The Kiwi

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Kiwi lack typical bird characteristics such as flight feathers. They rely on smell and touch rather than sight, making them more akin to nocturnal forest-floor-dwelling mammals than nocturnal birds. The kiwi was probably created as a distinct bird 'kind' designed for ground-dwelling habitats.
The kiwi (the unofficial national emblem of New Zealand and its people), although a nocturnal, flightless bird has so many unbirdlike features it has often been called an 'honorary mammal'.[1,2]

Lack of flight features

For flight, birds need functional wings, well-formed feathers, a tail for flight control, light bones, and a strong breast bone that is able to withstand the pressures and tensions imposed on it by the flight muscles attached to it. The chicken-sized kiwi, however, has none of these (figures 1 and 2).

The kiwi's wings, which are often referred to as 'vestigial',[3] are 'comically' small; only 2–3 cm (about 1 inch). This lack of visible wings, which are hidden under their feathers, gives the kiwi the genus name *Apteryx*, meaning wingless.[4]

Kiwi feathers lack the hooks and barbs that keep most birds' feathers in the neatly arranged vanes that contribute to the aerodynamics needed for flight (or swimming).[5] Kiwi feathers hang loose, are fluffier and look more hair-like than other birds' feathers (figure 3)—they were woven into treasured cloaks by the Maori pre-European settlers of New Zealand.[6] Their mottled brown colour camouflages them in a range of habitats from forest floor and bracken scrub to tussock grasslands.[7]

Kiwis also lack a tail and preen gland.[2,8] In other birds the preen gland, near the tail, supplies oil used to keep feathers weather and water proof and in good order.[9]

To withstand the stresses of flight, most birds have a 'keeled sternum', which sticks out and anchors well-developed, powerful flight muscles. The keeled sternum is one of the largest bones in the skeleton of most birds and its shape varies with the life habits of a species (such as foraging strategies, or type of prey and how it is caught).[10] The kiwi, ostrich, emu and cassowary belong to the only entire group of birds (ratites) that do not have a keeled sternum.[11] None of the ratites can fly.[12] Flightless members of other bird groups also have greatly reduced keels and rudimentary flight muscles, e.g. the Galápagos flightless cormorant[10,13] and flightless rails. (In the case of rails some are thought to have developed, then lost, the ability to fly, whereas others are thought to have never developed that ability at all.[14]) The undeveloped flight muscles of the kiwi contribute to its unusual pear-shaped body.

Birds generally have hollow bones and limited leg muscle development. These features lessen the weight birds must lift for flight. Kiwis, however, have marrow-filled bones and exceptionally well-developed leg muscles (figure 2). The legs can contribute up to a third of their body weight![1] Kiwis' powerful legs enable them to outrun humans, dig burrows and also defend themselves by kicking.

The kiwi's large, four-toed feet have fleshy pads underneath (figure 3), which enable them to tread quietly as they search for food in the leaf litter and topsoil.[12] They have large claws, which they use for digging.

Kiwi senses

Unlike other nocturnal birds, and contrary to what is expected according to evolutionary theory,[15] the kiwi's eyes are small. The optic nerve and parts of their brain related to sight are much smaller than in most birds. Their eye sockets are divided into large nasal cavities like in most mammals, rather than being separated by a plate as in most birds.[1]

The kiwis' sense of smell is extremely well developed. The sense of smell processing area of their brain (the olfactory bulb) is the second largest among all birds relative to the size of their whole brain.[16] Kiwis have up to six times as many olfactory receptor (OR) genes as other bird species[17]—OR genes relate to the sensory neurons in the olfactory surface cells that enable the sense of smell. The number of OR genes is thought to be related to how many different scents an animal can detect. In mammals, species that depend most heavily on smell rather than other senses also have larger numbers of OR genes. Kiwis use their sense of smell, rather than sight, to guide them to their food. Their loud nocturnal snuffling is equivalent to them blowing their noses to clear them![16]

Kiwis are the only birds with nostrils at the tip of their long, curved beak[8,16] rather than close to their skull. The tips of their beaks also have 'specialized vibration/pressure-sensing nerve endings', which also help them find their food.[8,16]

They also use their beaks as a probe and a lever to catch their prey. As they walk along, they tap the ground with their beaks, probing the soil and leaf litter and sniffing loudly. The kiwi beak has an unusual hinge arrangement so that the tip of the upper beak overlaps the lower beak.[16] Kiwis sometimes do bizarre 'headstands', kicking their legs up in the air and driving their beaks deeper into the ground. To enlarge a hole, they move their beaks back and forth. Once a kiwi has a worm grasped in its beak it will be very careful not to break it. Sometimes they will get the worm out by slow, gentle pulling. Other times the kiwi will hold completely still until the worm relaxes its grip on its tunnel, then give a quick tug to extract it.[16]

Unlike other birds kiwis have cat-like whiskers at the base of their beaks (figure 3) which may help with night time navigation.[2]

Also unlike most other birds, kiwis have clearly visible external ear openings.[1,2]

All of these features equip kiwis to rely on smell and touch rather than sight, making them more like nocturnal forest-floor-dwelling mammals than other nocturnal birds such as owls.[2,4]

Figure 1. The Southern Brown Kiwi, Tokoeka, or Common kiwi, *Apteryx australis.*

Figure 2. Dissected kiwi.

How did the kiwi get to New Zealand?[18]

New Zealand is isolated in the South Pacific, 2,000 km east of Australia. Being so isolated New Zealand has developed a unique flora and fauna, so much so that it has been called a 'biological ark'.[19] It has the largest number of endemic species of plants and animals in the world, including the kiwi.

There are three evolutionary theories as to how the flightless kiwi arrived in New Zealand:

The ancient ancestor theory proposes that the kiwi lived 60 Ma before New Zealand supposedly broke away from Australia and Antarctica.[20] [This theory presupposes long ages.]

The walking theory proposes a series of islands that rose and sank across the Tasman Sea between Australia, New Caledonia and New Zealand throughout the last 50 Ma and that kiwi walked across this series of 'stepping stone' islands.[19] [The string of islands would have had to rise and sink in exactly the right sequence and position close enough for the flightless kiwi to 'island hop'.]

The flying kiwi ancestor theory proposes that kiwi ancestors could fly but lost that ability since arriving in New Zealand.[19] [The ancestors would have had to 'evolve' all the many features necessary for flight (keeled sternum, wings, vaned feathers, tail, preening gland, hollow bones, etc.) and then lose them all again. This is an unrealistic stretch even for the most generous evolutionary timescale.]

A creationist perspective may be that the kiwi, and perhaps its ratite relatives, was created as a distinct bird 'kind', perfectly well designed for their ground-dwelling habitats and life styles. Two ancestors of the created kind would have been on Noah's Ark. But how, then, did they get from the ark landing site to New Zealand?

There is significant evidence that before the Flood there were massive floating ecosystems of lycopod forests that supported a wide variety of other species. Such floating ecosystems are possible sources of many carboniferous coal seams around the world.[21]

Before the Flood such floating ecosystems may have been positioned about the polar regions. Pre-Flood, there were no ice caps as the whole earth's climate was temperate.

Figure 3. Hair-like kiwi feathers.

However the polar regions would still have experienced less sunlight time and intensity than the equatorial regions, making them a suitable environment for both the lycopod forests and the kiwi.

During Noah's world-wide Flood, huge hydrological forces could have torn apart the massive floating ecosystems. During the abatement period fragments of these ecosystems may have floated on the receding waters and been carried around the globe on currents.

If this is so, ancestral kiwis could have wandered onto a floating ecosystem fragment, or fragments, and been carried to New Zealand, where they were able to thrive for several millennia as ground-dwelling birds in the predator-free environment.

As the post-Flood climate became more extreme and the salinity of the oceans increased, the floating ecosystems died out, perhaps contributing to the coal reserves on the west coast of New Zealand.

Conclusion

According to current evolutionary theory, there is no consensus as to whether kiwis (and ratites) were previously able to fly and lost that ability, or never developed the ability. The many extraordinary similarities between kiwis and mammals are also interpreted as evidence of 'convergent evolution', a 'one-off evolutionary design' among birds.[4] But evolution by design is a contradiction in terms. The kiwis' unique combination of physical, physiological, genetic, and behavioural characteristics strongly suggests that they were never able to fly; nor have they 'evolved' their unique array of mammal-like features. A far more straightforward and logical conclusion is that they were interestingly and appropriately designed with all the genetic information they would need to occupy their unique niche in the ecology of New Zealand.

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