

Do Penguins Have Backache?

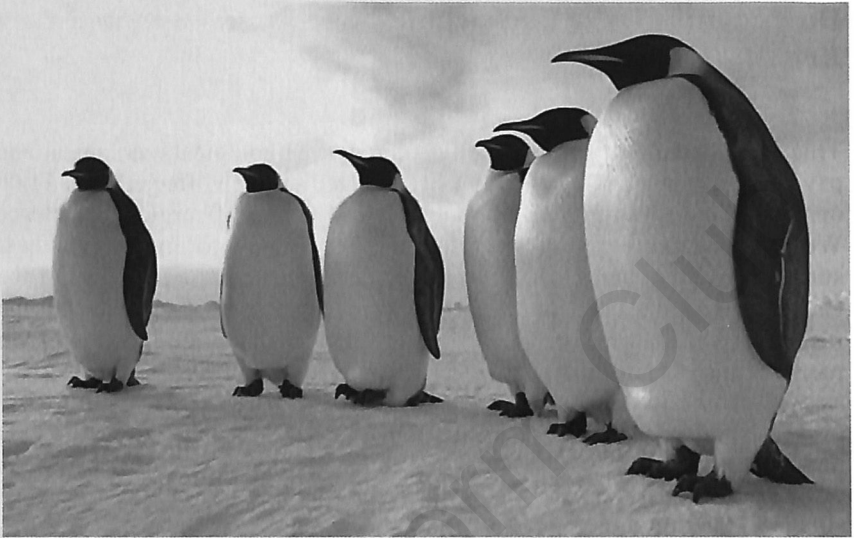
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This fundamental anatomical, physiological, pathological, zoological and psychological question was earnestly debated over a coffee table at 11.00 on a weekday morning 20 years ago at that centre of surgical excellence Woodend Hospital, by a team refuelling in readiness for meeting the next surgical problem at 11.10. Two of the debaters were/are members of the Cairngorm Club, and I am glad to report to the present membership the results of that animated conversation, still fresh in my mind (long-term memory may be still intact).

We had started with the observation that we had all had, or were presently suffering from, backache. Indeed, one of the lady coffee drinkers had developed this painful symptom shortly before the coffee had been brewed. She attributed the incapacity to bending over a hot tray of surgical instruments. Many other varied causes were suggested, supported, ridiculed or rejected. Our only consensus was that we were all human (just about) and that we spent many of our waking hours with our spinal columns vertical. We considered giraffes, kangaroos, chimpanzees, gorillas, etc. but decided that their spines were tilted rather than vertical. That only left penguins, as fish, amphibians, and reptiles are well known to be horizontal. None of us knew anything much about penguins as this was before the Internet and 'Life in the Freezer' - but we did know that Emperor Penguins are the biggest of the species and we had heard that they were to be found in Antarctica.

Several friends of mine in Foresterhill had been to Antarctica for the British Antarctic Survey (B.A.S.) to man British bases, mainly in the Antarctic peninsula, for periods of six, 12, or 18 months. The next time I met one or two of them, I enquired about Emperors, but no one knew, except to say that there were no colonies near to British bases. The available books on Penguins were generalised accounts but I found that they are swimming, diving birds incapable of flight and confined to the southern hemisphere (in contrast to polar bears which are found only in northern hemisphere). The further south you go, the bigger the subspecies become. This accounts for the first descriptions of Kings and Emperors not appearing until Captain Cook circumnavigated Antarctica in the 1770's.

I soon found that there were no Emperors in British zoos and indeed the only ones in captivity were in San Diego, California, in a specially refrigerated environment. The ornithological section of the Natural



What – Backache? Us?

(Photo: Glen Grant US National Science Foundation)

History Museum was in an old Rothschild mansion north of London, so a visit was arranged (by appointment only) to inspect the boxes of Emperor bones that had been presented over the years. It was disappointing that they did not have any articulated skeletons that might, just possibly, throw some light on the effects of an upright posture. I visited on a dark winter afternoon and was ushered up a grand staircase to a large former bedroom containing lines of cabinets with labelled drawers. From one of these, four shoe-box-like containers were extracted: two were inscribed with the words 'Ross Sea Expedition 1842' and two with 'Challenger Expedition 1876', and each contained beautifully prepared sets of bones. It was a surprise to find how tiny and gracile were the spinal bones in comparison with the large sturdy pelvis and leg bones. I was able handle these rare items and to photograph them on one of the work tables.

Being an associate of the Scott Polar Research Institute in Cambridge, I was able to use the very extensive library and to discuss penguin physiology with an expert, Dr Stonehouse. He explained the mechanisms whereby large penguins can survive excessive cold, dive deep (300m.), and only come up for air at long intervals.

The next move was to ask B.A.S. if they could find a specimen of an Emperor penguin so that I could investigate the matter of penguin backache, which had not been mentioned in my enquiries so far! Apparently, only the base at Halley Bay was within striking distance of an

Emperor rookery. I was warned that they were a protected species, and that various forms of licences would be required to import a cadaver into the U.K. It was proposed that some member of the crew at Halley would be able to visit the rookery in the spring, when the light returned, and collect a bird that had died during the winter when incubating an egg (thus the specimen would be a male, as only males huddle together during the Antarctic winter cradling an egg under their abdominal feathers, while the females go to sea to feed for a few months).

After one season I was warned that a specimen was on its way to Aberdeen, but it never appeared, and despite enquiries it was evidently 'lost in transit'. Next year a large penguin appeared, deeply frozen and wrapped in many layers of thick plastic sheeting. It had been kept frozen after collection for all the many stages of its journey to Aberdeen. Having been warned of its arrival I had secured permission to keep the cadaver temporarily in the deep freeze of the Pathology Department. It seemed a little surreal to be carrying a 20kg frozen penguin on my shoulder along the main corridor of Foresterhill. A number of friends stopped me to enquire but no one recognised the nature of my burden.

On arrival in the Medical School, the Professor of Bacteriology asked if he could culture any bacteria that might be found on the penguin's skin, deep in the feathers, on the hypothesis that they might be unique. I believe that nothing new was found.

Before dissection of the specimen in the basement of the Anatomy Department in Marischal College, radiographs were taken to show the assembly of the skeleton with the soft tissues intact. These showed the remarkable construction of the spinal column and the thorax, with several long fused segments of vertebrae and ribs. None of the bones were aerated as in flying birds, and there was no sign of any growth plates in the limb bones from which I surmised that the bird was an adult. There was no evidence of any degenerative changes in the mobile segments such as those familiar in humans.

Dissection in the cold, solitary gloom of the Anatomy Department, surrounded by embalmed human cadavers awaiting their student investigators the following year, was not an enjoyable experience; especially as attempts to embalm the penguin had failed due to ignorance of the precise position of the major arteries. The melted corpse was slowly disintegrating with the strong smell of old fish filling the atmosphere. After removing the thick layer of fat that underlay the dense feathers and skin, I soon found innumerable features that were new to me. I was astonished by the curvature of the neck bones, by the air sacs, and the huge limb muscles. The remnants were refrozen in the Anatomy Department.

It was about this time that I discovered a wonderful monograph on penguin anatomy published in 1883 in the *Journal of Zoology* by Professor Morrison Watson. He had dissected a wide variety of penguins collected from the Southern Ocean by the 'Challenger' expedition of 1876-78, the first scientific investigation of oceanic waters. His monograph runs to 244 pages, and is illustrated with beautiful hand-drawn diagrams and pictures. He made no mention of any pathological changes. Had I known of his work, my own dissection at Marischal College would have been much better directed and perhaps more fruitful.

The following year, to my surprise, another adult penguin arrived together with a chick covered in fluffy light grey down. I offered the adult to the Zoology Department for preservation of the skin and the skeleton. The chick was kept in the freezer at home alongside food cartons, much to my wife's displeasure! Further radiographs were taken. It had evidently died of starvation, perhaps because its mother had not come back from the ocean in the spring.

Disposal of my specimens had to be considered carefully. Putting parcels of flesh in the bin with household rubbish might offend the Refuse Department. Burying them in the garden at dead of night would probably attract the police. I discussed the matter with a vet who lives nearby and on his advice arranged for incineration at Craibstone. This process cost me £25, my only expense thanks to the co-operation and generosity of all the institutions and departments with which I dealt.

Thus I have not been able to decide if penguins suffer from backache, and no film that I have seen in subsequent years has ever shown an Emperor rubbing its back with a flipper or being massaged by its partner. I did not find any pathological changes that I could recognise in the few specimens I examined. It seems likely that only perfect specimens can survive life in the Antarctic, and even though males and females remain standing around their chicks and walk long distances over the ice, yet a lot of their lives are spent in the sea, and they can progress across the ice plains by skating on their bellies.

Professor Watson's work in 1883 just shows that in nearly every case someone has gone before. The only question that eludes me is how to estimate the age of a penguin, but, since I have not followed the literature for the last 10 years nor properly looked at the Internet, I expect that this matter has also been tied up.

Many great scientific discoveries have followed discussions around a coffee-table, like the one at Woodend Hospital so many years ago, but this time none did so!