientific position that as the web of life unravels, so do the lives of humans. A world without predators would not only negatively impact natural systems on which we as well as other animals depend, but in the words of American conservationist Susan Tixier, it 'becomes safe, sterile and dead.'"

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COYOTE
AN AMERICAN ICON

Whatever life throws at the coyote – whether it's an ice age, hunters, a loss of habitat or changing surroundings – it has proved itself to be a born survivor

It may seem odd that coyotes can be viewed as an American icon. Hunted by some and thought of as a pest by others, they are rarely seen during the day but make their presence known at night as they kill sheep and chickens and encroach further and further into city life. But an icon they most certainly are. Admired for their crafty ingenuity and an important and revered character in folklore and mythology, they are complex creatures, both gregarious and solitary.

As the years have gone by, their numbers have risen, with populations well into the millions. Coyotes have thrived, in part, due to human intervention – deforestation, hunting, poisoning and traps – causing the extermination of their natural enemy, the wolf, allowing them to roam freely. Without the presence of wolves, coyotes became an apex predator, and it is perhaps only through their shy nature that attacks on humans have remained uncommon while coyotes have spread across the American continent.

But again, that is to dwell on the negative side. Coyotes have proven able to adapt, typically sleeping away most of the light hours in modified badger burrows, rocky crevices or urban hideaways as they seek an escape from the heat and look to avoid detection. They'll come out at night in seek of prey, biting down hard on their chosen meal and shaking it vigorously to break its neck before devouring. They are born survivors, almost following the American Dream to the letter. Their success has been achieved through hard work, determination and initiative – albeit with a penchant for a shortcut or two.

COYOTE
Canis latrans
Class Mammalia

Territory Central and North America
Diet Rabbits, rodents, deer
Lifespan 10-14 years
Adult weight 23kg/50lbs
Conservation status

EX EW CR EN VU NT LC

LEAST CONCERN

Becoming America's top dog

Coyotes have proven to be so adaptable they are now even part of New York life

Coyotes have prowled the American landscape for hundreds of thousands of years, descending from the ancestor of wolves and proving more than adaptable to the continent's changing environment. During the Pleistocene epoch that lasted up to 11,700 years ago, coyotes were bulky, fierce creatures that used their large jaws and teeth to easily take down ancient giants such as mammoths. But they not only survived the difficult time when those large animals became extinct after the ice age, they thrived. Their jaws shrank and their size reduced as they started to prey on smaller creatures instead.

For much of their history, they were confined to the open prairies and deserts of central North America and Mexico. But when European colonists began to slaughter wolves and other predatory populations, the coyotes seized an opportunity. Able to breed more quickly than their fellow predators and adapt their diets, they expanded their range into areas that were once controlled by wolves. From 1700 onwards, they moved west then east. Today, coyotes can be found across the entire continent.

As common in cities and their suburbs as they are in the countryside, they have shifted their diet to feast on just about anything. But they have also entered into American culture. Native Americans tell stories of them, emphasising their wandering instincts, their survival and crafty personalities. Coyotes have also sung from mountain tops in Western movies and come to sticky ends in cartoons. They are an icon of the Wild West and secret urban dwellers that can even be found prowling the Big Apple. With more coyotes than at any other point in history, they also look set to stay.

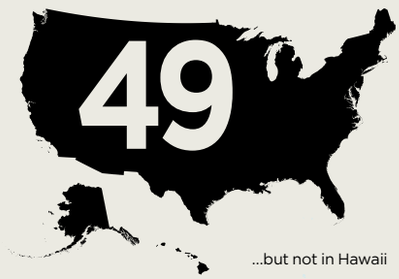
> "Able to breed more quickly than their fellow predators and adapt their diets, they expanded their range"

How similar are wolves, dogs and coyotes?

With a four per cent genetic difference, it is possible to use DNA analysis to distinguish coyotes from wolves and dogs but, as closely related species, there are many similarities between the three and it can be difficult to tell them apart on first glance. Certainly, all three are intelligent, social animals and great communicators that form strong family groups. Biologically, each also have heightened senses with eyes composed almost entirely of rods and a very well-developed sense of smell. They also have similar, varied fur colouring, scent mark their territory and have a natural fear of humans. But there are many differences. Coyotes have tall, pointed ears, a narrow, pointed snout and small paws whereas gray wolves have round ears, broad block snouts and larger paws. Most domestic dogs have floppy ears, short snouts and paws that sit between those of coyotes and wolves. In addition, gray wolves do not have a curly tail whereas dogs do and coyote tails are bushy. In fact, as coyotes run, their tails are kept down but dogs raise theirs and wolves keep them straight out.

Coyotes in numbers

Coyotes can be found in 49 US states...

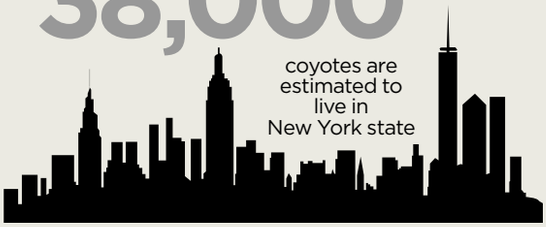


They can run as fast as

65 km/h

38,000

coyotes are estimated to live in New York state



There are **19** recognised subspecies

Coyotes were present in the Pleistocene epoch, which began **2.6** million years ago

400 THOUSAND are killed by hunters each year

Ancestors of the modern coyote

We can trace back relatives and ancestors of the coyote for more than 6 million years

Eucyon davisi
Miocene, 6 million years ago

Canis lepophagus
Pliocene, 5 million years ago

Canis chihliensis
2.7 million years ago

Canis edwardii
Late Blancan stage of Pliocene epoch, 2.3 million years ago

Canis aureus
1.9 million years ago

Canis ambrusteri
1.8 million years ago

Canis gezi
1.2 million years ago

Canis latrans
Early Pleistocene, 1 million years ago

Canis nehringi
800,000 years ago

Canis lupus
800,000 years ago

Canis dirus
125,000 years ago

Domestic dog
30,000 years ago

Versatility makes for wily coyotes

Coyotes possess a highly sophisticated intelligence, which has ensured survival regardless of circumstance

It is a mystery why the *Looney Tunes* character Wile E Coyote decided to buy weird and wonderful inventions from Acme when he could have stopped the Road Runner in its tracks by falling back on his animal instincts. But at least the cartoonists lent him the right name, since coyotes are indeed very wily, not to mention sneaky, and this allows them to flourish no matter where they live.

Just as the cartoon character tip-toed behind a rock as he waited for an anvil to fall on his prey, real-life coyotes can limit the noise they make by only allowing their toes to touch the ground. It allows them to get up close to their prey, attacking from the front and going for the head and throat. What's more, they can do this alone or in packs if their target is too large, their behaviour adapting to circumstance.

They'll scavenge if need be and smartly turn to fruit, vegetables and berries if there is no meat available. But they'll also root out plentiful supplies of ready meals – garbage left by humans, for instance, or food that has been put out for other animals. For as well as encroaching on ranches and preying on sheep, they are heading to cities in great numbers, even finding their way through open windows, doors and pet flaps for scraps.

It is in such environments that they put their cunning and athleticism to good use. Their resourcefulness allows them to make the most of their urban habitats (they've even figured out how to safely cross roads). They are also able to leap four metres (13 feet) from a standstill, allowing them to get over fences with relative ease.

"They've even figured out how to safely cross roads"

The coyote diet

Black bear cubs

Bison

Sheep

Deer

The explosive rise of the coywolf

When coyotes mate with dogs, they produce a canid hybrid called the coydog, which is similar in appearance to the coyote yet expresses loyalty, shyness and a mischievous streak. They are, mainly, deliberately bred although, in areas of high dog populations, coyotes will sometimes mate with domesticated canines in the wild.

But it's another coyote hybrid – the coywolf – that is gaining the most attention, having taken Eastern North America by storm. A result of mating between coyotes and wolves, they have grown in number over the past century and are made up of 65 percent coyote with an additional 25 per cent wolf and 10 per cent domestic dog DNA.

Coywolves emerged when eastern wolves suffered a drop in population due to hunting and the clearing of forests, and so began to breed with coyotes from the west. They are twice the size of coyotes with larger muscles and jaws. Known alternatively as the eastern coyote, they are able to live in smaller habitats than wolves, making them ideal for urban life.

Top three facts about coyotes

1 Coyotes are monogamous, mating with their partner for life and only seeking a new companion when their previous one dies. Both male and female will raise their pups together.

2 When coyotes hunt prey in winter, they can sniff animals buried under the snow. They rear up on their hind legs before slamming down with their front paws, tearing through the surface with ease.

3 Coyotes have a famous howl but it's not the only vocalisation they possess. They actually have 11, including yelps, whines, growls and – just like dogs – a bark.

Snakes

Birds

Rabbits

Coyote folklores and mythology

The coyote has figured as a negative character in many ancient stories

ABOVE While wolves have gained an air of mysticism and elegance about them, coyote still receive a lot of negative attention, and are seen as a pest by many

Among the Maidus, the coyote was perceived as dishonest. One story tells of the coyote watching the Earth Initiate create animals from clay. When trying to do the same, it laughed, then denied laughing, telling the world's first lie.

Achomawi legend suggested Coyote was to blame for winter storms after it took the lead in a race against Cloud which reacted by growing tempting fruits before its competitor. As Coyote munched, the Cloud caught up and soon claimed victory.

When Coyote believed Duck had caused his daughter to fall ill, Native American legend determined that it led the bird into a hole before treating Duck's wife and children badly. Duck sought revenge by freezing Coyote to death.

"Coywolves emerged when eastern wolves suffered a drop in population due to hunting and the clearing of forests"

© Thinkstock, Getty, Alamy

One of a kind Raccoon dog

Charismatic, cunning and incredibly cute: raccoon dogs are some of the quirkiest canines around

RACCOON DOG
Nyctereutes procyonoides
Class Mammalia

Territory East Asia and Europe
Diet Frogs, lizards, birds, rodents and fish
Lifespan 7-12 years
Adult weight 7kg/15lbs
Conservation status

EX EW CR EN VU NT LC

LEAST CONCERN

You'll win no prizes for guessing how the raccoon dog got its name: this bandit-like canine bears an amazing resemblance the North American raccoon. Although the two species are barely related on a genetic level, their similarities go further than appearances. They both have dexterous front paws, which they use to catch slippery aquatic prey.

The raccoon dog is also notable for being one of the only canine species capable of climbing, and is the only dog-like mammal known to hibernate in winter. However, as it's not part of the *Canini* tribe, it's not a 'true dog' either; a basal canid, it exists in a separate genus.

However, one of the most impressive adaptations of the raccoon dog is its winter coat. Its thick fur consists of two layers, keeping it cosy in temperatures as cold as -25 degrees Celsius.

In Japan, raccoon dogs are known as tanukis; they are considered lucky and thought to attract good fortune. Amusingly, the raccoon dog's large testicles are often exaggerated to symbolise its supposed wealth.

The raccoon dog is a skilled climber, and climbs the trees in its natural habitat with its curved claws

The talented tanuki

They may not be closely related to raccoons in terms of genetics, but raccoon dogs are similarly wily. Like their namesakes, they are known to be talented thieves – in cases where these cunning canines have been domesticated, their owners have highlighted how difficult it is to prevent them from stealing food.

In the wild, raccoon dogs use their quick wits and social skills to form monogamous, mutually beneficial relationships with their partners. While females stay at home to look after the pups, males forage food to bring back to their families.

Fur trade

The raccoon dog's beautiful coat has sadly led to the species being targeted by fur traders. Multiple raccoon dogs are crammed into uncomfortable wire cages before being bludgeoned and skinned, often while they're still alive. Since raccoon dog fur has previously been mislabelled as 'faux fur', consumers don't always realise that they're supporting such cruel practices. This caused a widespread scandal in the fashion industry in 2008.

Muzzle
Raccoon dogs use their snouts to root around in the ground for insects. Like other canines, they rely on their keen sense of smell for hunting.

Fur
A short, dense undercoat keeps the raccoon dog insulated in freezing weather, while longer guard hairs provide an extra layer against the elements.

Teeth
As they are omnivorous, raccoon dogs have smaller carnassials and canines than other dogs. Their flat molars are useful for chewing and grinding a wide variety of food.

Feet
Curved claws help raccoon dogs to climb trees, a skill that most canines lack. Their dexterous front paws allow them to keep hold of slimy prey like fish and frogs.

Raccoon dogs in Europe

Despite being indigenous to east Asia, raccoon dogs have gradually expanded their territory into Europe. Originally released in Russia by the Soviet Union as hunting fodder, their adaptable nature and tendency to travel means they have wasted no time in scurrying their way across the continent.

These days, raccoon dogs are common in northern Europe, and individuals have been spotted as far west as France. They're viewed as pests in Scandinavia, where they have thrived thanks to their ability to survive cold winters and food shortages.

To prevent them from destroying gardens and spreading parasites, countries like Sweden and Denmark encourage citizens to hunt raccoon dogs. However, the hardy critters are difficult to shift, and it's predicted that their range will widen as climates get increasingly warmer.

Raccoon dogs form monogamous pairs that mate for life, and the males play a significant role in raising young

Relatives of the raccoon dog

While the raccoon dog is one of a kind, these canines share similar evolutionary traits

Grey fox
Like the raccoon dog, the grey fox is a basal species, meaning it is the most primitive species of its kind. They share their tree-scaling abilities with raccoon dogs – indeed, these are the only two canines in the world capable of climbing.

Bush dog
Bush dogs are similar in stature to raccoon dogs, with short legs relative to their body size. They live in forested areas near water, another trait shared by the raccoon dog.

Crab-eating fox
These South American canines are loyal to their partners, forming monogamous pairs just as raccoon dogs do. However, crab-eating foxes are found in South America, whereas raccoon dogs are native to Asia.

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BEWARE THE JACKAL

From scheming tricksters to gods of destruction, jackals have been given a devious reputation in folklore and mythology

Beware the jackal

This jackal, photographed at the Kgalagadi Transfrontier Park in southern Africa, was successful in its chase after taking these grouse by surprise while they settled to drink at a waterhole

Scheming jackals

The canid with ulterior motives

Ancient stories and religious texts have a significant influence over how people perceive animals. Just as the fox has been depicted as a sly and cunning creature in Western literature, the jackal has traditionally been portrayed as a sneaky mischief-maker in the East.

There are three official members of the jackal family. Black-backed jackals and side-striped jackals can be found in Africa, while golden jackals are spread throughout southeastern Europe, the Middle East and Asia.

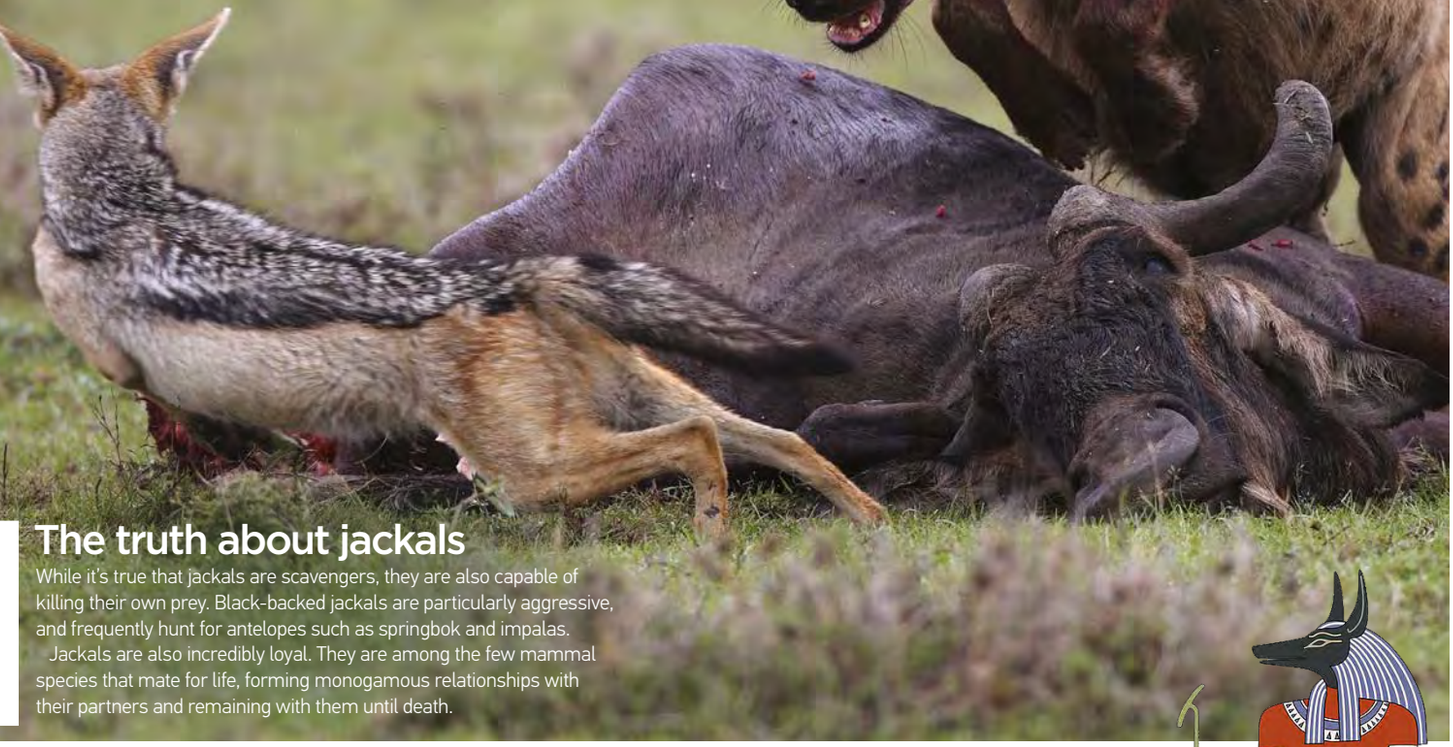
Various associations and meanings have been given to jackals, with different cultures assuming different personalities for the wild canines. Here are a few examples.

Jackals of the Khoikhoi

Stories in which sneaky tricks are the jackal's speciality

African folktales portray jackals as clever, opportunistic animals capable of outwitting more powerful predators thanks to their superior intelligence. The folklore of the Khoikhoi, an indigenous group of people from South Africa, includes several stories in which lions are tricked into giving up their food by jackals. Other Khoikhoi fables compare jackals to hyenas. One tale involves a jackal sneaking on to a passing wagon filled with fish by pretending to be dead. When a hyena wants to copy the idea, the jackal advises him to remain still no matter what happens. This leads to the hyena taking a violent beating from an unfriendly wagon driver and failing to steal any fish, much to the amusement of the jackal.

NAME OF ANIMAL
Unnamed
Famous for Trickery and intellect
Time period 300 BCE
Part of the world
South Africa



"African folktales portray jackals as clever, opportunistic animals"

The truth about jackals

While it's true that jackals are scavengers, they are also capable of killing their own prey. Black-backed jackals are particularly aggressive, and frequently hunt for antelopes such as springbok and impalas.

Jackals are also incredibly loyal. They are among the few mammal species that mate for life, forming monogamous relationships with their partners and remaining with them until death.

NAME OF ANIMAL
Anubis
Famous for Death and judgment
Time period 3100 BCE
Part of the world
Egypt

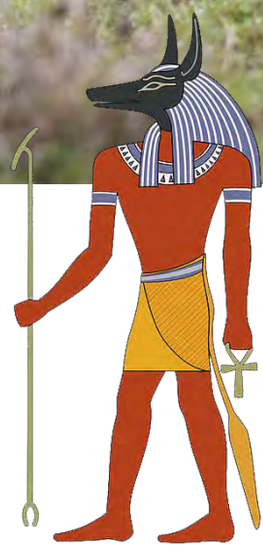
Anubis, god of the afterlife

The ancient Egyptian guardian of the dead

Among the most famous ancient Egyptian deities is Anubis, the jackal-headed god of death and the afterlife. As well as being a protector of graves, Anubis is particularly associated with mummification – he is described as an embalmer, attending to the mummies of the deceased and guiding worthy souls into the afterlife.

The scales of justice are used by Anubis to weigh the hearts of the dead and determine the fate of their souls. Those lighter than a feather are allowed to pass into an immortal existence. However, souls that are heavier than a feather are devoured by Ammit, a horrifying part crocodile, part lion, part hippopotamus demon.

Wild dogs were known for digging up graves and scavenging human flesh, so Anubis's jackal form may have been chosen to guard the dead from canines after they were buried.



Tabaqui, the tiger's servant

An unpopular jackal from a literary classic

Although he doesn't feature in Disney's animated classic, a jackal called Tabaqui was included in the original *Jungle Book* stories by Rudyard Kipling. The character is portrayed as a lowly scavenger, and the only friend of villainous tiger Shere Khan.

Tabaqui is despised by more noble animals like Baloo, Bagheera and the wolves – his submissive relationship with Shere Khan, sly behaviour and rabid rampages through the jungle paint a negative portrait of the jackal species. Eventually Tabaqui confesses Shere Khan's murderous intentions and is consequently killed by one of Mowgli's wolf brothers.

Some *Jungle Book* spin-offs depict Tabaqui as a spotted hyena. These dog-like animals are similarly associated with untrustworthy behaviour in folklore.

NAME OF ANIMAL
Tabaqui
Famous for Dishonesty and cowardice
Time period 1894
Part of the world
United Kingdom

Teaming up with tigers
Like Tabaqui, golden jackals expelled from their packs will sometimes associate themselves with tigers to feed on their kills.

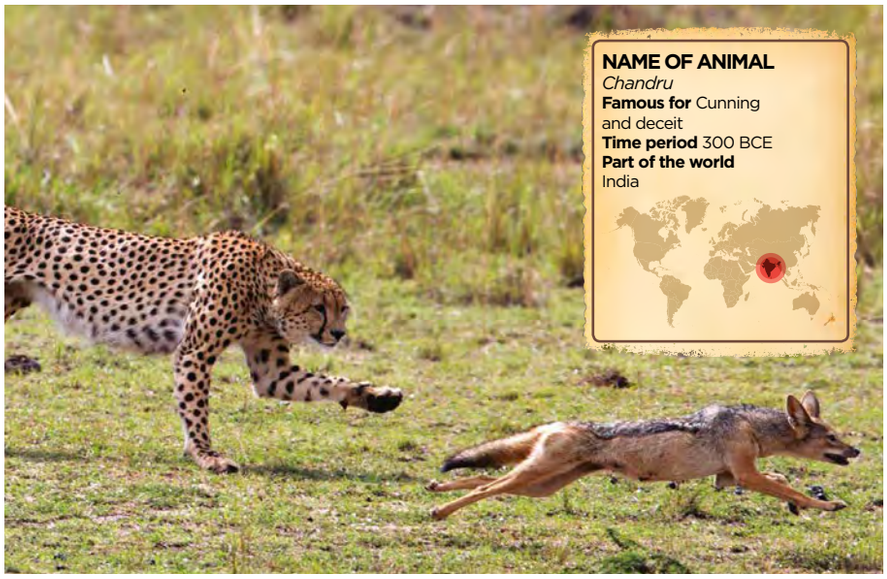
The blue jackal

A moral tale of treachery and comeuppance

One of the most famous stories from the *Panchatantra* (an ancient collection of Indian fables) tells of a jackal called Chandru who fell in a vat of blue dye while being chased by a group of dogs. After tricking other animals into believing that his blue colour gave him holy status, Chandru was treated like a king and began using other animals as servants to hunt for him.

However, when the monsoon season arrived and the rains came down, the scheming jackal's famous blue coat was washed away, revealing his ordinary brownish fur beneath.

Realising that they had been tricked by him, the other animals chased Chandru into the deepest part of the jungle, and he was never seen again.



NAME OF ANIMAL
Chandru
Famous for Cunning and deceit
Time period 300 BCE
Part of the world
India

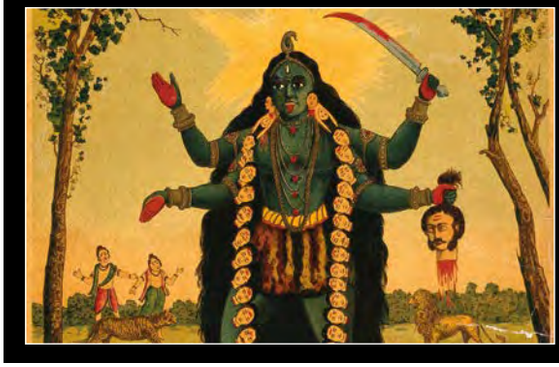
Kali, the night of death

A violent Hindu goddess associated with jackals

NAME OF ANIMAL
Kali
Famous for Fury and destruction
Time period 1500 BCE
Part of the world
India

The Hindu goddess Kali is revered as a fierce and powerful destroyer of evil. Also known as 'the night of death' and 'the black one', her aggressive persona is embodied in the form of the golden jackal. These wild dogs sometimes accompany her in traditional depictions. Interpretations of Kali are usually violent and war-like – her appearance is defined by red eyes, a lolling tongue, a garland of severed heads and a knife dripping with blood.

However, Kali is also known to be a loving and kind goddess. By vanquishing demons and wrongdoers, she is ultimately protecting her followers and restoring peace.



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ALL THE BETTER TO HEAR YOU WITH BAT-EARED FOX

Meet the bat-eared fox , a one-of-a-kind African canine with extraordinary auditory abilities

Technically, the bat-eared fox is neither a bat nor a fox. The large, extra-sensitive ears on top of this canine's head admittedly bear a resemblance to those of bats, and its other facial features are foxy enough to justify the second half of its name. But this is a mammal in a category of its own – indeed, bat-eared foxes are the sole members of the *Otocyon* genus, distinguished from other wild dogs due to their exceptional hearing and voracious appetite for insects.

Two key populations of bat-eared foxes can be located in Africa: one group dwells in the eastern continent (including Ethiopia, Tanzania and Sudan) while another has established territories in southern Africa (from Zambia and Angola to the Cape Peninsula).

There are a few behavioural differences between these two populations – the southern variety tend to live in pairs with their young, whereas eastern groups contain a greater number of adults alongside offspring. Sleeping patterns also vary between the two populations, with eastern foxes maintaining a nocturnal lifestyle for most of the year.

However, the most notable characteristics of bat-eared foxes remain the same across both populations. All have a fixation with foraging for insects – an uncommon trait among canines, which are usually associated with hunting meatier prey. While bat-eared foxes do occasionally kill and eat vertebrates like lizards and rodents, their diet is predominantly insect-based, and their anatomies have evolved in a way that helps them to consume massive quantities of creepy crawlies in a single hunting session.

When they're not on the lookout for six-legged snacks, bat-eared foxes love spending time with their families. They communicate using various visual displays, mostly based around the movements of their ears and tails. Social grooming and regular play also help to establish strong bonds between members of the den.

The power of listening

While most dogs follow their noses, black-eared foxes rely on their enormous ears

The first thing most people notice about the bat-eared fox is its massive pair of ears. These serve an important purpose – good hearing is fundamental to this canine's lifestyle, particularly when it comes to hunting.

Unlike most wild dogs, the bat-eared fox rarely preys on vertebrates such as mammals and birds. Instead, they specialise in making a meal of insects. Their favourite food by far is African harvester termites. These creepy crawlies make up approximately 80 per cent of the bat-eared fox's diet, and are located using those all-important ears.

By walking slowly with their heads close to the ground, they can pick up the sound of insects moving around underground. Once a group of termites is located, the foxes use their sharp digging claws to scoop out as many bugs as they can before crunching them up in their insectivorous jaws.

Bat-eared foxes are so good at tracking down termites that they're considered important pest controllers. Each fox consumes up to 1.15 million termites a year, preventing the bugs from causing excessive damage to soil and grass in farmers' pastures.

"The father fox guards the den, grooms the kits and teaches them how to hunt"

Bat-eared foxes will remain loyal to their partners for life, till death do they part, and co-parent their kits

Life in the den

Bat-eared foxes are incredibly social animals, living in family groups led by the breeding pair. Each family occupies a den – a large burrow used for shelter and raising the young. As bat-eared foxes are not as territorial as other canines, several dens may be established in the same area without causing conflict between competing families.

Mating pairs of bat-eared foxes are monogamous, staying with the same partner for the duration of their lives. Both males and females help to raise fox kits – mothers provide the milk necessary for the young to develop into strong adult foxes, while fathers guard the den, groom the kits and teach them how to hunt for their own food.

BAT-EARED FOX
Otocyon megalotis
Class Mammal

Territory Eastern and southern Africa
Diet Insects
Lifespan 10-13 years
Adult weight 5.4kg (12lbs)
Conservation status

EX EW CR EN VU NT LC
LEAST CONCERN

What is it?

Despite its name, the black-eared fox does not actually belong to the same family as the 'true' foxes of the *Vulpes* genus. They belong to their own genus – *Otocyon* – a name derived from the Greek words for ear (otus) and dog (cyon).

This means the bat-eared fox is a basal species: the most primitive canine of its kind. It occupies its own branch of the family tree, separating it from the likes of red foxes and arctic foxes.

ABOVE The bat-eared fox's big ears are especially handy for hearing tiny insects in the ground

How bat-eared foxes hunt their prey

These insect-loving canines take an alternative approach to foraging food

Step 1
While looking for insects to chow down on, the bat-eared fox makes the most of its epic ears, patrolling its territory with its head close to the ground to listen out for the scuttling sound of termites.

Step 2
Once a cluster of creepy crawlies has been identified by sound, the bat-eared fox uses its specialised digging claws to unearth a bounty of grub. As well as termites, these insectivores will happily munch on the likes of beetles, grasshoppers, spiders, scorpions and millipedes.

Step 3
Although other canines bring food back to their dens or regurgitate meals for their young to feed on, bat-eared fox mothers prefer to keep their kits nourished with protein-rich milk until they're old enough to forage for themselves.

© Thinkstock; Nature PL; Alamy

Foxes

These sly and slinky canids are very different from their larger, stockier relatives, but nevertheless show incredible similiarities. Discover more about these clever carnivores

"Large ears allow the fennec to seek out subterranean prey and maintain a manageable body temperature"

124

The fennec fox is the smallest of foxes, but don't underestimate it!

108

© Dreamstime; Thinkstock; Alamy

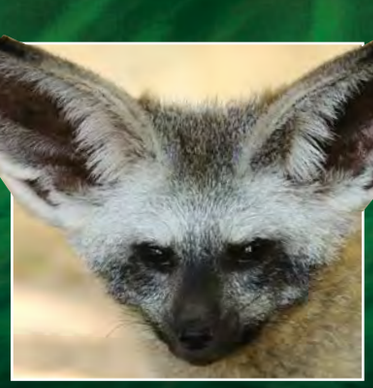
KING OF THE CANINES!

FOX

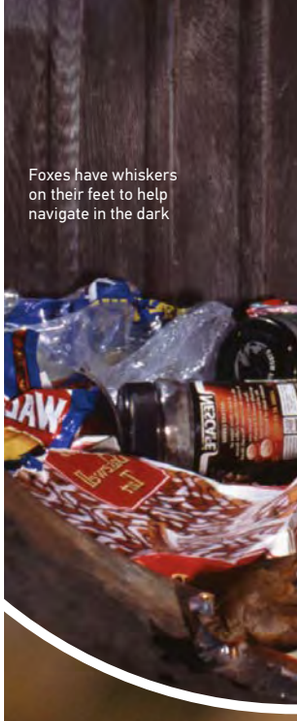
From forests and frozen landscapes, to front lawns and farmyards – even fairy tales and fables – the fox, has woven the story of a superbly adaptable survivor

Although their canine cousins, wolves, grab much more attention – especially if you include the subspecies of grey wolf we lovingly refer to as man's best friend – underestimating foxes is a famously foolish faux pas. Stories of foxes outwitting man, woman and beast alike have been passed down from the Japanese Kitsune, several of the ancient Greek Aesop's fables and our own European tales of Reynard the legendary trickster. These may all be fictional, but the fact that they all portray foxes as intelligent, cunning and resourceful creatures is no coincidence. The fox is all of the above and more; a truly considerate carnivore, aware of its surroundings and able to capitalise on every advantage.



The fennec fox is the smallest of all the world's foxes


Foxes have whiskers on their feet to help navigate in the dark

Distinguished desert-dwellers

Making a living in an evaporative environment is notoriously tough. Despite this, all of the major hot deserts sustain species of fox

Animals adapted to the lack of water and fluctuating extremes of temperature that define desert regions, are collectively known as xerocoles. The zoologist Joel Asaph Allen developed a theory – now widely accepted as a biological rule – as long ago as 1877, that stated the body shape and proportions of mammals and birds vary according to the temperature of the habitat they live in.

Several species of true foxes (the genus *Vulpes*) as well as closely related Zorros or false foxes (genus *Lycalopex*) show Allen's rule in action very well. For instance, in the Arabian and Syrian deserts, you can actually find red foxes, but over a relatively short time (100 years) the individuals who pushed into deep-desert have developed the large ears and reduced body-size of more anciently adapted relatives also found in the area; true desert specialists such as Rüppell's (sand) fox and Blanford's fox.

Across the Arabian peninsula and African continent, including the Sahara you'll find the worlds smallest species of fox. The tiny fennec fox is a true desert animal; so much so that it is the only Saharan carnivore that can survive in this environment without the need to drink any water at all.

DESERT FOX
Vulpes zerda
Class Mammalia

Territory Northern Africa
Diet Plants, rodents and eggs
Lifespan 10-14 years
Adult weight 1-2.5kg (2.2-3.3lb)
Conservation status

EX EW CR EN VU NT LC

LEAST CONCERN

Western civilisation's own wild carnivore

As human housing sprawls across what was only (relatively) recently forest and farmland, foxes discover city life, and come in from the cold

At the last official estimation by the United Nations Population Fund in 2011, the human population was thought to exceed seven billion. Over 50 per cent of humans are urbanite – dwelling in cities or towns built by humans for humans, meaning that a large proportion of our planet is urbanised – transformed to suit our needs, not those of wildlife. Even the wildest-looking parks and gardens found inside human habitats are very different from naturally-occurring rough grass and woodland that was traditionally the home of the ubiquitous red fox.

If anything, the fox's legendary instinct for outwitting people is becoming far more fact than fiction in the current day and age. While we've invited their close cousins, dogs, to share our homes and conveniences, foxes have taken it upon themselves to join us, cunningly making use of our waste, learning to lurk in the shadows and mapping our sleeping cities as new frontiers to adapt to and occupy.

Rarely seen during the day, red foxes and their cousins, the supposedly more primitive grey foxes, generally patrol gardens and alleyways in the dead of night. Their excellent hearing and sharp sense of smell mean that a fleet-footed retreat happens long before any humans arrive on the scene. Most fox activity is noticed via unsecured bin-contents, scattered by marauding scavengers, pungent scent markings and dug-out entry points under garden fences. Posing little to no threat to domestic animals like cats, it's likely that they keep less welcome urban invaders such as rats and mice well in check. Just another attractive prospect for foxes that are looking to leave the countryside for an inviting life within the concrete jungle.

RED FOX
Vulpes vulpes
Class Mammalia

Territory Europe, Asia and North America
Diet Plant matter, rodents and birds
Lifespan 2-4 years
Adult weight 3-11kg (7-24lb)
Conservation status

EX EW CR EN VU NT LC
LEAST CONCERN

"Woodland was traditionally the home of the red fox"

Foxes in the city

Several species of fox have come to regard human settlement as an invitation to join us. Here's a run-down:

Red fox
Most of the 47 recognised sub-species of this fox make more than the odd trip into town. In London, the estimated population is 10,000 – 75 per cent of them building dens under garden sheds.

Grey fox
Although outperformed by red foxes in most areas, these false foxes have one advantage, they can climb like cats! Their forearms rotate, allowing them to climb fences to access food and hide in trees.

San Joaquin kit fox
Climate change in California's San Joaquin Valley has dried out reservoir supply pipelines. This has allowed this tiny, endangered subspecies access to the inner city areas of Bakersfield.

Crab-eating fox
Despite their name, crab-eating foxes are very unfussy eaters. Perhaps due to human expansion in South America, these large, dog-like canids are increasingly stalking rubbish dumps and preying on rats.

Illustrious inhabitants of icy plains

Arctic fox

Patrolling the high-northern edges of the Taiga snow-forest, braving the Arctic tundra's frozen soil and chill winds, you'll find fascinating foxes

Bleak and uninviting, the tundras at the top of the world seem an unlikely place to find life of any kind. Whipped by strong winds and coated by a permafrost that freezes the mostly barren earth, down to almost a metre (three foot) below the surface, winter temperatures can drop as low as Ð50°C (Ð58°F). Summers are announced by bursts of wildflowers, and the snow melts to reveal patches of moss and hardy heather, growing in sheltered pits and hollows created over centuries by pools of standing water. The small amount of rain that falls can't penetrate the solidly frozen soil beneath the surface, and tundra landscapes become a patchwork of frigid marshes and bald, hard-packed dirt.

It is said that the plants and animals native to the Arctic tundra are merely clinging to life. However, the wily arctic fox is so superbly adapted that it literally changes with the seasons, in appearance and behaviour. In spring and summer, skinny arctic foxes have a camouflaged brown coat and feast on migratory bird eggs and even ringed seal pups. By Autumn, foxes may be more than 50 per cent heavier, sporting a brilliant white coat. In the dead of winter, they will track polar bears, taking advantage of the bear's kills. Alternately, they will listen for small animals moving under the snow, leap into the air, and punch down with their paws into the prey's burrow with deadly accuracy.

Almost identical conditions, caused by high altitudes, create Alpine tundra in mountain ranges. In the frozen Himalayan highlands of Nepal, western China and northern Pakistan, the handsome Tibetan fox employs eerily similar strategies, following hunting brown bears to take advantage of their strength and sense of smell. All tundra dwelling foxes create underground larders, utilising the frost to refrigerate their food.

Four arctic adaptations

- Reduced body size gives a smaller surface area than other foxes, which reduces the amount of heat lost.
- Monogamous pairs raise their five to nine cubs as a team to ensure each one survives.
- Opportunistic foxes follow bigger predators to scavenge on their leftovers, and even store up food in the summer.
- Extremely good hearing helps a fox hunt during the winters when there's no sunlight.

ARCTIC FOX
Vulpes lagopus
Class Mammalia

Territory Northern Europe, northern Canada and the Arctic Circle
Diet Rodents, birds and fish
Lifespan 3-6 years
Adult weight 3-8kg (7-17lb)
Conservation status

EX EW CR EN VU NT LC

LEAST CONCERN

Masters of the middle ground

Occupying the middle-ground between desert and forest, foxes thrive in grassland environments.

About one quarter of Earth's surface is covered in grasslands. Whether they are warmer tropical savannas that experience dry and rainy seasons, or temperate plains with steadier rainfall and cold dormant' seasons, all are characterised by a covering of vegetation with blade-like leaves that grow from the base. Humans rely on grassland for farming – they often contain deep, rich fertile soil beds and grazing cattle.

Many species of fox have settled in this habitat, and the common red fox is found thriving from the Northern Australian grasslands (where it is considered an invasive species) to the West Siberian Plains and British fields and meadows. The corsac fox ranges the steppes and dry plains of Mongolia and China to Central Asia, leading a nomadic lifestyle and sometimes forming migrating packs. Along with its close relative the Tibetan fox, this species can survive in conditions from the Alpine tundra to the arid desert, but is mostly found in the middle ground between the two – the fertile, black-soiled and wildflower strewn Eurasian grasslands.

In southern Africa's diverse Bushveld ecoregion, the insect-eating and aptly-named bat-eared fox is an example of a truly adapted grass-dweller. On the American continent, the Northern Great Plains and prairies play home to the adorable swift fox, a cat-sized species that digs elaborate dens in the soft soil. South America's pampas lowlands even have a false-fox, so prevalent that it is named the pampas fox.

Across the entire Indian subcontinent, the common Bengal fox is found wherever there is flat, open, grassy terrain.

Although prey animals ranging from insects to amphibians along with small birds and rodents are abundant, many grassland foxes are much more omnivorous than their desert or tundra-dwelling relatives, even including grasses in their diets.

CORSAC FOX
Vulpes corsac
Class Mammalia

Territory Central Asia
Diet Rodents and birds
Lifespan Up to 13 years
Adult weight 1.5-3kg (3.5-7lb)
Conservation status

EX EW CR EN VU NT LC
LEAST CONCERN

Built to survive

Foxes have some unique adaptations that help them survive

Sensing magnetic fields

When facing the North Magnetic Pole, over 70 per cent of a fox's pounces are successful. When facing other directions, they only have an 18 per cent chance of success.

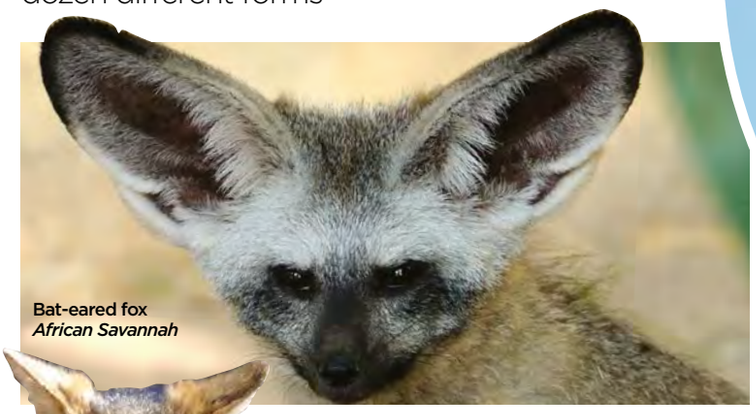
Strong stomach

With a similar digestive system to humans, foxes eat a varied diet. Their strong bite and powerful digestive enzymes give them an advantage, by breaking down what they swallow.

Foxes of the world

This predator lives across the globe in a dozen different forms

South American grey fox
Coastal mountains

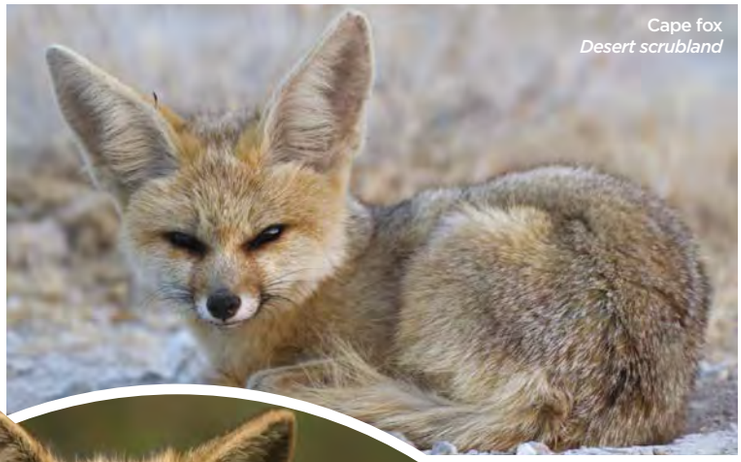


Bat-eared fox
African Savannah

Channel islands fox
Californian islands

Bengal fox
Himalayan foothills

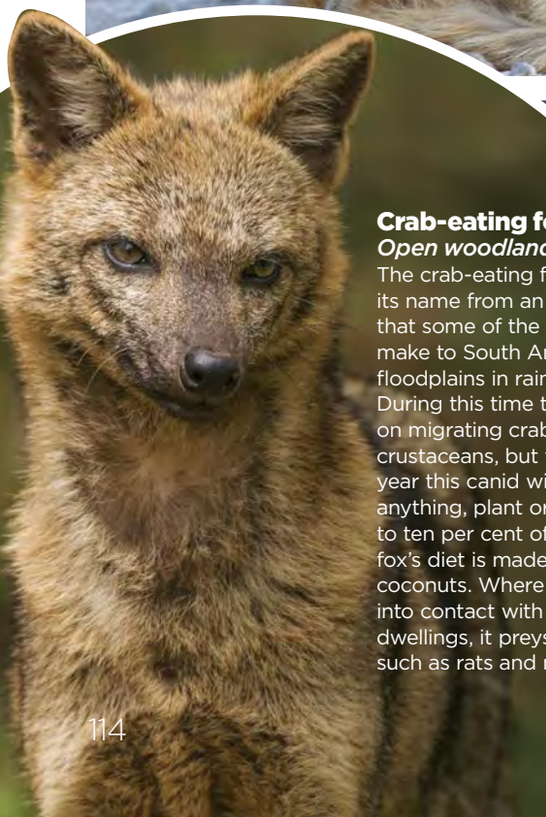
Arctic fox
North Pole



Cape fox
Desert scrubland

Corsac fox
Asian deserts

Corsac foxes can sometimes be found right across the Eurasian steppes, from China, Mongolia and Afghanistan to Russia. We say 'sometimes', because this fox is known to undergo massive fluctuations in population, sometimes a tenfold drop within the space of year. Often, these declines coincide with a particularly harsh winter, but over the following three to four years, they seem to return in greater numbers. Interestingly, Corsacs seem to rely on the burrows of marmots – large mountain squirrels – and the recent decline of these burrow-mates, from over-hunting, could hinder the corsac fox's recovery.



Crab-eating fox
Open woodlands

The crab-eating fox gets its name from an annual trip that some of the population make to South American floodplains in rainy season. During this time they will gorge on migrating crabs and other crustaceans, but for most of the year this canid will eat almost anything, plant or animal. Up to ten per cent of this fake fox's diet is made up of dwarf coconuts. Where it comes into contact with human dwellings, it preys on vermin such as rats and mice.

Rüppell's fox
Hot desert


Tibetan fox
Asian mountains

Red fox
Northern hemisphere
The red fox is the most widespread and abundant of all wild carnivores on Earth. Fossil records tell us that red foxes have lived in North Africa for at least 700,000 years, and on the Eurasian continent for 400,000. The red fox has managed to colonise every landmass except for Antarctica, making it the poster species for biological plasticity – the ability to physically adapt quickly to any environment. Red foxes from different parts of the world vary quite drastically.


Sechuran fox
Tropical coasts


Swift fox
American grasslands


Kit fox
North America


Grey fox
Central America

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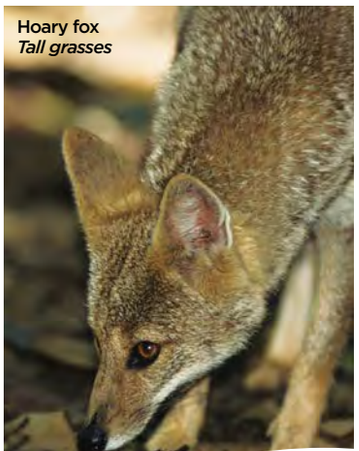
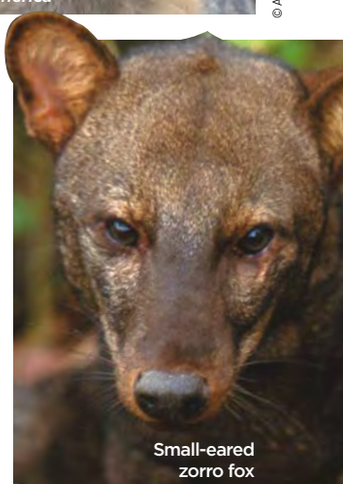
Darwin's fox
Island forests


Hoary fox
Tall grasses


Small-eared zorro fox
Amazon rainforest

Fennec fox
Moroccan desert
Fully grown fennec foxes weigh less than one kilogram (two pounds), making this the smallest of all the canids. Unmistakable due to their huge ears and long tails, fennecs are built for life in the North African desert. Their kidneys are so efficient that they can survive without drinking. Their social nature, along with several tell-tale factors (like a lack of musk glands and fewer chromosomes) are leading some zoologists to reconsider whether they are truly foxes.

THE *FORMIDABLE* RED FOX

The red fox has become one of the world's most ubiquitous species, using their cunning skills to survive in climates all over the globe

Cunning and incredibly charismatic, this animal doesn't need to be the biggest, scariest predator on the planet in order to thrive. In fact, the red fox has made the top 100 list of the world's most invasive species, surviving in all sorts of conditions across the globe, from tundra to cities and even desert.

Foxes are such successful hunters that they've been blamed for single-handedly wiping out 20 species of Australian mammals, and they're also ruffling feathers in California, endangering ground-nesting birds. Even their relatives, the Arctic fox, are reducing in numbers thanks to their larger red cousins moving in on their territory and helping themselves to all the food. It's not entirely the fox's fault; humans initially exported the animal from the UK to the other side of the world in the 19th century so that they could continue their favourite sport: fox hunting. Climate change is to blame for the fox's relocation to

© FLPA /Jules Cox

the Arctic, as the temperature warms and they begin to travel northward. We may have facilitated the fox's world domination, but no one could have foreseen just how clever and versatile this creature would turn out to be.

Few animals have worked out that humans are the only mammals that will consciously sustain another living species, but the fox figured that out long ago. Recognising the opportunities that await them during the day, they altered their nocturnal habits to suit us. They've even trained humans to feed them, with many people leaving leftovers out purposefully to attract foxes to their gardens. Word must have spread about the wealth of opportunities urban life holds in store, as thousands of foxes seem to have packed their bags and left the countryside for the city. The British government estimates that seven million tonnes of food is thrown away every year, which is good news for these natural scavengers. Urban foxes are not unique to the UK either, having colonised several other European cities, including Rome, Paris and Berlin, to name a few. They can also be seen stalking the streets of New York and Los Angeles, as well as urban Australia and Japan, but the UK is one of the rare places where you'll find foxes living in gardens.

As omnivorous animals, they can live off mammals, fruit and insects, which is a great advantage to surviving in the wild. Even when sustenance is abundant, the fox stashes every morsel for later use. They do this by burying it underground and marking their territory by urinating, so any passers-by know it belongs to them. This ability to devour pretty much anything is what makes them so successful in both rural and urban areas, at home and abroad. Meat protein is undoubtedly the most essential part of their nutrition, however, with research suggesting it forms 95 per cent of an average rural fox's diet. They are nature's bin men, happily devouring any dead animals they come across (including roadkill), which is a really useful function within nature. When a fox is in the mood for fresh meat, however, it usually opts for small burrowing animals like rabbits and rodents that require a great deal of stealth to catch off-guard.

In this case, the fox exercises its most famous hunting method: the mousing leap. Head alert and ears pricked,

Other types of fox

Arctic fox (*Alopex lagopus*)
This small white fox is native to the Arctic regions of the Northern Hemisphere where its thick fur helps to keep the animal warm in temperatures below freezing.

Grey fox (*Urocyon cinereoargenteus*)
This fox loves to climb trees and their dens may be as high as 9m (30ft) above the ground. Fruit forms a major part of the grey fox's diet.

Crab-eating fox (*Cerdocyon thous*)
As the name suggests, this fox enjoys eating crabs. In the wet season, it scours the floodplains looking for scuttling critters and it does not present a threat to livestock.

Bat-eared fox (*Otocyon megalotis*)
The ears are the standout feature of this fox, measuring 13cm (5.1in) long. It uses them to locate harvester termites, which forms the majority of its diet.

World domination

From humble beginnings, the red fox has taken over an impressive chunk of earth

North America *100,000-300,000 years ago*
While the grey fox is considered a native of North America, the red fox is a subject of debate. It's thought that they could have used the same path used by humans during the last Ice Age. More recently, red foxes were brought to the continent in the 18th century for hunting and the fur trade.

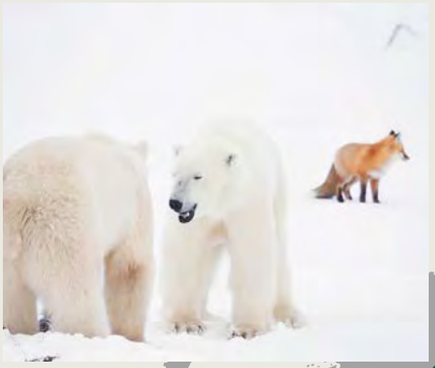
Red fox range

When and where the red fox increased its range...

Red foxes range 3 million years ago

Red foxes range 2 million years ago

United Kingdom
350,000 years ago
With over 10,000 foxes estimated to be roaming the London today, the red fox's presence has certainly made an impact since its arrival from the countryside within the last 100 years. Noticeably braver than their countryside counterparts, over the years the fox has grown less wary of humans, sharing town centres, back gardens and garbage bins alike.



Arctic tundra *Last 60 years*
Tundras are among Earth's most hostile environments with average winter temperatures of -32 degrees Celsius (-25 degrees Fahrenheit), but climate change has seen some southern animals like the red fox moving in. They are larger and more dominant than the white Arctic fox and as a result, they are losing land and food to their red relatives.

ARCTIC TUNDRA

RUSSIA

Europe and Russia *3.4 and 1.8 million years ago*
The red fox is Eurasian in origin with fossils revealing they've been around for more than a million years. The remains were found in the same location as early human settlements, leading to the theory that the red fox was used as a source of food and pelts by primitive humans. Their natural progression through Europe over centuries of adaptation has lead to the species being spread across the continent.

UK

EUROPE

HUNGARY

KAZAKHSTAN

MONGOLIA

CHINA

"Remains were found in the same location as early human settlements"

EGYPT

INDIA

THAILAND

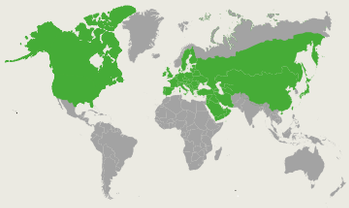
AFRICA

SOUTH AFRICA

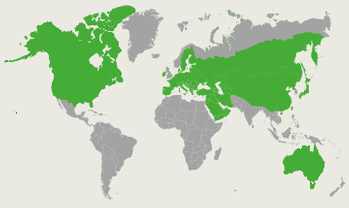
AUSTRALIA

Australia *180 years ago*
The British wanted to continue the traditional English sport of fox hunting, so they introduced the red fox to the British colonies. It became a successful apex predator and spread across most of the continent, feeding primarily on rabbits, but it has also been blamed for reducing the numbers of native mammals and birds.

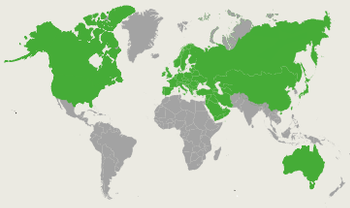
Red foxes range 350,000 years ago



Red foxes range 100,000 years ago



Red foxes range 180 years ago



Red foxes range 60 years ago

Three reasons why the red fox is so successful

No natural predators
At one stage, the fox would have been hunted by larger predators such as panthers and wolves, but today these animals are few and far between. This is good news for the fox, which now has no natural predator to speak of. It's one of the reasons why it has been so successful worldwide.

Clever and cunning
The red fox has adapted to eating takeaways and other processed foods that humans leave behind. They are also expert hunters, cleverly sneaking up on its prey before pouncing directly on their victim. Being an opportunistic omnivore means they can thrive in both the city and the countryside.

Quick to adapt
You'll find red foxes in just about every kind of environment on Earth. With long agile legs built for speed, a thick warm coat of fur, sharp teeth and claws, the fox is well placed for fight and flight. Throw in their keen senses to the mix and you end up with one formidable creature.

RIGHT An urban red fox scavenging discarded takeaway boxes on the streets of London

Keen hearing
In order to hunt smaller animals, such as mice and rabbits, the fox's ears are finely tuned to pick up low frequencies.

Poor eyesight
A fox's eyes are incredibly weak compared to its other senses, which it mainly relies on for hunting prey.

Useful tail
A fox's tail isn't just for show, as it actually aids the creature's balance and also serves to keep it warm when curled up.

the fox uses its keen sense of hearing to pinpoint the prey's exact location. It remains stock-still, listening hard for squeaking and scurrying. Then, muscles tensed like a coiled spring, the fox will launch itself into the air and land head-first on the target. Not all leaps end in supper, but it's one of its most effective techniques. Even foxes living in cold climates use this method and go deep-snow diving, using the launch to propel themselves under the carpet of ice to catch critters below. Intriguingly, scientists have noted that foxes are much more successful when they are facing north. Some now believe that the fox is honing in on the electromagnetic fields of the planet and using them to calculate the distance from its prey, like a guided missile seeking out its target.

When the fox has the prey clamped in his jaws, he won't viciously shake it about like a wolf or a dog, but delivers a series of sharp bites. This animal may be related to the canine family but it's much more feline when it comes to hunting. When the catch of the day is rabbit, the fox will adopt a low crouching stance to best conceal its entrance. Rabbits know the danger of being out in the open and regularly stop to look around. Once the fox is spotted, the chase is on and it'll aim to bite the haunches to disable its prey. Though small mammals are quick and can easily slip away into the undergrowth, the fox has other tricks up its sleeve. Some are bold enough to forgo stealth entirely by engaging in playful antics in the hope that their curious prey will come and take a closer look – a method aptly called 'charming'.

The fox usually operates alone, but Roald Dahl was onto something when he wrote the children's tale *Fantastic Mr Fox*. His bushy-tailed trickster outsmarted the humans time and time again in the daily mission to gather food for his family. He had a wife and a few children (which are officially known as kits) counting on him to bring back the bacon, or in actual case – a plump chicken from Boggis, a duck or goose from Bunce, or a nice turkey from Bean (the three unfortunate farmers in the story). In real life, foxes are usually found in pairs or small groups consisting of the mated pair, their offspring and sometimes one or two from their previous litter that will help to feed and care

The unique call of a fox

The scream of a red fox is a sound that you'll never forget. It's high-pitched and not too dissimilar to a human female, making it all the more alarming when it pierces the night's silence. It's actually the call of a young female red fox looking for a mate in time for the breeding season. They scream in short bursts, stopping and then starting up again every 3-10 seconds and it's designed to travel long distances so male foxes in the vicinity can hear it. Fortunately for sleeping humans, this is only once a year, in January or early February and only lasts a couple of weeks.

LEFT A red fox cautiously stalks an unsuspecting female pheasant

The red fox in numbers

2.5 metres
Foxes dig burrows deep under the ground for their dens

07 months
Young red foxes are able to hunt on their own, using their natural abilities

49-58 DAYS
The average gestation period for a female fox, usually giving birth in the spring

23-41 CM
The size of the smallest species, the fennec fox

4-6
A vixen gives birth to around four or six kits in every litter, all of whom are initially born entirely blind

250,000
It's estimated that there are a quarter of a million foxes currently living in the UK

13-15 DAYS
The time it takes for kits to eventually open their eyes

LEFT Two adolescent males play-fighting in the snow

Feeding habits

Far from fussy eaters, foxes will scavenge whatever is on the menu that day, whether it's a lowly earthworm, a bird fallen from a nest or the last night's leftovers from your rubbish bin. They are omnivores so they can eat small mammals, as well as insects and fruit and berries, meaning they thrive in rural and urban areas alike.

Foxes are extremely territorial and usually claim up to 13km^2 (5mi^2) of land as their own. They will be constantly patrolling on the lookout for food, urinating as they go in order to remind themselves where they've already looked, as well as to ward off others of their kind. Their patch will have several burrows and dens that not only provide shelter, but also doubles as storage for food.

As nocturnal animals, foxes will hunt at night and rest during the day. They have excellent sense of hearing and smell, which they use to hone in on their prey before sneaking up them with feline-like prowess. Amazingly, some cunning foxes have realised there are more feeding opportunities available during the day and have changed their habits to suit the humans they live alongside, often visiting gardens in the hope of table scraps left outside for them.

LEFT A European red fox scavenges the corpse of a dead pine marten in Normandy

for the new arrivals. This is crucial in the first few weeks when the kits are blind and deaf and therefore vulnerable to predators. Many never make it to adulthood, but by forming a family unit, the fox gives their young the best chance of a future, just like the foxes in Roald Dahl's story.

The uneasy relationship between this animal and the humans depicted in the novel is also true of real life. We both have a long history and research has revealed they were once close friends of ours. While analysing the remains at a prehistoric burial ground in Jordan, a grave was uncovered containing a human male and his companion fox. The Cambridge University-led team suggested that as the grave is 4,000 years older than the earliest known human-dog burial, it seems our ancestors were fox lovers long before dogs became man's best friend. This is likely owing to the fact that foxes are timid by nature, but too much love from humans can make a fox trusting and lead them to start approaching, and inadvertently scaring, other people.

Foxes are often seen as pests, especially among those who have had their entire chicken coop destroyed in one night. It's an emotional and economic disaster, but not one that has been premeditated by a fox. In these situations where livestock has been insufficiently protected from

"Muscles tensed like a coiled spring, the fox will launch itself into the air"

Did you know?

Red foxes don't share the pack mentality of other canines. They might live in small groups following a mating pair, but they often simply inhabit the same range, and they hunt alone.

ABOVE Two kits relaxing together on a lane in Lorraine, France

"Foxes often only stop biting when every living thing has stopped moving"

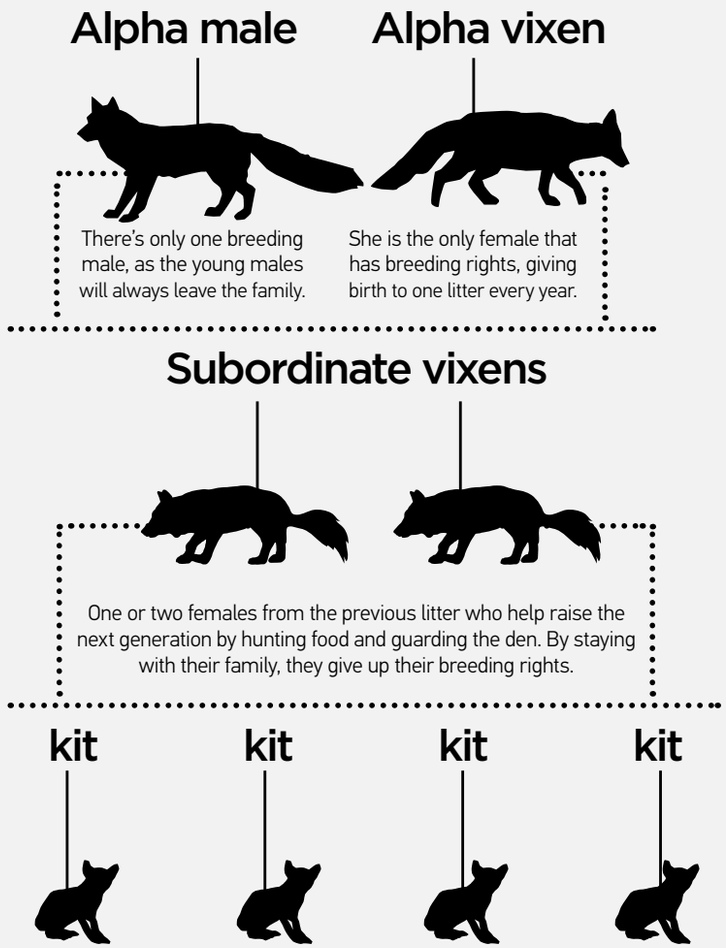
intruders, foxes often only stop biting when every living thing has stopped moving. The fox is acting on instinct, just like many other wild animals. It could be because they don't know when their next meal will be, so take advantage of what's available, or it could be that they don't know how to react when confronted with prey that doesn't try to escape, but either way it's not malicious.

In fact, the only mammals known to kill for sport are humans and unfortunately foxes have long been hunted by us. Foxes are also a victim of the fur trade in places like Siberia and North America, but where the former was borne out of humans wanting to stay warm in cold climes, the latter developed into a brutal game. American fox chasers became obsessed with catching the elusive animal that's able to bolt with incredible speed, up to 48 kilometres (30 miles) per hour. This determined pack of human hunters bred dogs specifically for chasing foxes, but some hounds ended up dying of exhaustion, earning the fox the nicknames 'dog killer' and 'red ranger'.

The fox belongs to the same family as the dog, known as the *Canidae*. Other members to this club of carnivorous and omnivorous mammals include wolves, jackals and coyotes, but the fox has relatively longer legs and smaller stomachs compared to their distant cousins. It is these adaptations that enable the animal to run for long periods of time, but they must eat often. Since they'll eat whatever's on the menu, however, this isn't a problem. It's actually the main reason why the red fox has the largest distribution of any species of canid. There are 37 species that are referred to as foxes, including ones that eat crabs and others that look like furry four-legged bats, the red fox is the largest and most widespread of them all.

Where humans have converted their natural forests into agricultural lands and cities, the fox has flourished. It's no wonder they have become symbols of wisdom in folklore and have left their mark in every culture and are among nature's biggest success stories.

Fox hierarchy



The mother remains with her young for the first two weeks and then begins hunting again. The kits will leave the den to make their own way in the world at just seven months old.

Leaving their mark

Have you ever taken a dog for a walk and wondered why they can't just empty their bladder in one go, rather than getting acquainted with every lamppost and tree along the way? It's because it has nothing to do with needing the toilet and everything to do with marking their territory. Urine is a way of making their presence known to other dogs in the area and foxes do exactly the same thing in the wild. It tells them where they've been and lets others know its sex and status. This also helps to ward off unwanted trespassers, especially in the best hunting spots. Foxes may be part of the family of Canidae that includes wolves, coyotes and domestic dogs, but they share some traits with cats. Look into their eyes and you'll find the same vertical slit pupils, which helps them to see better at night. They also have a spine-covered tongue for lapping up water and grooming their fur.

BELOW A red fox and an Australian shepherd dog share a curious glance at each other

© Corbis; FLPA; Naturepl.com; Thinkstock

Did you know?

Some scientists think fennec foxes should be classified differently to other canines of the *Vulpes* genus – they lack musk glands, have fewer chromosomes and are more sociable than other foxes. An alternate Latin name, '*Fennecus zerda*', has been proposed to acknowledge these differences.

FENNEC FOX
Vulpes zerda
Class Mammalia

Territory North African Sahara
Diet Omnivore
Lifespan 10-15 years
Adult weight 1.59kg/3.5 lbs
Conservation status

EX EW CR EN VU NT LC

LEAST CONCERN

MORE THAN A PRETTY FACE

THE FENNEC FOX

They may look cute and cuddly, but fennec foxes are far from lazy lapdogs – these wild critters should be admired for their astounding survival skills

Fennec foxes look so adorable that you'd be forgiven for thinking they're a similar species to the pampered pooches that are commonly seen poking their heads out of handbags, rather than hardy members of the *Vulpes* genus. But looks can be deceiving. Beneath this canine's cute exterior is a creature capable of surviving in one of Earth's most punishing habitats: the desert.

Famously found in the Sahara of North Africa, fennec foxes inhabit an environment that other canines rarely stray into. Some parts of this barren land receive less than half an inch (2.5cm) of water every year, and the relentless heat commonly soars above a temperature of 50 degrees Celsius. Most mammals would die of dehydration or heatstroke in such arid conditions, but the fennec fox's well-adapted body and shrewd natural instincts have helped it to thrive.

Large ears allow the fennec to seek out subterranean prey and maintain a manageable body temperature. Furry feet prevent it from burning its paws on the desert sand, and shovel-like claws provide the perfect tool for digging burrows in sand dunes. Its light golden coat provides ideal camouflage in the sandy terrain while deflecting heat from the sun. Even its fluffy tail is useful, providing a thick blanket to wrap around its body during the considerably cold desert nights.

Despite its impressive survival abilities, some people can't look past the fennec fox's lovable looks, and they have consequently become popular with exotic pet owners. It's legal to keep and breed them in many parts of the world, although these canines should never truly be considered domestic animals.

In fact, fennec foxes are a nuisance to look after, with nocturnal lifestyles that compel them to cause all kinds of mischief at night: they'd much rather be prowling the sand dunes, living up to their reputation as one of nature's most magnificent desert animals.

Designed for the desert

Fennec foxes call upon a wealth of evolutionary traits to survive in the scorching Sahara, from oversized ears to water-retaining kidneys

Every part of the fennec fox's anatomy is adapted to life in the desert. While those big ears may give them a cartoonish, cutesy appearance, they serve an important purpose: radiating body heat and keeping the fox's body at a manageable temperature when the midday sun is at its fiercest.

The fennec's ears (which happen to be the largest of any fox in relation to body size) are also super sensitive. They are efficient at picking up the smallest vibrations in the sand, providing them with the power to hear prey moving around underground. In a desert environment where food is elusive, adaptations like this can be the difference between staying alive and starving to death.

Live prey isn't always available, so fennec foxes have evolved to be unfussy omnivores, opportunistically feeding on a wide range of food. Plants and insects are common meals, but they'll also hunt for rodents, rabbits and birds when the opportunity presents itself.

Water is naturally hard to come by in the desert, so the fennec fox's kidneys have adapted to restrict water loss. They are consequently able to survive solely on hydration from their food.

Whereas the arctic wolf has small ears to conserve heat, fennec foxes have excessively large ones to disperse heat

Fennex foxes' fluffy tails are not just a cute accessory; they protect them from the sand but also keep them warm at night

Whatever the weather

Although the desert is sweltering in the daytime, the temperature often plummets to subzero at night. Since the fennec fox is a nocturnal animal, it needs a strategy for surviving the cold.

To safeguard themselves in the desert's extreme climate, fennec foxes dig deep burrows in hills and sand dunes. Moisture gathers at the base of these hills, keeping the underground dens cool during the day when the foxes are asleep. If the temperature is too cold to hunt at night, they may remain in their burrows, wrapping up their bodies in their heavily furred tails to keep themselves warm.

Fennecs prefer to live in sociable groups of about ten individuals. They communicate using a variety of vocalisations, ranging from dog-like barks to cat-like purrs. If it spots a predator, a fennec will warn its friends by letting out a distress call. With extra foxy eyes and ears on alert, each individual in the group benefits from its communal lifestyle.

Fennec foxes

"When the temperature is cold, fennec foxes wrap their bodies in their heavily furred tails"

A fennec fox's sandy colour matches its surroundings, though some can be lighter than others or bear markings

Tail
The fennec fox's long tail provides extra insulation during the cold desert nights. It's used to cover extremities such as the feet and nose.

Coat
The light fawn colour of a fennec fox's coat helps to deflect heat from the sun, and also serves as camouflage in the desert sand.

Ears
Sensitive enough to scout out burrowing animals and large enough to dissipate excess body heat, fennec foxes rely heavily on their ears.

Body
Weighing in at just over 1.5 kg (3lbs), fennecs have the smallest bodies in the canine family. This could be due to the scarcity of food in the desert.

Feet
To protect their paws on the hot desert sand, fennec foxes have thick fur on the soles of their feet.

Did you know?

A group of fennec foxes is called a skulk. Males are known as reynards, while females are vixens. Baby fennec foxes are referred to as kits, rather than pups or cubs.

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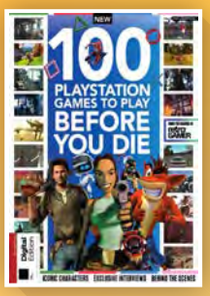

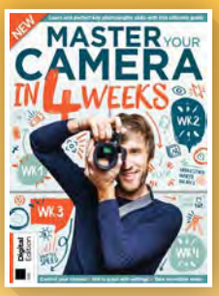

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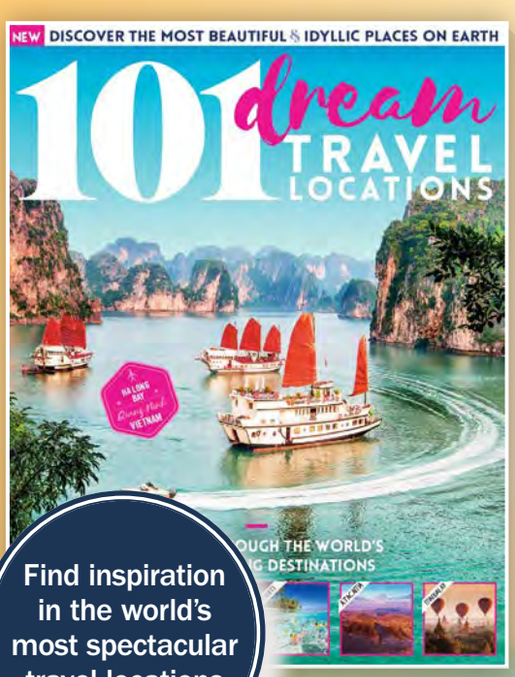

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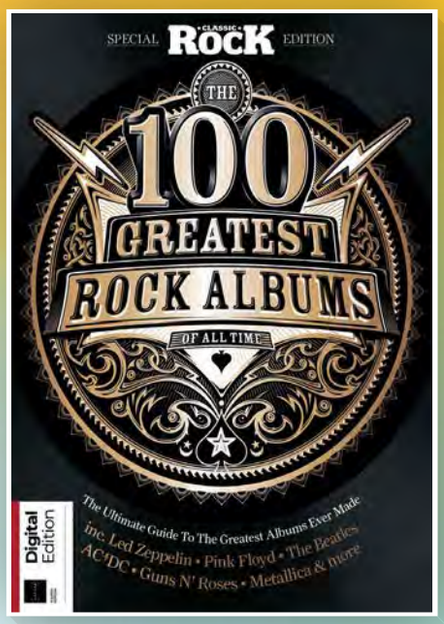

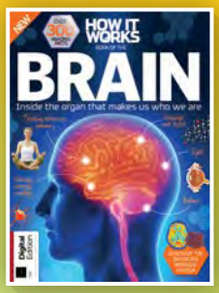

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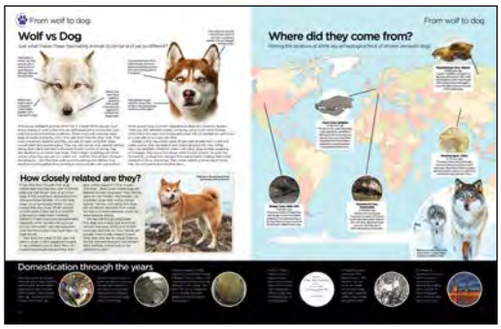

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