= King Island emu =

The King Island emu (Dromaius novaehollandiae minor) is an extinct subspecies of emu that was endemic to King Island , which is situated in the Bass Strait between mainland Australia and Tasmania . Its closest relative may be the extinct Tasmanian emu (D. n. diemenensis) , as they belonged to a single population until less than 14 @,@ 000 years ago , when Tasmania and King Island were still connected . The small size of the King Island emu may be an example of insular dwarfism .

The King Island emu was the smallest of all emus , and had darker plumage than the mainland emu . It was black and brown , and had naked blue skin on the neck , and its chicks were striped like those on the mainland . The subspecies was distinct from the likewise diminutive Kangaroo Island emu (D. baudinianus) in a number of osteological details , including size . The behaviour of the King Island emu probably did not differ much from that of the mainland emu . The birds gathered in flocks to forage and during breeding time . They fed on berries , grass and seaweed . They ran swiftly , and could defend themselves by kicking . The nest was shallow , and consisted of dead leaves and moss . Seven to nine eggs were laid , which were incubated by both parents .

Europeans discovered the King Island emu in 1802 during early expeditions to the island , and most of what is known about the bird in life comes from an interview French naturalist François Péron conducted with a sealer there , as well as depictions by artist Charles Alexandre Lesueur . They had arrived on King Island in 1802 with Nicolas Baudin 's expedition , and in 1804 several live and stuffed King and Kangaroo Island emus were sent to France . The two live King Island specimens were kept in the Jardin des Plantes , and the remains of these and the other birds are scattered throughout various museums in Europe today . The logbooks of the expedition did not specify from which island each captured bird originated , or even that they were taxonomically distinct , so their status remained unclear until more than a century later . Hunting pressure and fires started by early settlers on King Island likely drove the wild population to extinction by 1805 . The two captive specimens in Paris both died in 1822 and are believed to have been the last of their kind .

= = Taxonomy = =

There was long confusion regarding the taxonomic status and geographic origin of the small island emu taxa from King Island and Kangaroo Island , since specimens of both populations were transported to France as part of the same French expedition to Australia in the early 1800s . The logbooks of the expedition failed to clearly state where and when the small emu individuals were collected , and this has resulted in a plethora of scientific names subsequently being coined for either bird , many on questionable grounds , and the idea that all specimens had originated from Kangaroo Island . Furthermore , in 1914 , L. Brasil argued the expedition did not encounter emus on King Island , because the weather had been too bad for them to leave their camp . The French also referred to both emus and cassowaries as " casoars " at the time , which has led to further confusion .

Louis Jean Pierre Vieillot coined the binomial Dromaius ater in 1817 . In 1906 , Walter Baldwin Spencer coined the name Dromaius minor based on some Pleistocene subfossil bones and eggshells found on King Island the same year , believing they were the first physical evidence of an emu from there . William Vincent Legge also coined a name for these remains , Dromaius bassi , but at a later date . In his 1907 book Extinct Birds , Walter Rothschild stated that Vieillot 's description actually referred to the mainland emu , and that the name D. ater was therefore invalid . Believing the skin in Muséum national d 'Histoire naturelle of Paris was from Kangaroo Island , he made it the type specimen of his new species Dromaius peroni , named after the French naturalist François Péron , who is the main source of information about the bird in life .

The Australian amateur ornithologist Gregory Mathews coined further names in the early 1910s , including a new genus name , Peronista , as he believed the King and Kangaroo Island birds were generically distinct from the mainland emu . Later writers claimed that the subfossil remains found on King and Kangaroo Islands were not discernibly different , and that they therefore belonged to

the same taxon . In 1959 , the French ornithologist Christian Jouanin proposed that none of the skins were actually from Kangaroo Island , after inspecting expedition and museum documents . In 1990 , Jouanin and Jean @-@ Christophe Balouet used environmental forensics to demonstrate that the mounted skin in Paris came from King Island , and that at least one live bird had been brought from each island . All scientific names given to the Kangaroo Island emu were therefore based on specimens from King Island or were otherwise invalid , leaving it nameless . More recent finds of subfossil material and subsequent studies on King and Kangaroo Island emu , notably by Shane A. Parker in 1984 , confirmed their separate geographic origin and distinct morphology . Parker named the Kangaroo Island bird Dromaius baudinianus , after Nicolas Baudin , the leader of the French expedition . The name Dromaius ater was kept for the King Island emu .

There are few morphological differences that distinguish the extinct insular emus from the mainland emu besides their size , but all three taxa were most often considered distinct species . A 2011 genetic study of nuclear and mitochondrial DNA , which was extracted from five subfossil King Island emu bones , showed that its genetic variation fell within that of the extant mainland emus . It was therefore interpreted as conspecific with the emus of the Australian mainland , and was reclassified as a subspecies of Dromaius novaehollandiae , D. n. ater . Other animals present on King Island are also considered as subspecies of their mainland or Tasmanian counterparts rather than distinct species . The authors suggested that further studies using different methods might be able to find features that distinguish the taxa . In its 2013 edition , The Howard and Moore Complete Checklist of the Birds of the World emended the trinomial name of the King Island emu to D. n. minor , based on Spencer 's D. minor , on the ground that Vieillot 's D. ater was originally meant for the mainland emu . This rationale was accepted by the IOC World Bird List , which used D. n. minor thereafter .

= = = Evolution = = =

During the Late Quaternary period (0 @.@ 7 million years ago) , small emus lived on a number of offshore islands of mainland Australia . In addition to the King Island emu , these included taxa found on Kangaroo Island (D. baudinianus) and Tasmania (D. n. diemenensis) , all of which are now extinct . The smallest taxon , the King Island emu , was confined to a small island situated in the Bass Strait between Tasmania and Victoria , approximately 100 km (62 mi) from both coasts . King Island was once part of the land bridge which connected Tasmania and mainland Australia , but rising sea levels following the last glacial maximum eventually isolated the island . As a result of phenotypic plasticity the King Island emu population possibly underwent a process of insular dwarfism .

According to the authors of the 2011 genetic study , the close relation between the King Island and mainland emus indicates that the former population was isolated from the latter relatively recently , due to sea level changes in the Bass Strait , as opposed to a founding emu lineage that diverged from the mainland emu far earlier and had subsequently gone extinct on the mainland . Models of sea level change indicate that Tasmania , including King Island , was isolated from the Australian mainland around 14 @,@ 000 years ago . Up to several thousand years later King Island was then separated from Tasmania . This scenario would suggest that a population ancestral to both the King Island and Tasmanian emu was initially isolated from the mainland taxon , after which the King Island and Tasmanian populations were separated . This in turn indicates that the likewise extinct Tasmanian emu is probably as closely related to the mainland emu as is the King Island emu , with both the King Island and Tasmanian emu being more closely related to each other . Fossil emu taxa show an average size between that of the King Island emu and mainland emu . Hence , mainland emus can be regarded as a large or gigantic form .

= = Description = =

The King Island emu was the smallest emu taxon , and was about half the size of the mainland birds . It was about 87 cm (34 in) tall . According to François Péron 's interview with a local sealer ,

the largest specimens were up to 137 cm (4 @.@ 5 ft) in length , and the heaviest weighed 20 to 23 kg (45 to 50 lb) . It had a darker plumage , with extensive black feathers on the neck and head , and blackish feathers on the body , where it was also mixed with brown . The bill and feet were blackish , and the naked skin on the side of the neck was blue . The 2011 genetic study did not find genes commonly associated with melanism in birds , but proposed the dark colouration could be due to alternative genetic or non @-@ genetic factors . Péron stated there was little difference between the sexes , but that the male was perhaps brighter in colouration and slightly larger . The juveniles were grey , while the chicks were striped like other emus . There were no seasonal variations in plumage . Since the female mainland emus are on average larger than the males , and can turn brighter during the mating season , contrary to the norm in other bird species , some of these observations may have been based on erroneous conventional wisdom .

Subfossil remains of the King Island emu show that the tibia was about 330 mm (13 in) long , and the femur was 180 mm (7 in) long . The pelvis was 280 mm (11 in) long , 64 mm (2 @.@ 5 in) wide at the front , and 86 mm (3 in) wide at the back . The tarsometatarsus averaged 232 mm (9 in) in length . In males , the tibiotarsus averaged 261 mm (10 in) , whereas it averaged 301 mm (12 in) in females . In contrast , the same bones measured 269 mm (10 @.@ 5 in) and 305 mm (12 in) in the Kangaroo Island emu . Apart from being smaller , the King Island emu differed osteologically from the Kangaroo Island emu in the intertrochlear foramen of the tarsometatarsus usually being fully or partially abridged . The outer trochlea was more incurved towards the middle trochlea in the Kangaroo Island bird , whereas they were parallel in the King Island emu .

The King Island emu and the mainland emu show few morphological differences other than their significant difference in size . Mathews stated that the legs and bill were shorter than those of the mainland emu , yet the toes were nearly of equal length , and therefore proportionally longer . The tarsus of the King Island emu was also three times longer than the culmen , whereas it was four times longer in the mainland emu . Additional traits that supposedly distinguish this bird from the mainland emu have previously been suggested to be the distal foramen of the tarsometatarsus , and the contour of the cranium . However , the distal foramen is known to be variable in the mainland emu showing particular diversity between juvenile and adult forms and is therefore taxonomically insignificant . The same is true of the contour of the cranium , which is more dome @-@ shaped in the King Island emu , a feature that is also seen in juvenile mainland emus .

= = Behaviour and ecology = =

Péron 's interview describes some aspects of the behaviour of the King Island emu . He writes that the bird was generally solitary but gathered in flocks of ten to twenty at breeding time , then wandered off in pairs . They ate berries , grass and seaweed , and foraged mainly during morning and evening . They were swift runners , but were apparently slower than the mainland birds , due to being fat . They swam well , but only did so when necessary . They reportedly liked the shade of lagoons and the shoreline , rather than open areas . They used a claw on each wing for scratching themselves . If unable to flee from the hunting dogs of the sealers , they would defend themselves by kicking , which could inflict a great deal of harm .

Captain Matthew Flinders did not encounter emus when he visited King Island in 1802 , but his naturalist , Robert Brown , examined their dung and noted they had chiefly fed on the berries of Leptecophylla juniperina . An account by English ornithologist John Latham about the " Van Diemen 's cassowary " may also refer to the King Island emu , based on the small size described . In addition to a physical description , he stated that they gathered in groups of 70 to 80 individuals in a given location while foraging , behaviour that was exploited by hunters .

Péron stated that the nest was usually situated near water and on the ground under the shade of a bush . It was constructed of sticks and lined with dead leaves and moss ; it was oval in shape and not very deep . He claimed that seven to nine eggs were laid always on 25 and 26 July , but the selective advantage of this breeding synchronisation is unknown . The female incubated the eggs , but the male apparently developed a brood patch , which indicates it contributed as well . The non @-@ incubating parent also stayed by the nest , and the chicks left the nest two to three days after

hatching . The eggs were preyed upon by snakes , rats , and quolls . Péron gave the incubation period as five or six weeks , but since the mainland emu incubates for 50 to 56 days , this may be too short . He stated a mother emu would defend its young from crows with its beak , but this is now known to be strictly male behaviour .

= = Relationship with humans = =

The emus of King Island were first recorded by Europeans when a party from the ship Lady Nelson , led by John Murray , visited the island in January 1802 . The bird was sporadically mentioned by travellers henceforward , but not in detail . Captain Nicolas Baudin visited King Island later in 1802 , during an 1800 ? 04 French expedition to map the coast of Australia . Two ships , Le Naturaliste and Le Géographe , were part of the expedition , which also brought along naturalists who described the local wildlife . François Péron , a naturalist who was part of Baudin 's expedition , visited King Island and was the last person to record descriptions of the King Island emu from the wild . At one point , Péron and some of his companions became stranded due to storms and took refuge with some seal hunters . They were served emu meat , which Péron described in favourable terms as tasting halfway " between that of the turkey @-@ cock and that of the young pig " .

Péron did not report seeing any emus on the island himself , which might explain why he described them as being the size of mainland birds . Instead , most of what is known about the King Island emu today stems from a 33 @-@ point questionnaire that he used to interview a local English sealer , Daniel Cooper , about the bird . In accordance with a request by the authorities for the expedition to bring back useful plants and animals , Péron asked if the emus could be bred and fattened in captivity , and received a variety of cooking recipes . Péron 's questionnaire remained unpublished until 1899 , and very little was therefore known about the bird in life until then .

= = = Transported specimens = = =

Several emu specimens belonging to the different subspecies were sent to France , both live and dead , as part of the expedition . Some of these exist in European museums today . Le Naturaliste brought one live specimen and one skin of the mainland emu to France in June 1803 . Le Géographe collected emus from both King and Kangaroo Island , and at least two live King Island individuals , assumed to be a male and female by some sources , were taken to France in March 1804 . This ship also brought skins of five juveniles collected from different islands . Two of these skins , of which the provenance is unknown , are presently kept in Paris and Turin ; the rest are lost . In addition to rats , cockroaches , and other inconveniences aboard the ships , the emus were incommoded by the rough weather which caused the ships to shake violently ; some died as a result , while others had to be force fed so they did not starve to death . In all , Le Géographe brought 73 live animals of various species back to France .

The two individuals brought to France were first kept in captivity in the menagerie of Empress Josephine , and were moved to the Jardin des Plantes after a year . The " female " died in April 1822 , and its skin is now mounted in the Muséum national d 'Histoire naturelle of Paris . The " male " died in May 1822 , and is preserved as a skeleton in the same museum . A feather of the Paris skin was given to the Tasmanian Museum and Art Gallery , the only confirmed feather belonging to this subspecies currently in Australia . The Paris skin contains several bones , but not the pelvis , which is an indicator of sex , so the supposed female identity is unconfirmed . Péron noted that the small emus brought to France were distinct from those of the mainland , but not that they were distinct from each other , or which island each had come from , so their provenance was unknown for more than a century later .

There is also a skeleton in Museo di Storia Naturale di Firenze , which it obtained from France in 1833 , but was mislabelled as a cassowary until correctly identified by Italian zoologist Enrico Hillyer Giglioli in 1900 . Several elements of this skeleton are missing , and some have been replaced with wooden copies . Its right metatarsus was damaged during life and had healed incorrectly . It was thought to be a male , but is now known to be a composite of two individuals . A fourth specimen

was thought to be kept in the Liverpool Museum , but it may simply be a juvenile mainland emu . Apart from the King Island emu specimens brought to France , a few are also known to have been brought to mainland Australia in 1803 , but their fate is unknown .

= = = Contemporary depictions = = =

Péron 's 1807 , three @-@ volume account of the expedition , Voyage de découverte aux terres Australes , contains an illustration (plate 36) of " casoars " by Charles @-@ Alexandre Lesueur , who was the resident artist during Baudin 's voyage . The caption states the birds shown are from " Ile Decrès " , the French name for Kangaroo Island , but there is confusion over what is actually depicted . The two adult birds are labelled as a male and female of the same species , surrounded by juveniles . The family @-@ group shown is improbable , since breeding pairs of the mainland Emu split up once the male begins incubating the eggs . Lesueur 's preparatory sketches also indicate these may have been drawn after the captive birds in Jardin des Plantes , and not wild ones , which would have been harder to observe for extended periods .

The Australian museum curator , Stephanie Pfennigwerth , has instead proposed that the larger , light @-@ ruffed " male " was actually drawn after a captive Kangaroo Island emu , that the smaller , dark " female " is a captive King Island emu , that the scenario is fictitious , and the sexes of the birds indeterminable . They may instead only have been assumed to be male and female of the same species due to their difference in size . A crooked claw on the " male " has also been interpreted as evidence that it had lived in captivity , and it may also indicate that the depicted specimen is identical to the Kangaroo Island emu skeleton in Paris , which has a deformed toe . The juvenile on the right may have been based on the Paris skin of an approximately five @-@ month @-@ old King Island emu specimen , which may in turn be the individual that died on board le Geographe during rough weather , and was presumably stuffed there by Lesueur himself . The chicks may instead simply have been based on those of mainland emus , as none are known to have been collected .

= = = Extinction = = =

The exact cause for the extinction of the King Island emu is unknown . Soon after the bird was discovered , sealers settled on the island because of the abundance of elephant seals . Péron 's interview with Daniel Cooper suggested that they likely contributed to the demise of the bird by hunting it , and perhaps by starting fires . Péron described how dogs were purpose @-@ trained to hunt down the emus ; Cooper even claimed to have killed no fewer than 300 emus himself . Cooper had been on the island for six months , which suggests he killed 50 birds a month . His group of sealers consisted of eleven men as well as his wife , and they alone may have killed 3 @,@ 600 emus by the time Péron visited them .

Péron explained that the sealers consumed an enormous quantity of meat , and that their dogs killed several animals each day . He also observed such hunting dogs being released on Kangaroo Island , and mused that they might wipe out the entire population of kangaroos there in some years , but he did not express the same sentiment about the emus of King Island . Natural fires may also have played a role . It is probable that the two captive birds in France , which died in 1822 , outlived their wild fellows on King Island , and were therefore the last of their kind . Though Péron stated King Island " swarmed " with emus in 1802 , they may have become extinct in the wild as early as 1805 .

In 1967 , when the King Island emu was still thought to be only known from prehistoric remains , James Greenway questioned whether they could have been exterminated by a few natives , and speculated that fires started by prehistoric men or lightning may have been responsible . At this time , the mainland emu was also threatened by overhunting , and Greenway cautioned that it could end up sharing the fate of its island relatives if no measures were taken in time .