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The Cervantes egg: an early Malagasy tourist to Australia

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Abstract – A large fossil bird's egg discovered near Cervantes in Western Australia is identified as belonging to *Aepyornis maximus* by its size and eggshell structure. It is the second such egg found in Western Australian Holocene beach dune deposits. Radiocarbon dating of the specimen gives an age of about 2000 years. By comparison with other known rafting events, we suggest that this egg and the Scott River *Aepyornis* egg both drifted across on oceanic currents from Madagascar and were not brought to Australia by human intervention.

INTRODUCTION

A large fossil bird's egg (Figure 1) was discovered by three primary school students about 7 km north of the town of Cervantes, in Western Australia, in late 1992. It represents the second such discovery of a very large fossil bird egg from the dune deposits of southern Western Australia, the first being found by Mr Vic Roberts, then ten years old, near the mouth of the Scott River, near Augusta in 1930. Well-known naturalist Harry Butler saw this egg in a farmhouse in Nannup in 1962 and informed the Western Australian Museum, which now has the egg (Figure 2) on a permanent loan from Roberts.

The Cervantes egg was found exposed in sand dunes about 300 m inland from the coast. Mory (1994) referred to this egg as being found in Holocene dunes overlying lagoonal deposits, suggesting that the sediments containing the egg were probably less that 3000 years in age. Radiocarbon dating of the Cervantes egg as about 2000 years (see below) fits in well with this suggested geomorphological age of the dune deposits.

The Cervantes find was announced to the public through an article in *The Sunday Times* newspaper on the 21st March 1993 and subsequently received an enormous amount of media coverage locally, nationally and even internationally. Despite initial disputes over the ownership and attempts by the finders to auction or sell the egg, the Western Australian Government eventually made a ruling that under the Lands Act the specimen, which was found on Crown Reserve Land, actually belonged to the Crown. An *ex gratia* payment of $25,000 was later made to the families involved as a goodwill payment. The legal wrangle surrounding the egg's ownership was thus important in precipitating the first draft legislation pertaining to fossils and their ownership for the State of Western Australia.

The Cervantes egg is now a registered specimen in the Western Australian Museum palaeontological collections, as WAM 93.9.1. Preliminary observations on the egg were first published by Long (1993).

IDENTIFICATION OF THE CERVANTES AND SCOTT RIVER EGGS

The Cervantes egg measures 31.7 cm in length, being significantly larger than the Scott River egg at 27.6 cm long. Both the Cervantes and Scott River eggs appear to belong to the extinct flightless bird *Aepyornis maximus,* which lived in Madagascar until as little as 400 years ago (Figure 3). This bird reached gigantic sizes of up to 2.5 m tall and would have weighed more than half a tonne.

The Cervantes eggshell is quite thick, ranging from 3.05 to 3.45 mm where it could be measured, and this compares well to the measurements of the Madagascar Elephant Bird, *Aepyornis*. The shell structure is best viewed in radial thin sections (Figure 4) and is of an ornithoid-ratite morphotype (Hirsch and Packard 1987). There are two pronounced shell layers, the well-structured mammillary layer and the continuous spongy layer with an abrupt change of the structure between

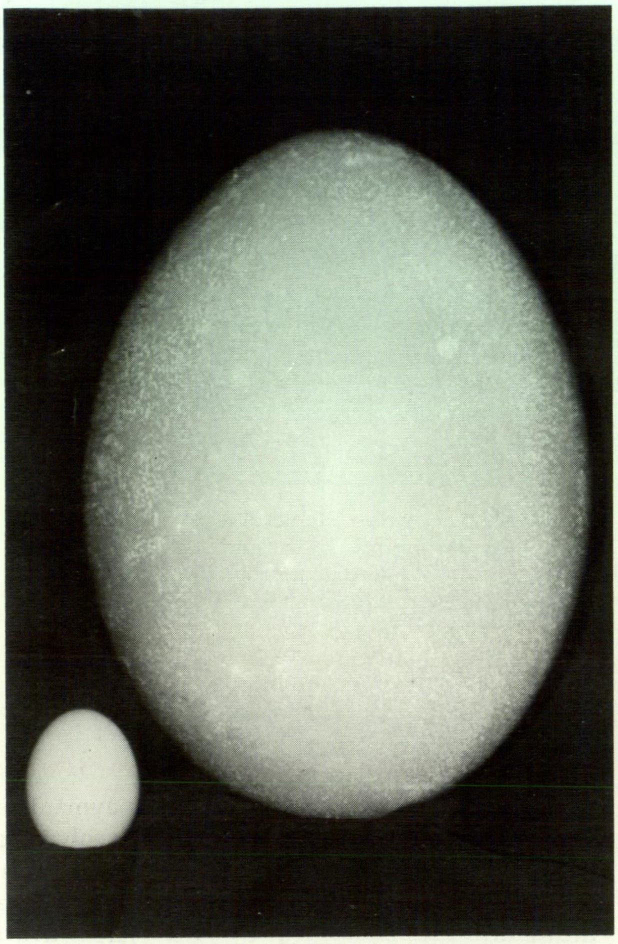

Figure 1 The Cervantes egg compared with that of a chicken egg (photo courtesy of J.A. Bell).

them. In the case of *Aepyornis*, a third outer layer is present.

The external layer is relatively thick, more so than that found in the only other ornithoid ratite, the Ostrich *(Struthio)*. The continuous inner layer is similar to that in both the Ostrich and the Emu *(Dromaius)*. This layer has pronounced, horizontal growth lines and otherwise looks structureless in comparison to the mammillary layer.

The mammillary layer is almost one third of the eggshell thickness. It has a radial, wedge-like arrangement of the tubular crystalline material, and on the base of the large mammillae a particularly fine ultrastructure is visible.

The pore canal observed in the Cervantes eggshell is single and non-branching. *Aepyornis* has single or branched pore canals. The pore pattern on the surface of the eggshell (Figure 5), opening into long, narrow slits is very reminiscent of *Aepyornis*, and not of other ratites. Just as in *Aepyornis*, the pores of the Cervantes egg opened either singly or multiply in the long pore slits. The Cervantes egg is in the size range and of similar shape to known *Aepyornis* eggs.

The Scott River egg has a similar eggshell texture to that of the Cervantes egg, but has been sand blasted along one side, creating a smooth, polished, but slightly pitted surface.

A comparison to the eggs of large birds known from Australia, the dromornithids, reveals distinct differences, namely in the structure of the surface areas in which pore canals open. In *Genyornis*, where this can be well observed, these pore slits are markedly curved. In the Cervantes egg the slits are straight. The surface of the Cervantes egg is smooth as in *Genyornis*, where shell thickness is much less (with an average of material we measured being about 1.15 mm) and different from eggs of the largest dromornithid known with a thickness of 4.07 mm, which had a crenulated, rough surface (Williams and Rich 1992, 1996).

DATING OF THE CERVANTES EGG

The loose material found inside the egg was selected for dating on the basis that this sample was best protected from contamination. The material was extracted using a dentist drill in the clean laboratory at ANSTO.

Organic samples to be analysed by Accelerator Mass Spectrometry (AMS) needed to be purified and transformed into graphite target for the ion source. First CO_2 was obtained from two samples, one of 40 mg and one of 80 mg by hydrolysis in hydrochloric acid under vacuum. The resulting gas was graphitised onto an iron catalyst using zinc for the initial reduction to carbon monoxide. The graphite/iron mixtures were finally pressed into cathodes and loaded into the iron source on the ANTARES AMS spectrometer (Tuniz *et al.* in press).

The procedure for the analysis of the $^{14}C/^{13}C$ isotopic ration is here briefly described. Negative carbon ions are produced in the sputter ion source and, after low-energy mass analysis, they are injected into the tandem accelerator. High precision AMS measurements are carried out by rapid sequential injection of the isotopes ^{13}C and ^{14}C. negative ions are attracted to the positive voltage at the terminal and thereby accelerated to energies of 5.2 MeV at which point they pass through a carbon foil and are stripped of some of their electrons. Multi-charged positive ions are then further accelerated by the same positive voltage on the terminal. The isotopic ration of $^{14}C/^{13}C$ is derived from the ^{14}C counting rate in the detector and the beam current of the stable isotope. Figure 6 shows the plot of data upon which the date is based.

The conventional radiocarbon age for the Cervantes egg is 1928 +/–73 yr BP, which corresponds to a calibrated age range of 12–187 yr AD (correction for natural isotopic fractionation was performed by assuming $\delta 13 = -14$ per mil (Berger 1975)). Conventional radiocarbon ages as

Figure 2 The Scott River egg, found in 1930 near Augusta (photo: Douglas Elford, Western Australian Museum).

reported in years BP (before present, where present is 1950 AD) and are calculated using the "Libby" half-life of 5568 years and the assumption that the production of ^{14}C has been constant. The differences between conventional radiocarbon ages and calibrated ages has been determined with high precision for most of the Holocene by radiocarbon measurements on tree ring samples, which are independently dated by dendrochronology. Part of this difference derives from the use of conventional half-life, which is known to be 3% too small. The remaining difference derives from secular variations of ^{14}C production rate in the atmosphere for geo- and helio-magnetic effects and global variations in the parameters of the carbon cycle.

Shell fragments (>10 g) from *Aepyornis* eggs found in the sand dunes of Madagascar, have been dated previously using conventional radiocarbon methods, yielding ages which span the period 850 to 7500 yr BP (Berger 1975; Long *et al.* 1983).

SUPPORT FOR THE DRIFTING EGG HYPOTHESIS

The discovery of the Scott River egg caused quite a stir. Doubt was immediately cast on its authenticity. After all, how could a large egg float across the Indian Ocean and be washed up on a beach intact? Despite this incredible scenario, the identification of the egg as an *Aepyornis*, based on its surface texture, microstructure and overall size, appears most likely. Williams and Rich (1996) cast doubt on its identification as being from an

Figure 3 A Malagassy *Aepyornis* egg in its native land, Madagascar (photo courtesy of Air Madagascar).

Aepyornis, yet the study of the second egg, from Cervantes, confirms its identity as also *Aepyornis*.

The discovery of the second Australian *Aepyornis* egg, from Cervantes, lends support to the drifting egg hypothesis. However, most convincing evidence comes from the recovery of two fresh King Penguin *(Aptenodytes patagonicus)* eggs on Western Australian beaches, which must have come from one of the subantarctic islands such as the Kerguelen Islands, some 2000 km away from Australia.

The first of the penguin eggs was found about 2 miles south of Augusta, close to the site of the original Scott River *Aepyornis* egg, on January 10th 1974. It was found by three beach fishermen who plucked it at the high water mark, examined it and threw it away behind the first sand dunes. On January 12th 1974 Geoff Lodge met with one of the fishermen, went to the site and after an hour's search, and found the egg intact in the dune. When the egg was blown, it was found to contain an embryo quite advanced, without any odour of decay. As the egg laying season for these penguins is between late November and mid-April, the egg must have been transported in an advanced stage of incubation by the West Wind Drift, and was discovered almost immediately after reaching the West Australian coast. The discovery of this egg and further details pertaining to it are described by Lodge (1976). The specimen is now held in the private collection of Mr G. Lodge at Boyup Brook, Western Australia.

A second egg of *Aptenodytes patagonicus* was found on Trigalow Beach, in Doubtful Bay Island near Bremer Bay on the southern coast of Western Australia in March 1991. This egg measures 11 cm long and is now registered in the ornithological collection of the Western Australian Museum as A24905. This egg is also intact and was covered with barnacles and algae, which were easily removed by the finder without damage to the shell before it was examined by museum scientists. The egg contained addled contents. The nearest living colonies for these penguins are Marion Island, the Crozets, the Kerguelen Islands and Heard Island (Figure 7). The most likely source, given the current patterns and proximity to Western Australia, would be the Kerguelen Islands.

Yet another egg, an Ostrich egg *(Struthio camelus)*, was retrieved from a dredge in the Timor Sea in the early 1990s, just south of Timor, northwest of the Western Australian coastline. The egg was heavily weighed down with algae, so was not actually floating at the surface of the water, but suspended in mid-water according to its finder, who brought the egg into the Western Australian Museum. The egg was examined and identified as that of an Ostrich and returned to its finder by Ron Johnson of the Ornithology Department of the Western Australian Museum (R. Johnston, personal communication 1996).

And still another convincing piece of evidence favouring the rapid drifting hypothesis for the

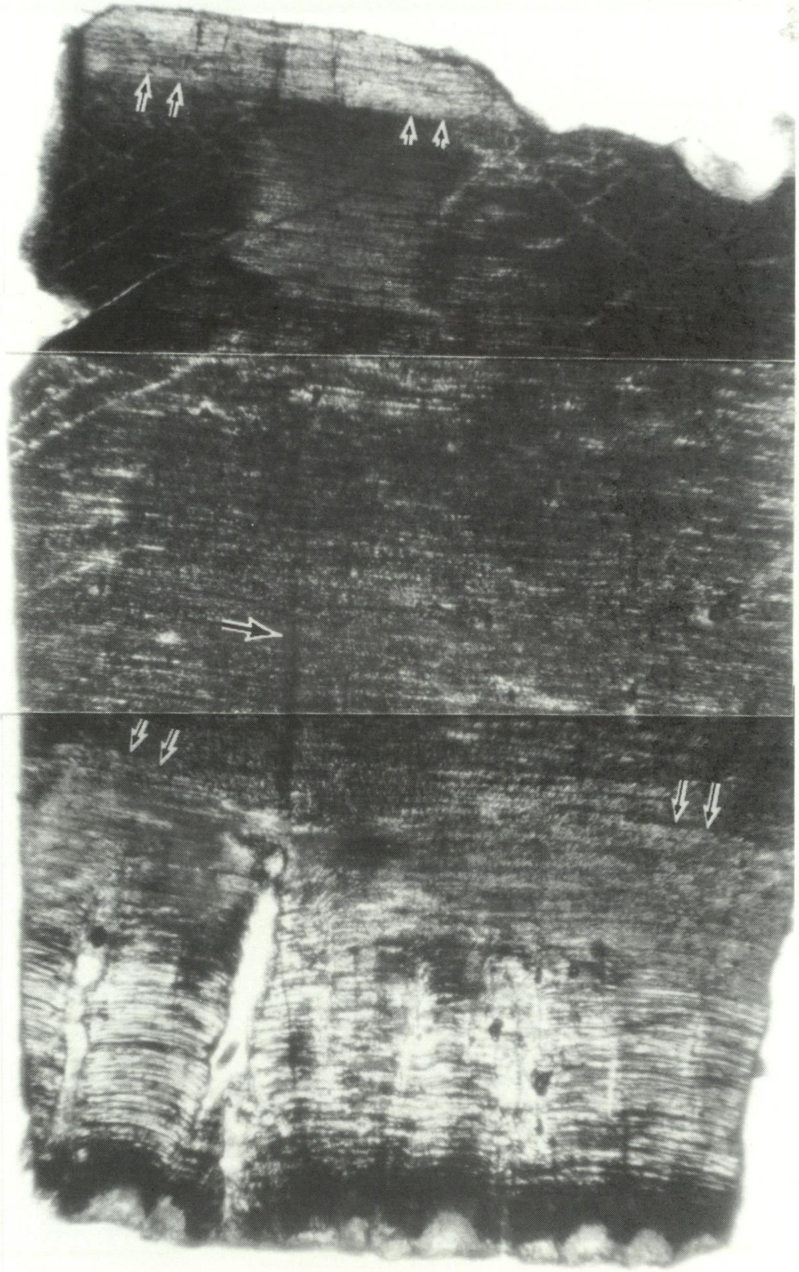

Figure 4 Thin section (radial) of the egg shell of the Cervantes egg showing the three major layers (exactly the same in *Aepyornis*): arrows point to the boundary between the outer layer (top left only), the continuous layer (middle) and the mammillary layer. The dark vertical line indicated by the arrow is a faint indication of one of the pore canals (x50) (courtesy of K. Hirsch).

Aepyornis eggs comes from Betty Beach, near Manypeaks, Narrikup, Western Australia, where in 1980 a float was found that had originated in South Africa. The float had been released in 1977 as a part of a study of in-shore current movements. Thus, there is evidence supporting the transport of intact fragile material, such as eggs, over long oceanic distances.

One question raised with regard to long distance drift is the lack of marine encrustations that should occur on items such as eggs, if they had spent several months at sea. To this end, we observe that glass floats frequently wash up on Western Australian beaches that have barnacles on them and are soon sandblasted clean and polished. This process could have occurred to the *Aepyornis* eggs after they had reached shore, thus removing the trace of marine growth. Evidence for this is seen on the Scott River egg, which shows one surface highly polished from wind driven sand blasting.

Although long distance rafting is certainly a possibility, another exists, and that is one of short distance dispersal. During the 19th and 20th centuries it was not uncommon to find Elephant Bird eggs aboard ships sailing around the world. It

Figure 5 Surface structure of *Aepyornis* eggshell. Note the long slit-like structures into which the pores open. This type of structure is exactly what is seen in the Cervantes egg (x20).

is possible that one or both of the eggs arrived near Australia aboard ship and with shipwreck ended up on Western Australian beaches, travelling only a short distance. We note that at the location of the Scott River egg, in the dunes near Augusta, there have been no records of early shipwrecks

Karl-Heintz Wrywoll, a specialist in Quaternary sedimentary deposits at the University of Western Australia, visited the site near Cervantes where the egg was found. He suggested that the Cervantes egg could easily have floated in on a quite recent storm surge as it was lying not far

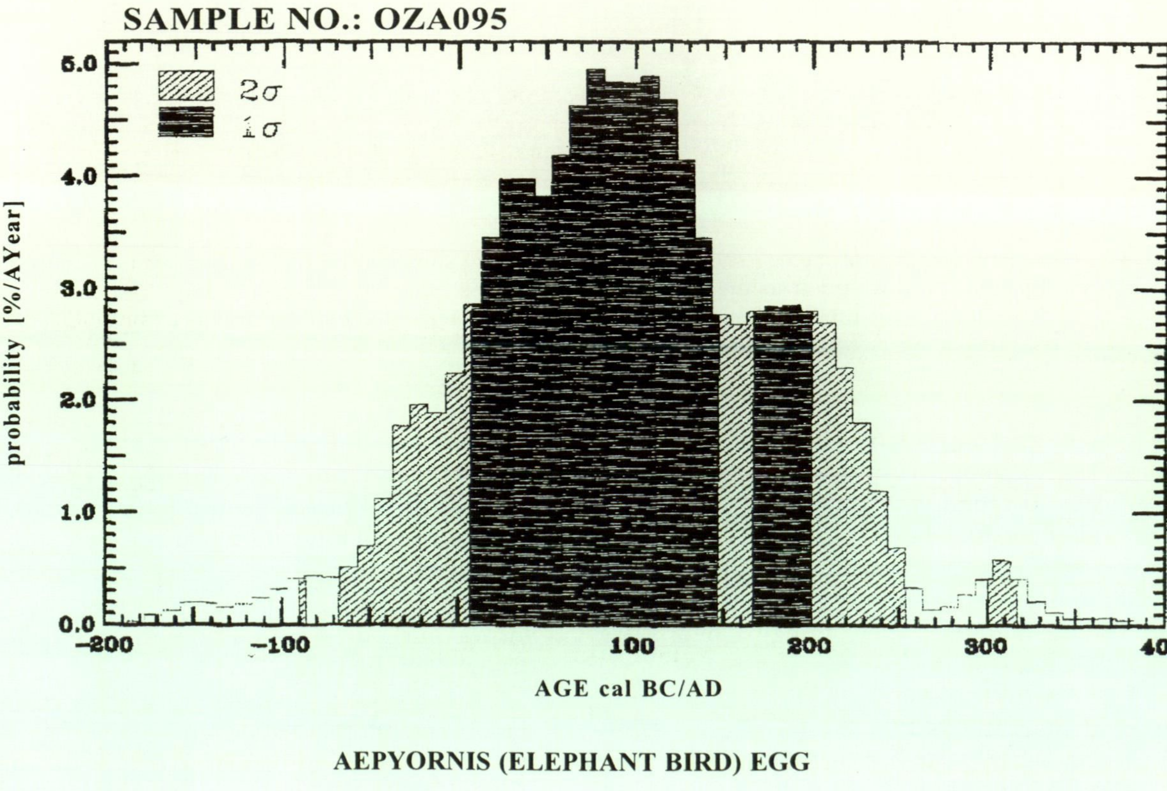

Figure 6 Plot of data upon which the date of the Cervantes egg was based.

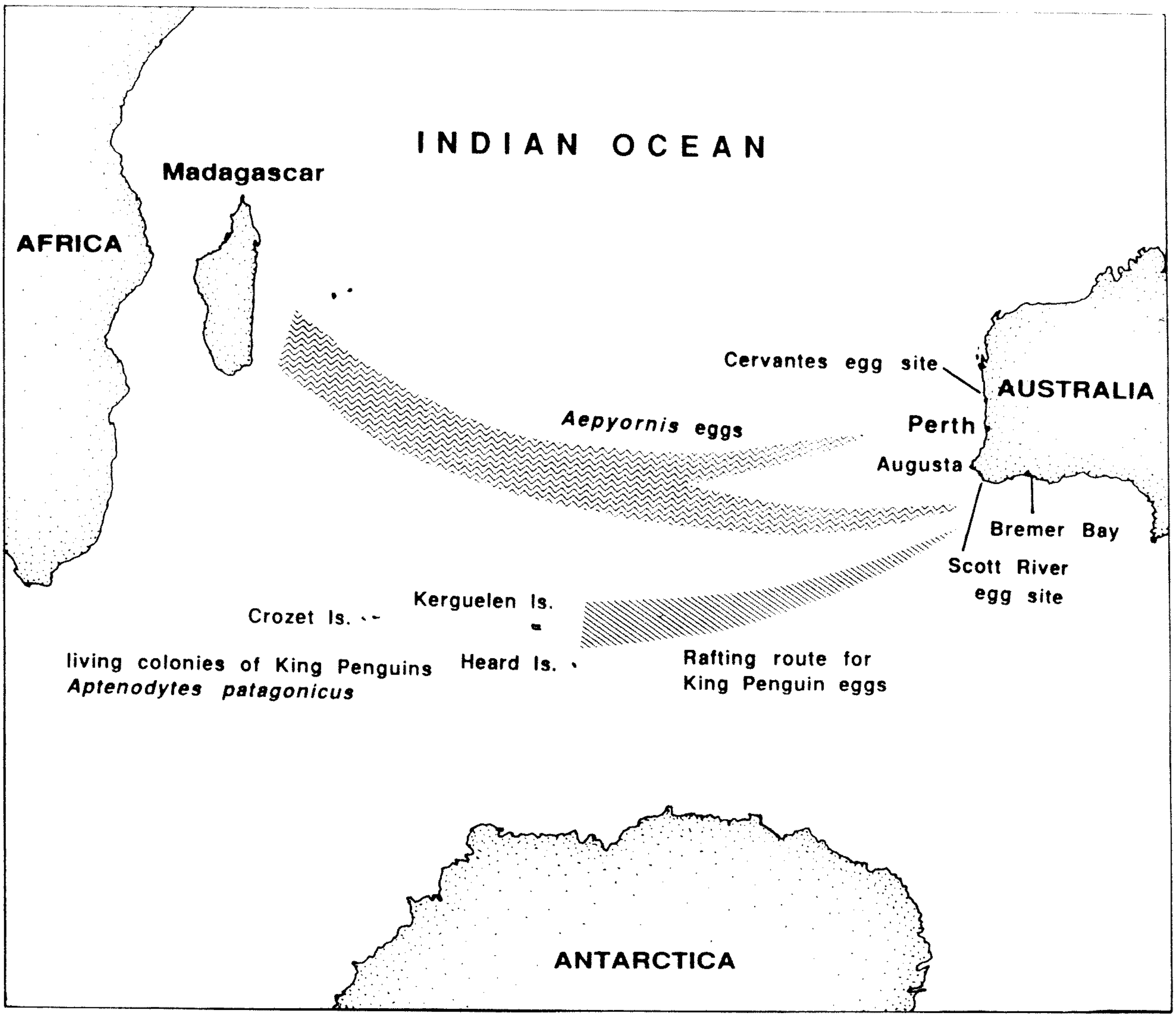

Figure 7 Map showing the position of nearest living colonies of King Penguins, *Aptenodytes patagonicus*, whose eggs have also travelled by oceanic currents to end up on Western Australian beaches near Augusta (in 1976) and Bremer Bay (in 1991). Possible rafting route and sites where the two *Aepyornis* eggs were found are also indicated.

above the current high tide mark. The Holocene dunes in which the egg was buried contained no visible evidence of human activity, such as shipwreck artifacts or signs of Aboriginal influence, such as midden remains or tools. So, perhaps the Cervantes egg was a long distance marine tourist.

CONCLUSIONS

It appears that the egg recovered from near Cervantes by three primary school children in late 1992 is from the extinct Elephant Bird of Madagascar, *Aepyornis maximus*. The egg has been dated at about 2000 years of age and certainly could have reached the Western Australian coast by long distance rafting. It is still possible that it could have floated ashore from a shipwreck, but it is most likely an overseas tourist. Both in its form, macrostructure and microstructure it is more similar to *Aepyornis* than to any of the native giant land birds in the family Dromornithidae.

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