

GIANT FLIGHTLESS BIRDS

BY BRYAN PATTERSON

ASSISTANT CURATOR OF PALEONTOLOGY

A new exhibition case installed in Ernest R. Graham Hall of Paleontology (Hall 38) is devoted to giant flightless birds. It contains skeletons of a New Zealand moa and a South American phororhacoid.

The large ground birds, represented today by the ostriches of Africa and the Near East, the rheas of South America, and the emus and cassowaries of the Australian region, are of interest from several points of view. They represent an extreme of specialization in the bird world, one in which gradual adaptation to a completely terrestrial existence led to the loss of the power of flight which in turn made possible great increase in bulk. They are now, and were in the past, very few in number compared with the hosts of flying birds, a fact which suggests that evolution of such types was possible only under exceptional conditions. Finally, they afford a glimpse of a world that might have been—of the sort of beings that might have dominated the land surfaces if mammals had never existed.

ISOLATED ON TWO CONTINENTS

The past history of the living groups is not well known. Emus and cassowaries are known from the Pleistocene of Australia, ostriches from the early Pliocene of Europe and Asia, and rheas from the early Miocene of South America. These fossil forms are practically as specialized as their living relatives, indicating that the history of each group began long before its first appearance in the geological record. With the exception of that of the ostriches, it is almost certain that these histories have run their courses in the regions which the living forms inhabit. This belief is based on a wealth of evidence indicating that South America was, and that Australia has been, isolated from the rest of the world for extremely long periods of time, the former from the end of the Age of Reptiles to almost the end of the Age of Mammals, a stretch of more than fifty million years, and the latter probably from an even earlier date.

Inhabiting South America together with the rheas were the phororhacoids, perhaps the most spectacular birds of all time. A group of flesh-eaters ranging in height from less than three feet to over eight, they must have preyed on a wide variety of animals from creatures of mouse size to the larger herbivorous mammals. They were discussed at length in the March, 1941 issue of FIELD MUSEUM NEWS.

That a group of birds should have played so notable a part in the animal life of a large region is altogether exceptional and seems to have been one of the biological results of the isolation of South America. The fauna of the continent at the time that it was cut off from North America did not include any true carnivorous mammals, their places being partially filled by flesh-

eating marsupials, relatives of the opossum which were much less intelligent and effective animals. These evidently failed to become the dominant predators of the region, and the rise of the phororhacoids accordingly became possible. The extinction of the group appears to have roughly coincided in time with the reunion of the two Americas and the invasion of the southern continent by cats, dogs, and other true carnivores which came down from the north. This seems to indicate that the phororhacoids



Drawing by John Conrad Hansen

RESTORATION OF A MOA

These giant birds flourished and grew fat during millions of years in their isolated home in New Zealand, but became extinct after the arrival of Man. Their island sanctuary was invaded centuries ago by those hardy voyagers, the Polynesians, who crossed vast expanses of the South Pacific Ocean in frail primitive open boats.

might not have come into existence had they been faced with effective competition from the start.

The lack of true carnivores in South America takes on added significance when it is realized that the Australian region, home of the emus and cassowaries, likewise contained none of these mammals until they were introduced by man. This at once suggests a correlation between a lack of true carnivores in a region and the evolution there of large flightless birds.

The large island of Madagascar has evidently been separated from Africa for many millions of years. Certainly until comparatively recent times the island was inhabited by giant plant-feeding ground birds, similar to the ostrich in general appearance but much more heavily built. They appear to have been forest dwellers, resembling in this respect the living cassowaries. Here again enemies were few, being limited to some small civets and a primitive relative of the cats. The ancestors of these mammals evidently reached Madagascar about the middle of the Age of Mammals, by accidental means—probably by flotation on natural rafts of vegetation. By that time the evolution of the ground birds must have

been too well under way to be materially affected by these newcomers. The extinction of the group dates from the human period and there is evidence that man had a hand in the process. *Aepyornis*, the best known form, enjoys the distinction of having laid the largest eggs of any known bird. The biggest egg yet discovered has a length of almost fourteen inches, and a greater circumference exceeding three feet. It is believed that these eggs may have come to the attention of the early Arabian navigators, and thus have contributed to the legend of the Roc which is so prominent a feature in the story of Sinbad the Sailor.

New Zealand is unique among the land masses and larger islands of the world not only in having no carnivorous mammals but in having no native land mammals of any kind. In this natural bird sanctuary a number of avian orders evolved ground-dwelling forms, many of which completely lost the ability to fly. The giants among these were a group known collectively as moas. Extremely abundant and diversified, they ranged in height from about ten feet to less than two and a half feet. In general appearance they resembled the ostriches and rheas but were heavier, especially in the legs, and probably less speedy. Their isolation and safety came to an end when Polynesian peoples, exploring the South Pacific in open boats, began to colonize New Zealand. These invaders found in the moas a readily available source of food and appear to have killed off the last survivors by about A.D. 1300.

MAMMAL INVASIONS ENDED ERA

It would appear from this record that freedom from the destructive activities of true mammalian carnivores is a prime requisite for the evolution of giant flightless birds. The occurrence of a few such groups in the northern hemisphere during the early epochs of the Age of Mammals also supports this view. At the time these were living the modern carnivores had not yet evolved, their places being occupied by the related but less specialized creodonts. After cats, dogs, weasels, etc. appeared on the scene, no more flightless giants are known to have arisen in areas to which they had access. Isolation in parts of the world to which these beasts of prey did not penetrate evidently made possible the rise and long survival of the birds discussed here.

After the passing of the dinosaurs and other giant reptiles some sixty million years ago, the mammals dominated the land and the pressure of their superior competition kept the birds largely confined to an aerial existence. Had no mammals existed, however, it is very likely that many bird groups would have reverted to terrestrial habits, and that giant forms would have been varied and widely distributed instead of being confined to a few areas where fortuitous combinations of circumstances made their development possible.



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