

= Quagga =

The quagga ( / ˈkwæɡə / or / ˈkwæɡə / ) ( *Equus quagga quagga* ) is an extinct subspecies of plains zebra that lived in South Africa until the 19th century . It was long thought to be a distinct species , but genetic studies have shown it to be the southernmost subspecies of plains zebra . It is considered particularly close to Burchell 's zebra . Its name is derived from its call , which sounds like " kwa @-@ ha @-@ ha " .

The quagga is believed to have been around 257 cm ( 8 ft 5 in ) long and 125 ? 135 cm ( 4 ft 1 in ? 4 ft 5 in ) tall at the shoulder . It was distinguished from other zebras by its limited pattern of primarily brown and white stripes , mainly on the front part of the body . The rear was brown and without stripes , and therefore more horse @-@ like . The distribution of stripes varied considerably between individuals . Little is known about the quagga 's behaviour , but it may have gathered into herds of 30 ? 50 individuals . Quaggas were said to be wild and lively , yet were also considered more docile than Burchell 's zebra . They were once found in great numbers in the Karoo of Cape Province and the southern part of the Orange Free State in South Africa .

After the Dutch settlement of South Africa began , the quagga was heavily hunted as it competed with domesticated animals for forage . While some individuals were taken to zoos in Europe , breeding programs were unsuccessful . The last wild population lived in the Orange Free State , and the quagga was extinct in the wild by 1878 . The last captive specimen died in Amsterdam on 12 August 1883 . Only one quagga was ever photographed alive and only 23 skins are preserved today . In 1984 , the quagga was the first extinct animal to have its DNA analysed , and the Quagga Project is trying to recreate the phenotype of hair coat pattern and related characteristics by selectively breeding Burchell 's zebras .

= = Taxonomy = =

The name " quagga " is derived from the Khoikhoi word for zebra and is onomatopoeic , being said to resemble the quagga 's call , variously transcribed as " kwa @-@ ha @-@ ha " , " kwahaah " , or " oug @-@ ga " . The name is still used colloquially for the plains zebra . The quagga was originally classified as a distinct species , *Equus quagga* , in 1778 by Dutch naturalist Pieter Boddaert . Traditionally , the quagga and the other plains and mountain zebras were placed in the subgenus *Hippotigris* .

There has been much debate over the status of the quagga in relation to the plains zebra . It is poorly represented in the fossil record , and the identification of these fossils is uncertain , as they were collected at a time when the name quagga referred to all zebras . Fossil skulls of *Equus mauritanicus* from Algeria have been claimed to show affinities with the quagga and the plains zebra , but they may be too badly damaged to allow definite conclusions to be drawn from them . Quaggas have also been identified in cave art attributed to the San . Reginald Innes Pocock was perhaps the first to suggest that the quagga was a subspecies of plains zebra in 1902 . As the quagga was scientifically described and named before the plains zebra , the trinomial name for the quagga becomes *E. quagga quagga* under this scheme , and the other subspecies of plains zebra are placed under *E. quagga* as well .

Historically , quagga taxonomy was further complicated by the fact that the extinct southernmost population of Burchell 's zebra ( *Equus quagga burchellii* , formerly *Equus burchellii burchellii* ) was thought to be a distinct subspecies ( also sometimes thought a full species , *E. burchellii* ) . The extant northern population , the " Damara zebra " , was later named *Equus quagga antiquorum* , which means that it is today also referred to as *E. q. burchellii* , after it was realised they were the same taxon . The extinct population was long thought very close to the quagga , since it also showed limited striping on its hind parts . As an example of this , Shortridge placed the two in the now disused subgenus *Quagga* in 1934 . Most experts now suggest that the two subspecies represent two ends of a cline .

Different subspecies of plains zebra were recognised as members of *Equus quagga* by early researchers , though there was much confusion over which species were valid . Quagga subspecies

were described on the basis of differences in striping patterns , but these differences were since attributed to individual variation within the same populations . Some subspecies and even species , such as *E. q. danielli* and *Hippotigris isabellinus* , were only based on illustrations ( iconotypes ) of aberrant quagga specimens . Some authors have described the quagga as a kind of wild horse rather than a zebra , and one craniometric study from 1980 seemed to confirm its affiliation with the horse ( *Equus caballus* ) . It has been pointed out that early morphological studies were erroneous ; using skeletons from stuffed specimens can be problematical , as early taxidermists sometimes used donkey and horse skulls inside their mounts when the originals were unavailable .

= = = Evolution = = =

The quagga was the first extinct animal to have its DNA analysed , and this 1984 study launched the field of ancient DNA analysis . It confirmed that the quagga was more closely related to zebras than to horses , with the quagga and mountain zebra ( *Equus zebra* ) sharing an ancestor 3 ? 4 million years ago . An immunological study published the following year found the quagga to be closest to the plains zebra . A 1987 study suggested that the mtDNA of the quagga diverged at a range of roughly 2 % per million years , similar to other mammal species , and again confirmed the close relation to the plains zebra .

Later morphological studies came to conflicting conclusions . A 1999 analysis of cranial measurements found that the quagga was as different from the plains zebra as the latter is from the mountain zebra . A 2004 study of skins and skulls instead suggested that the quagga was not a distinct species , but a subspecies of the plains zebra . In spite of these findings , many authors subsequently kept the plains zebra and the quagga as separate species .

A genetic study published in 2005 confirmed the subspecific status of the quagga . It showed that the quagga had little genetic diversity , and that it diverged from the other plains zebra subspecies only between 120 @,@ 000 and 290 @,@ 000 years ago , during the Pleistocene , and possibly the penultimate glacial maximum . Its distinct coat pattern perhaps evolved rapidly because of geographical isolation and / or adaptation to a drier environment . In addition , plains zebra subspecies tend to have less striping the further south they live , and the quagga was the most southern @-@ living of them all . Other large African ungulates diverged into separate species and subspecies during this period as well , probably because of the same climate shift . The simplified cladogram below is based on the 2005 analysis ( some taxa shared haplotypes and could therefore not be differentiated ) :

= = Description = =

The quagga is believed to have been 257 cm ( 8 ft 5 in ) long and 125 ? 135 cm ( 4 ft 1 in ? 4 ft 5 in ) tall at the shoulder . Its coat pattern was unique among equids : zebra @-@ like in the front but more like a horse in the rear . It had brown and white stripes on the head and neck , brown upper parts and a white belly , tail and legs . The stripes were boldest on the head and neck and became gradually fainter further down the body , blending with the reddish brown of the back and flanks , until disappearing along the back . It appears to have had a high degree of polymorphism , with some individuals having almost no stripes and others having patterns similar to the extinct southern population of Burchell 's zebra , where the stripes covered most of the body except for the hind parts , legs and belly . It also had a broad dark dorsal stripe on its back . It had a standing mane with brown and white stripes .

The only quagga to have been photographed alive was a mare at the Zoological Society of London 's Zoo . Five photographs of this specimen are known , taken between 1863 and 1870 . On the basis of photographs and written descriptions , many observers suggest that the stripes on the quagga were light on a dark background , unlike other zebras . Reinhold Rau , pioneer of the Quagga Project , claimed that this is an optical illusion : that the base colour is a creamy white and that the stripes are thick and dark . Embryological evidence supports zebras being dark coloured with white as an addition .

Living in the very southern end of the plains zebra 's range , the quagga had a thick winter coat that moulted each year . Its skull was described as having a straight profile and a concave diastema , and as being relatively broad with a narrow occiput . Like other plains zebras , the quagga did not have a dewlap on its neck as the mountain zebra does . The 2004 morphological study found that the skeletal features of the southern Burchell 's zebra population and the quagga overlapped , and that they were impossible to distinguish . Some specimens also appeared to be intermediate between the two in striping , and individuals of the extant Burchell 's zebra population still exhibit limited striping . It can therefore be concluded that the two subspecies graded morphologically into each other . Today , some stuffed specimens of quaggas and southern Burchell 's zebra are so similar that they are impossible to definitely identify as either , since no location data was recorded . The female specimens used in the study were larger than the males on average .

= = Behaviour and ecology = =

The quagga was the southernmost distributed plains zebra , mainly living south of the Orange River . It was a grazer , and its habitat range was restricted to the grasslands and arid interior scrubland of the Karoo region of South Africa , today forming parts of the provinces of Northern Cape , Eastern Cape , Western Cape and the Free State . These areas were known for distinctive flora and fauna and high amounts of endemism .

Little is known about the behaviour of quaggas in the wild , and it is sometimes unclear what exact species of zebra is referred to in old reports . The only source that unequivocally describes the quagga in the Free State is that of the English military engineer and hunter Major Sir William Cornwallis Harris . His 1840 account reads as follows :

The geographical range of the quagga does not appear to extend to the northward of the river Vaal . The animal was formerly extremely common within the colony ; but , vanishing before the strides of civilisation , is now to be found in very limited numbers and on the borders only . Beyond , on those sultry plains which are completely taken possession of by wild beasts , and may with strict propriety be termed the domains of savage nature , it occurs in interminable herds ; and , although never intermixing with its more elegant congeners , it is almost invariably to be found ranging with the white @-@ tailed gnu and with the ostrich , for the society of which bird especially it evinces the most singular predilection . Moving slowly across the profile of the ocean @-@ like horizon , uttering a shrill , barking neigh , of which its name forms a correct imitation , long files of quaggas continually remind the early traveller of a rival caravan on its march . Bands of many hundreds are thus frequently seen doing their migration from the dreary and desolate plains of some portion of the interior , which has formed their secluded abode , seeking for those more luxuriant pastures where , during the summer months , various herbs thrust forth their leaves and flowers to form a green carpet , spangled with hues the most brilliant and diversified .

Quaggas have been reported gathering into herds of 30 ? 50 individuals and sometimes travelled in a linear fashion . They may have been sympatric with Burchell 's zebra between the Vaal and Orange rivers . This is disputed , and there is no evidence that they interbred . It could also have shared a small portion of its range with Hartmann 's mountain zebra ( *Equus zebra hartmannae* ) .

Quaggas were said to be lively and highly strung , especially the stallions . During the 1830s , quaggas were used as harness animals for carriages in London , the males probably being gelded to mitigate their volatile nature . Local farmers used them as guards for their livestock , as they were likely to attack intruders . On the other hand , captive quaggas in European zoos were said to be tamer and more docile than Burchell 's zebra . One specimen was reported to have lived in captivity for 21 years and 4 months , dying in 1872 .

Since the practical function of striping has not been determined for zebras in general , it is unclear why the quagga lacked stripes on its hind parts . A cryptic function for protection from predators ( stripes obscure the individual zebra in a herd ) and biting flies ( which are less attracted to striped objects ) , as well as various social functions , have been proposed for zebras in general . Differences in hind quarter stripes may have aided species recognition during stampedes of mixed herds , so that members of one subspecies or species would follow its own kind . It has also been

evidence that the zebras developed striping patterns as thermoregulation to cool themselves down , and that the quagga lost them due to living in a cooler climate , although one problem with this is that the mountain zebra lives in similar environments and has a bold striping pattern . A 2014 study strongly supported the biting @-@ fly hypothesis , and the quagga appears to have lived in areas with lesser amounts of fly activity compared to other zebras .

= = Decline and extinction = =

As it was easy to find and kill , the quagga was hunted by early Dutch settlers and later by Afrikaners to provide meat or for their skins . The skins were traded or used locally . The quagga was probably vulnerable to extinction due to its limited distribution , and it may have competed with domestic livestock for forage . The quagga had disappeared from much of its range by the 1850s . The last population in the wild , in the Orange Free State , was extirpated in the late 1870s . The last known wild individual died in 1878 .

Individual quaggas were also captured and shipped to Europe , where they were displayed in zoos . Lord Morton tried to save the animal from extinction by starting a captive breeding program . He was only able to obtain a single male which , in desperation , he bred with a female horse . This produced a female hybrid with zebra stripes on its back and legs . Lord Morton 's mare was sold and was subsequently bred with a black stallion , resulting in offspring that again had zebra stripes . An account of this was published in 1820 by the Royal Society . This led to new ideas on telegony , referred to as pan @-@ genesis by Charles Darwin .

The last captive specimen , a female in Amsterdam 's Natura Artis Magistra zoo , lived there from 9 May 1867 until it died on 12 August 1883 , but its origin and cause of death were not recorded . The specimen in London died in 1872 and the one in Berlin in 1875 . There are 23 known stuffed and mounted quagga specimens throughout the world . In addition , there is a mounted head and neck , a foot , seven complete skeletons , and samples of various tissues . A twenty @-@ fourth mounted specimen was destroyed in Königsberg , Germany , during World War II .

= = = Breeding back project = = =

After the very close relationship between the quagga and surviving zebras was discovered , Reinhold Rau started the Quagga Project in 1987 in South Africa to create a quagga @-@ like zebra population by selective breeding for a reduced stripe pattern from plains zebra stock , with the eventual aim of introducing them to the quagga 's former range . To differentiate between the quagga and the zebras of the project , they refer to it as " Rau quaggas " . The founding population consisted of 19 individuals from Namibia and South Africa , chosen because they had reduced striping on the rear body and legs . The first foal of the project was born in 1988 . Once a sufficiently quagga @-@ like population has been created , it will be released in the Western Cape .

Introduction of these quagga @-@ like zebras could be part of a comprehensive restoration program including such ongoing efforts as eradication of non @-@ native trees . Quaggas , wildebeest , and ostriches , which occurred together during historical times in a mutually beneficial association , could be kept together in areas where the indigenous vegetation has to be maintained by grazing . In early 2006 , the third and fourth generation animals produced by the project were considered looking much like the depictions and preserved specimens of the quagga . This type of selective breeding is called breeding back . The practice is controversial , since the resulting zebras will resemble the quaggas only in external appearance , but will be genetically different . The technology to use recovered DNA for cloning does not yet exist .