

= Kakapo =

The kakapo (Māori : kākāpō or night parrot) , *Strigops habroptilus* (Gray , 1845) , also called owl parrot , is a species of large , flightless , nocturnal , ground @-@ dwelling parrot of the super @-@ family Strigopoidea endemic to New Zealand .

It has finely blotched yellow @-@ green plumage , a distinct facial disc of sensory , vibrissa @-@ like feathers , a large grey beak , short legs , large feet , and wings and a tail of relatively short length . A combination of traits make it unique among its kind ; it is the world 's only flightless parrot , the heaviest parrot , nocturnal , herbivorous , visibly sexually dimorphic in body size , has a low basal metabolic rate and no male parental care , and is the only parrot to have a polygynous lek breeding system . It is also possibly one of the world 's longest @-@ living birds . Its anatomy typifies the tendency of bird evolution on oceanic islands , with few predators and abundant food : a generally robust physique , with accretion of thermodynamic efficiency at the expense of flight abilities , reduced wing muscles , and a diminished keel on the sternum . Like many other New Zealand bird species , the kakapo was historically important to the Māori , the indigenous people of New Zealand , appearing in many of their traditional legends and folklore . It was hunted and used as a resource by Māori , both for its meat as a food source and for its feathers , which were used to make highly valued pieces of clothing . It was also sometimes kept as a pet .

The kakapo is critically endangered ; as of March 2014 , with an additional six from the first hatchings since 2011 , the total known population was only 123 living individuals , as reported by the Kakapo Recovery programme , most of which have been given names . Because of Polynesian and European colonisation and the introduction of predators such as cats , rats , ferrets , and stoats , the kakapo was almost wiped out . Conservation efforts began in the 1890s , but they were not very successful until the implementation of the Kakapo Recovery plan in the 1980s . As of April 2012 , surviving kakapo are kept on three predator @-@ free islands , Codfish (Whenua Hou) , Anchor and Little Barrier islands , where they are closely monitored . Two large Fiordland islands , Resolution and Secretary , have been the subject of large @-@ scale ecological restoration activities to prepare self @-@ sustaining ecosystems with suitable habitat for the kakapo . The New Zealand government is willingly providing the use of these islands to kakapo conservation . A successful breeding season in 2016 saw 34 chicks fledge , taking the total population to 157 .

= = Taxonomy , systematics and naming = =

The kakapo was originally described by English ornithologist George Robert Gray in 1845 . The name " kakapo " is the English transliteration of " kākāpō " which is derived from the Māori terms kākā (" parrot ") + pō (" night ") . Its generic name is derived from the Ancient Greek strig , genitive strigos " owl " , and ops " face " , while its specific epithet comes from habros " soft " , and ptilon " feather " . It has so many unusual features that it was initially placed in its own tribe , Strigopini . Recent phylogenetic studies have confirmed the unique position of this genus as well as the closeness to the kākā and the kea , both belonging to the New Zealand parrot genus Nestor . Together , they are now considered a separate family within the parrots , Strigopidae . Within the Strigopidae , the kakapo is placed in its own tribe , Strigopini . The common ancestor of the kakapo and the genus Nestor became isolated from the remaining parrot species when New Zealand broke off from Gondwana , around 82 million years ago . Around 70 million years ago , the kakapo diverged from the genus Nestor .

Earlier ornithologists felt that the kakapo might be related to the ground parrots and night parrot of Australia due to their similar colouration , but this is contradicted by recent studies ; rather , the cryptic colour seems to be adaptation to terrestrial habits that evolved twice convergently .

= = Description = =

The kakapo is a large , rotund parrot ; the adult can measure from 58 to 64 cm (23 to 25 in) in length , and weight can vary from 0 @. 95 to 4 kg (2 to 9 lb) at maturity . Males are larger than

females . Twenty @-@ eight males were found to average 2 kg (4 @.@ 4 lb) in one study , and 39 males were found to average 2 @.@ 06 kg (4 @.@ 5 lb) in another . In the same studies , 28 females were found to average 1 @.@ 5 kg (3 @.@ 3 lb) and 18 females averaged 1 @.@ 28 kg (2 @.@ 8 lb) . However , one source states that females will not breed until they attain a threshold weight of 1 @.@ 5 kg (3 @.@ 3 lb) . They are the heaviest living species of parrot ; while the largest males attain much heavier weights than any other extant parrot , kakapos average about 400 g (14 oz) more than a hyacinth macaw . The kakapo cannot fly , having short wings for its size and lacking the pronounced keel bone (sternum) that anchors the flight muscles of other birds . It uses its wings for balance , support , and to break its fall when leaping from trees . Unlike other land birds , the kakapo can accumulate large amounts of body fat to store energy , making it the heaviest parrot .

The upper parts of the kakapo have yellowish moss @-@ green feathers barred or mottled with black or dark brownish grey , blending well with native vegetation . Individuals may have strongly varying degrees of mottling and colour tone and intensity ? museum specimens show that some birds had completely yellow colouring . The breast and flank are yellowish @-@ green streaked with yellow . The belly , undertail , neck and face are predominantly yellowish streaked with pale green and weakly mottled with brownish @-@ grey . Because the feathers do not need the strength and stiffness required for flight , they are exceptionally soft , giving rise to the specific epithet *habroptilus* . The kakapo has a conspicuous facial disc of fine feathers resembling the face of an owl ; thus , early European settlers called it the " owl parrot " . The beak is surrounded by delicate vibrissae or " whiskers " , which the bird uses to sense the ground for navigation as it walks with its head lowered . The mandible is mostly ivory @-@ coloured , with part of the upper mandible being bluish @-@ grey . The eyes are dark brown . Kakapo feet are large , scaly , and , as in all parrots , zygodactyl (two toes face forward and two backward) . The pronounced claws are particularly useful for climbing . The ends of the tail feathers often become worn from being continually dragged on the ground .

The female is easily distinguished from the male : she has a more narrow and less domed head , her beak is narrower and proportionally longer , her cere and nostrils smaller , her legs and feet more slender and pinkish grey , and her tail proportionally longer . While her plumage colour is not very different from that of the male , the toning is more subtle , with less yellow and mottling . She tends to resist more and be more aggressive than the male when handled . A nesting female also has a brood patch on the bare skin of the belly .

Like many parrots , the kakapo has a variety of calls . As well as the booms (see below for a recording) and chings of their mating calls , it will often skraark to announce its location to other birds .

The kakapo has a well @-@ developed sense of smell , which complements its nocturnal lifestyle . It can discriminate among odours while foraging , a behaviour reported for only one other parrot species . One of the most striking characteristics of the kakapo is its pleasant and powerful odour , which has been described as musty . Given the kakapo 's well @-@ developed sense of smell , this scent may be a social chemosignal . The smell often alerts predators to the largely defenceless kakapo .

== = Anatomy == =

The skeleton of the kakapo differs from other parrots in several features associated with flightlessness . Firstly , it has the smallest relative wing size of any parrot . Its wing feathers are shorter , more rounded , and less asymmetrical and have fewer distal barbs to lock the feathers together . The sternum is small and has a low , vestigial keel and a shortened spina externa . As in other flightless birds and some other flighted parrots , the furcula is not fused but consists of a pair of clavicles lying in contact with each coracoid . As in other flightless birds , the angle between the coracoid and sternum is enlarged . The kakapo has a larger pelvis than other parrots . The proximal bones of the leg and arm are disproportionately long and the distal elements are disproportionately short .

The pectoral musculature of the kakapo is also modified by flightlessness . The pectoralis and

supracoracoideus muscles are greatly reduced . The propatagialis tendo longus has no distinct muscle belly . The sternocoracoideus is tendinous . There is an extensive cucularis capitis clavicularis muscle that is associated with the large crop .

= = Ecology and behaviour = =

It seems that the kakapo ? like many of New Zealand 's bird species ? has evolved to occupy an ecological niche normally filled by various species of mammal (the only non @-@ marine mammals native to New Zealand are three species of small bats) . Before the arrival of humans , the kakapo was distributed throughout the three main islands of New Zealand . It lived in a variety of habitats , including tussocklands , scrublands and coastal areas . It also inhabited forests , including those dominated by podocarps (rimu , matai , kahikatea , totara) , beeches , tawa , and rata . In Fiordland , areas of avalanche and slip debris with regenerating and heavily fruiting vegetation ? such as five finger , wineberry , bush lawyer , tutu , hebes , and coprosmas ? became known as " kakapo gardens " .

The kakapo is primarily nocturnal ; it roosts under cover in trees or on the ground during the day and moves around its territories at night .

Though the kakapo cannot fly , it is an excellent climber , ascending to the crowns of the tallest trees . It can also " parachute " ? descending by leaping and spreading its wings . In this way it may travel a few metres (yards) at an angle of less than 45 degrees .

Having lost the ability to fly , it has developed strong legs . Movement is often by way of a rapid " jog @-@ like " gait by which it can move many kilometres . A female has been observed making two return trips each night during nesting from her nest to a food source up to 1 km (0 @-@ 6 mi) away and the male may walk from its home range to a mating arena up to 5 km (3 mi) away during the mating season (October ? January) .

Young birds indulge in play fighting , and one bird will often lock the neck of another under its chin . The kakapo is curious by nature and has been known to interact with humans . Conservation staff and volunteers have engaged extensively with some kakapo , which have distinct personalities .

The kakapo was a very successful species in pre @-@ human New Zealand , and one of the reasons for this was their set of adaptations to effectively avoid predation from native birds of prey , which were their only predators in the past . However , these same behaviours have been of no use to them when faced with the mammalian predators which were introduced to New Zealand after human settlement , because these hunt in different ways . As hunters , birds behave very differently from mammals , relying on their powerful vision to find prey , and thus they usually (with the exception of owls) hunt by day . Apart from the two surviving New Zealand raptors , the New Zealand falcon and swamp harrier , there were two other birds of prey in pre @-@ human New Zealand : Haast 's eagle and Eyles ' harrier . All four species soared overhead searching for prey in daylight , and to avoid these avian predators , the kakapo 's ancestors adopted camouflaged plumage and became nocturnal . In addition , when the kakapo feels threatened , it freezes , so that it is more effectively camouflaged in the forest vegetation which their plumage resembles . It was not entirely safe at night , when the laughing owl was active , and it is apparent from their nest deposits on Canterbury limestone cliffs that the kakapo was among their prey .

Mammalian predators , in contrast to birds , rely on their sense of smell and hearing to find prey and often hunt by night . The kakapo 's adaptations to avoid avian predation have thus been useless against its new enemies ? this is one of the reasons for its massive decline since the introduction of dogs , cats and mustelids ? see Conservation : Human impact . A typical way for humans to hunt down the kakapo is by releasing trained dogs .

= = = Diet = = =

The beak of the kakapo is adapted for grinding food finely . For this reason , the kakapo has a very small gizzard compared to other birds of their size . It is generally herbivorous , eating native plants , seeds , fruits , pollen and even the sapwood of trees . A study in 1984 identified 25 plant species as

kakapo food . It is particularly fond of the fruit of the rimu tree , and will feed on it exclusively during seasons when it is abundant . The kakapo has a distinctive habit of grabbing a leaf or frond with a foot and stripping the nutritious parts of the plant out with its beak , leaving a ball of indigestible fibre . These little clumps of plant fibres are a distinctive sign of the presence of the bird . The kakapo is believed to employ bacteria in the fore @-@ gut to ferment and help digest plant matter .

Kakapo diet changes according to the season . The plants eaten most frequently during the year include some species of *Lycopodium ramulosum* , *Lycopodium fastigium* , *Schizaea fistulosa* , *Blechnum minus* , *Blechnum procerum* , *Cyathodes juniperina* , *Dracophyllum longifolium* , *Olearia colensoi* and *Thelymitra venosa* . Individual plants of the same species are often treated differently . Kakapo leave conspicuous evidence of their feeding activities , over feeding areas that range between 10 by 10 metres (30 ft × 30 ft) and 50 by 100 metres (160 ft × 330 ft) per individual . Kakapo feeding grounds almost always host manuka and yellow silver pine scrubs .

= = = Reproduction = = =

The kakapo is the only species of flightless parrot in the world , and the only flightless bird that has a lek breeding system . Males loosely gather in an arena and compete with each other to attract females . Females listen to the males as they display , or " lek " . They choose a mate based on the quality of his display ; they are not pursued by the males in any overt way . No pair bond is formed ; males and females meet only to mate .

During the courting season , males leave their home ranges for hilltops and ridges where they establish their own mating courts . These leks can be up to 7 kilometres (4 mi) from a kakapo 's usual territory and are an average of 50 metres (160 ft) apart within the lek arena . Males remain in the region of their court throughout the courting season . At the start of the breeding season , males will fight to try to secure the best courts . They confront each other with raised feathers , spread wings , open beaks , raised claws and loud screeching and growling . Fighting may leave birds with injuries or even kill them .

Each court consists of one or more saucer @-@ shaped depressions or " bowls " dug in the ground by the male , up to 10 centimetres (4 in) deep and long enough to fit the half @-@ metre length of the bird . The kakapo is one of only a handful of birds in the world which actually constructs its leks . Bowls are often created next to rock faces , banks , or tree trunks to help reflect sound - the bowls themselves function as amplifiers to enhance the projection of the males ' booming mating calls . Each male 's bowls are connected by a network of trails or tracks which may extend 50 metres (160 ft) along a ridge or 20 metres (70 ft) in diameter around a hilltop . Males meticulously clear their bowls and tracks of debris . One way researchers check whether bowls are visited at night is to place a few twigs in the bowl ; if the male visits overnight , he will pick them up in his beak and toss them away .

To attract females , males make loud , low @-@ frequency (below 100 Hz) booming calls from their bowls by inflating a thoracic sac . They start with low grunts , which increase in volume as the sac inflates . After a sequence of about 20 loud booms , the male kakapo emits a high @-@ frequency , metallic " ching " sound . He stands for a short while before again lowering his head , inflating his chest and starting another sequence of booms . The booms can be heard at least 1 kilometre (0 @.@ 62 mi) away on a still night ; wind can carry the sound at least 5 kilometres (3 @.@ 1 mi) . Males boom for an average of eight hours a night ; each male may produce thousands of booms in this time . This may continue every night for three or four months during which time the male may lose half his body weight . Each male moves around the bowls in his court so that the booms are sent out in different directions . These booms are also notorious for attracting predators , because of the long range at which they can be heard .

Females are attracted by the booms of the competing males ; they too may need to walk several kilometres from their territories to the arena . Once a female enters the court of one of the males , the male performs a display in which he rocks from side to side and makes clicking noises with his beak . He turns his back to the female , spreads his wings in display and walks backwards towards her . He will then attempt copulation for 2 to 14 minutes . Once the birds have mated , the female

returns to her home territory to lay eggs and raise the chicks . The male continues booming in the hope of attracting another female .

The female kakapo lays 1 or 2 eggs (rarely 3) per breeding cycle , with long intervals between laying of first and second eggs . She nests on the ground under the cover of plants or in cavities such as hollow tree trunks . The female incubates the eggs faithfully , but is forced to leave them every night in search of food . Predators are known to eat the eggs and the embryos inside can also die of cold in the mother 's absence . Kakapo eggs usually hatch within 30 days , bearing fluffy grey chicks that are quite helpless . After the eggs hatch , the female feeds the chicks for three months , and the chicks remain with the female for some months after fledging . The young chicks are just as vulnerable to predators as the eggs , and young have been killed by many of the same predators that attack adults . Chicks leave the nest at approximately 10 to 12 weeks of age . As they gain greater independence , their mothers may feed the chicks sporadically for up to 6 months .

Because the kakapo is long @-@ lived , with an average life expectancy of 95 years and the maximum at about 120 years , it tends to have an adolescence before it starts breeding . Males do not start to boom until about 5 years of age . It was thought that females reached sexual maturity at 9 years of age , but this idea was debunked in the 2008 breeding season when two 6 @-@ year @-@ old females named Apirama and Rakiura laid eggs . Generally females do not seek out males until they are between 9 and 11 years old . The kakapo does not breed every year and has one of the lowest rates of reproduction among birds . Breeding occurs only in years when trees mast (fruit heavily) , providing a plentiful food supply . Rimu mast occurs only every three to five years , so in rimu @-@ dominant forests such as those on Codfish Island , kakapo breeding occurs as infrequently .

Another aspect of the kakapo 's breeding system is that a female can alter the sex ratio of her offspring depending on her condition . A female who eats protein @-@ rich foods produces more male offspring (males have 30 % ? 40 % more body weight than females) . Females produce offspring biased towards the dispersive sex when competition for resources (such as food) is high and towards the non @-@ dispersive sex when food is plentiful . A female kakapo will likely be able to produce eggs even when there are few resources , while a male kakapo will be more capable of perpetuating the species when there are plenty , by mating with several females . This supports the Trivers ? Willard hypothesis . The relationship between clutch sex ratio and maternal diet has conservation implications , because a captive population maintained on a high quality diet will produce fewer females and therefore fewer individuals valuable to the recovery of the species .

= = Conservation = =

Fossil records indicate that in pre @-@ Polynesian times , the kakapo was New Zealand 's third most common bird and it was widespread on all three main islands . However , the kakapo population in New Zealand has declined massively since human settlement of the country . Since 1891 , conservation efforts have been made to prevent extinction . The most successful scheme has been the Kakapo Recovery Programme ; this was implemented in 1989 and continues .

= = Human impact = =

The first factor in the decline of the kakapo was the arrival of humans . M?ori folklore suggests that the kakapo was found throughout the country when the Polynesians first arrived in Aotearoa 700 years ago . Subfossil and midden deposits show that the bird was present throughout the North Island , South Island and Stewart Island / Rakiura before and during early M?ori times . M?ori hunted the kakapo for food and for their skins and feathers , which were made into cloaks . They used the dried heads as ear ornaments . Due to its flightlessness , strong scent and habit of freezing when threatened , the kakapo was easy prey for the M?ori and their dogs . Its eggs and chicks were also preyed upon by the Polynesian rat or kiore , which the M?ori brought to New Zealand . Furthermore , the deliberate clearing of vegetation by M?ori reduced the habitable range for kakapo . Although the kakapo was extinct in many parts of the islands by the time Europeans arrived ,

including the Tararua and Aorangi Ranges , it was still present in the central part of the North Island and forested parts of the South Island .

Beginning in the 1840s , European settlers cleared vast tracts of land for farming and grazing , further reducing kakapo habitat . They brought more dogs and other mammalian predators , including domestic cats , black rats and stoats . Europeans knew little of the kakapo until George Gray of the British Museum described it from a skin in 1845 . As the M?ori had done , early European explorers and their dogs ate kakapo . In the late 19th century , the kakapo became well known as a scientific curiosity , and thousands were captured or killed for zoos , museums and collectors . Most captured specimens died within months . From at least the 1870s , collectors knew the kakapo population was declining ; their prime concern was to collect as many as possible before the bird became extinct .

In the 1880s , large numbers of mustelids (stoats , ferrets and weasels) were released in New Zealand to reduce rabbit numbers , but they also preyed heavily on many native species including the kakapo . Other browsing animals , such as introduced deer , competed with the kakapo for food , and caused the extinction of some of its preferred plant species . The kakapo was reportedly still present near the head of the Whanganui River as late as 1894 , with one of the last records of a kakapo in the North Island being a single bird caught in the Kaimanawa Ranges by Te Kepa Puawheawhe in 1895 .

= = = Early protection efforts = = =

In 1891 , the New Zealand government set aside Resolution Island in Fiordland as a nature reserve . In 1894 , the government appointed Richard Henry as caretaker . A keen naturalist , Henry was aware that native birds were declining , and began catching and moving kakapo and kiwi from the mainland to the predator @-@ free Resolution Island . In six years , he moved more than 200 kakapo to Resolution Island . By 1900 , however , stoats had swum to Resolution Island and colonised it ; they wiped out the nascent kakapo population within 6 years .

In 1903 , three kakapo were moved from Resolution Island to the nature reserve of Little Barrier Island north @-@ east of Auckland , but feral cats were present and the kakapo were never seen again . In 1912 , three kakapo were moved to another reserve , Kapiti Island , north @-@ west of Wellington . One of them survived until at least 1936 , despite the presence of feral cats for part of the intervening period .

By the 1920s , the kakapo was extinct in the North Island and its range and numbers in the South Island were declining . One of its last refuges was rugged Fiordland . There , during the 1930s , it was often seen or heard , and occasionally eaten , by hunters or roadworkers . By the 1940s , reports of kakapo were becoming scarce .

= = = 1950 ? 89 conservation efforts = = =

In the 1950s , the New Zealand Wildlife Service was established and began making regular expeditions to search for the kakapo , mostly in Fiordland and what is now the Kahurangi National Park in the northwest of the South Island . Seven Fiordland expeditions between 1951 and 1956 found only a few recent signs . Finally , in 1958 a kakapo was caught and released in the Milford Sound catchment area in Fiordland . Six more kakapo were captured in 1961 ; one was released and the other five were transferred to the aviaries of the Mount Bruce Bird Reserve near Masterton in the North Island . Within months , four of the birds had died and the fifth died after about four years . In the next 12 years , regular expeditions found few signs of the kakapo , indicating that numbers were continuing to decline . Only one bird was captured in 1967 ; it died the following year .

By the early 1970s , it was uncertain whether the kakapo was still an extant species . At the end of 1974 , scientists located several more male kakapo and made the first scientific observations of kakapo booming . These observations led Don Merton to speculate for the first time that the kakapo had a lek breeding system . From 1974 to 1976 , 14 kakapo were discovered but all appeared to be

males . This raised the possibility that the species would become extinct , because there might be no surviving females . One male bird was captured in the Milford area in 1975 , christened " Richard Henry " , and transferred to Maud Island . All the birds the Wildlife Service discovered from 1951 to 1976 were in U @-@ shaped glaciated valleys flanked by almost @-@ vertical cliffs and surrounded by high mountains . Such extreme terrain had slowed colonisation by browsing mammals , leaving islands of virtually unmodified native vegetation . However , even here , stoats were present and by 1976 the kakapo was gone from the valley floors and only a few males survived high on the most inaccessible parts of the cliffs .

Before 1977 , no expedition had been to Stewart Island / Rakiura to search for the bird . In 1977 , sightings of kakapo were reported on Stewart Island . An expedition to the island found a track and bowl system on its first day ; soon after , it located several dozen kakapo . The finding in an 8 @,@ 000 @-@ hectare area of fire @-@ modified scrubland and forest raised hope that the population would include females . The total population was estimated at 100 to 200 birds .

Mustelids have never colonised Stewart Island / Rakiura , but feral cats were present . During a survey , it was apparent that cats killed kakapo at a rate of 56 % per year . At this rate , the birds could not survive on the island and therefore an intensive cat control was introduced in 1982 , after which no cat @-@ killed kakapo were found . However , to ensure the survival of the remaining birds , scientists decided later that this population should be transferred to predator @-@ free islands ; this operation was carried out between 1982 and 1997 .

= = = Kakapo Recovery programme = = =

In 1989 , a Kakapo Recovery programme was developed and a Kakapo Recovery Group established to implement it . The New Zealand Department of Conservation replaced the Wildlife Service for this task . The first action of the plan was to relocate all the remaining kakapo to suitable islands for them to breed . None of the New Zealand islands were ideal to establish kakapo without rehabilitation by extensive re @-@ vegetation and the eradication of introduced mammalian predators and competitors . Four islands were finally chosen : Maud , Hauturu / Little Barrier , Codfish and Mana . Sixty @-@ five kakapo (43 males , 22 females) were successfully transferred onto the four islands in five translocations . Some islands had to be rehabilitated several times when feral cats , stoats and weka kept appearing . Little Barrier Island was eventually viewed as unsuitable due to the rugged landscape , the thick forest and the continued presence of rats , and its birds were evacuated in 1998 . Along with Mana Island , it was replaced with two new kakapo sanctuaries , Chalky Island (Te Kakahu) and Anchor Island . The entire kakapo population of Codfish Island was temporarily relocated in 1999 to Pearl Island in Port Pegasus while rats were being eliminated from Codfish . All kakapo on Pearl and Chalky Islands were moved to Anchor Island in 2005 .

A key part of the Recovery Plan is the supplementary feeding of females . The kakapo breeds only once every two to five years , when a certain type of plant species , primarily *Dacrydium cupressinum* (rimu) , produces protein @-@ rich fruit and seeds . Observations of the relationship between intermittent breeding and the plant 's mast year help biologists choose which suitable supplementary foods to increase kakapo breeding frequency . In 1989 , six preferred foods (apples , sweet potatoes , almonds , Brazil nuts , sunflower seeds and walnuts) were supplied ad libitum each night to 12 feeding stations . Males and females ate the supplied foods , and females nested on Little Barrier Island in the summers of 1989 ? 91 for the first time since 1982 , although nesting success was low .

Supplementary feeding not only increases kakapo breeding frequency , but also affects the sex ratio of kakapo offspring , as maternal conditions influence this ratio . (See section " Reproduction " .) This finding was subsequently used to increase the number of female chicks by deliberately manipulating maternal conditions . During the winter of 1981 , only females lighter than 1 @.@ 5 kg (3 @.@ 3 lb) were given supplementary feeding to avoid raising their body condition , and the sex ratio results in 1982 were close to parity , eliminating the male @-@ biased sex ratios in the unrestricted feeding .

Though breeding can be improved by supplementary feeding , the survival of young kakapo is hampered by the presence of Polynesian rats . Of 21 chicks that hatched between 1981 and 1994 , nine were either killed by rats or died and were subsequently eaten by rats . Nest protection has been intensified since 1995 by using traps and poison stations as soon as a nest had been detected . A small video camera and infra @-@ red light source watch the nest continuously , and will scare approaching rats with flashing lights and loud popping sounds . To increase the success rate of nesting , a nest watcher places a small thermostatically controlled electric blanket over the eggs or chicks , whenever the female leaves the nest for food . The survival rate of chicks has increased from 29 % in unprotected nests to 75 % in protected ones .

To monitor the kakapo population continuously , each bird is equipped with a radio transmitter . Every known kakapo , barring some young chicks , has been given a name by Kakapo Recovery Programme officials . It is an affectionate way for conservation staff to refer to individual birds , and a stark reminder of how few remain . Artificial incubation of eggs and hand @-@ raising of chicks have often been used to improve the condition of the eggs and chicks . In November 2005 , the population comprised 41 females and 45 males , including four fledglings (3 females and 1 male) bred in 2005 . The oldest known kakapo , " Richard Henry " , was thought to be 80 years old at the time of his death in December 2010 .

In 2006 , the Kakapo Recovery Programme presented a new management plan that would run from 2006 to 2016 . The key goals of this plan are to increase the female population to at least 60 by 2016 , increase genetic diversity , maintain or restore a sufficiently large habitat to accommodate the expected increase in the kakapo population , and maintain public awareness and support .

The Kakapo Recovery programme has been successful , with the numbers of kakapo increasing steadily . Adult survival rate and productivity have both improved significantly since the programme 's inception . However , the main goal is to establish at least one viable , self @-@ sustaining , unmanaged population of kakapo as a functional component of the ecosystem in a protected habitat . To help meet this conservation challenge , two large Fiordland islands , Resolution (20 @,@ 860 ha) and Secretary (8 @,@ 140 ha) , have been prepared for re @-@ introduction of the kakapo with large @-@ scale ecological restoration activities . Ultimately , the Kakapo Recovery vision for the species is to restore the " mauri " (Maori for " life @-@ force ") of the kakapo by breeding 150 adult females .

During the 2008 ? 2009 summer breeding season , the total population of kakapo rose to over 100 for the first time since monitoring began , reaching 123 by February 2012 . Twenty two of the 34 chicks had to be hand @-@ reared because of a shortage of food on Codfish Island .

In 2012 , seven kakapo were transferred to Little Barrier Island , in an attempt to establish a successful breeding programme . Kakapo were last on the island in 1999 .

In March 2014 , with the kakapo population having increased to 126 , the bird 's recovery was used by Melbourne artist Sayraphim Lothian as a metaphor for the recovery of Christchurch , paralleling the " indomitable spirit of these two communities and their determination to rebuild " .

= = In M?ori culture = =

The kakapo is associated with a rich tradition of M?ori folklore and beliefs . The bird 's irregular breeding cycle was understood to be associated with heavy fruiting or " masting " events of particular plant species such as the Rimu which led M?ori to credit the bird with the ability to tell the future . Used to substantiate this claim were reported observations of these birds dropping the berries of the Hinau and Tawa trees (when they were in season) into secluded pools of water to preserve them as a food supply for the summer ahead ; in legend this became the origin of the M?ori practice of immersing food in water for the same purpose .

= = = Use for food and clothing = = =

The meat of kakapo made good eating and was considered by M?ori to be a delicacy and it was hunted for food when it was still widespread . One source states that its flesh " resembles lamb in

taste and texture " , although European settlers have described the bird as having a " strong and slightly stringent [sic] flavour . "

In breeding years , the loud booming calls of the males at their mating arenas made it easy for M?ori hunting parties to track the kakapo down , and it was also hunted while feeding or when dust @-@ bathing in dry weather . The bird was caught , generally at night , using snares , pitfall traps , or by groups of domesticated Polynesian dogs which accompanied hunting parties ? sometimes they would use fire sticks of various sorts to dazzle a bird in the darkness , stopping it in their tracks and making the capture easier . Cooking was done in a h?ngi or in gourds of boiling oil . The flesh of the bird could be preserved in its own fat and stored in containers for later consumption ? hunters of the Ng?i Tahu tribe would pack the flesh in baskets made from the inner bark of totara tree or in containers constructed from kelp . Bundles of kakapo tail feathers were attached to the sides of these containers to provide decoration and a way to identify their contents . Also taken by the M?ori were the bird 's eggs , which are described as whitish " but not pure white " , and about the same size as a kerer? egg .

As well as eating the meat of the kakapo , M?ori would use kakapo skins with the feathers still attached or individually weave in kakapo feathers with flax fibre to create cloaks and capes . Each one required up to 11 @,@ 000 feathers to make . Not only were these garments considered very beautiful , they also kept the wearer very warm . They were highly valued , and the few still in existence today are considered taonga (treasures) ? indeed , the old M?ori adage " You have a k?k?p? cape and you still complain of the cold " was used to describe someone who is never satisfied . Kakapo feathers were also used to decorate the heads of taiaha , but were removed before use in combat .

Despite this , the kakapo was also regarded as an affectionate pet by the M?ori . This was corroborated by European settlers in New Zealand in the 19th century , among them George Edward Grey , who once wrote in a letter to an associate that his pet kakapo 's behaviour towards him and his friends was " more like that of a dog than a bird " .

= = = In the media = = =

The conservation of the kakapo has made the species well known . Many books and documentaries detailing the plight of the kakapo have been produced in recent years , one of the earliest being Two in the Bush , made by Gerald Durrell for the BBC in 1962 . A feature @-@ length documentary , The Unnatural History of the Kakapo won two major awards at the Reel Earth Environmental Film Festival . Two of the most significant documentaries , both made by NHNZ , are Kakapo ? Night Parrot (1982) and To Save the kakapo (1997) . The BBC 's Natural History Unit also featured the kakapo , including a sequence with Sir David Attenborough in The Life of Birds . It was also one of the endangered animals Douglas Adams and Mark Carwardine set out to find for the radio series and book Last Chance to See . An updated version of the series has been produced for BBC TV , in which Stephen Fry and Carwardine revisit the animals to see how they are getting on almost 20 years later , and in January 2009 , they spent time filming the kakapo on Codfish Island . Footage of a kakapo named Sirocco attempting to mate with Carwardine 's head was viewed by millions worldwide , leading to Sirocco becoming " spokes @-@ bird " for New Zealand wildlife conservation in 2010 , as part of the International Year of Biodiversity . The kakapo was featured in the episode " Strange Islands " of the documentary series South Pacific , originally aired on 13 June 2009 . Kakapo were also used as an example of unique island fauna in the episode " Worlds Apart " of the series The Living Planet .