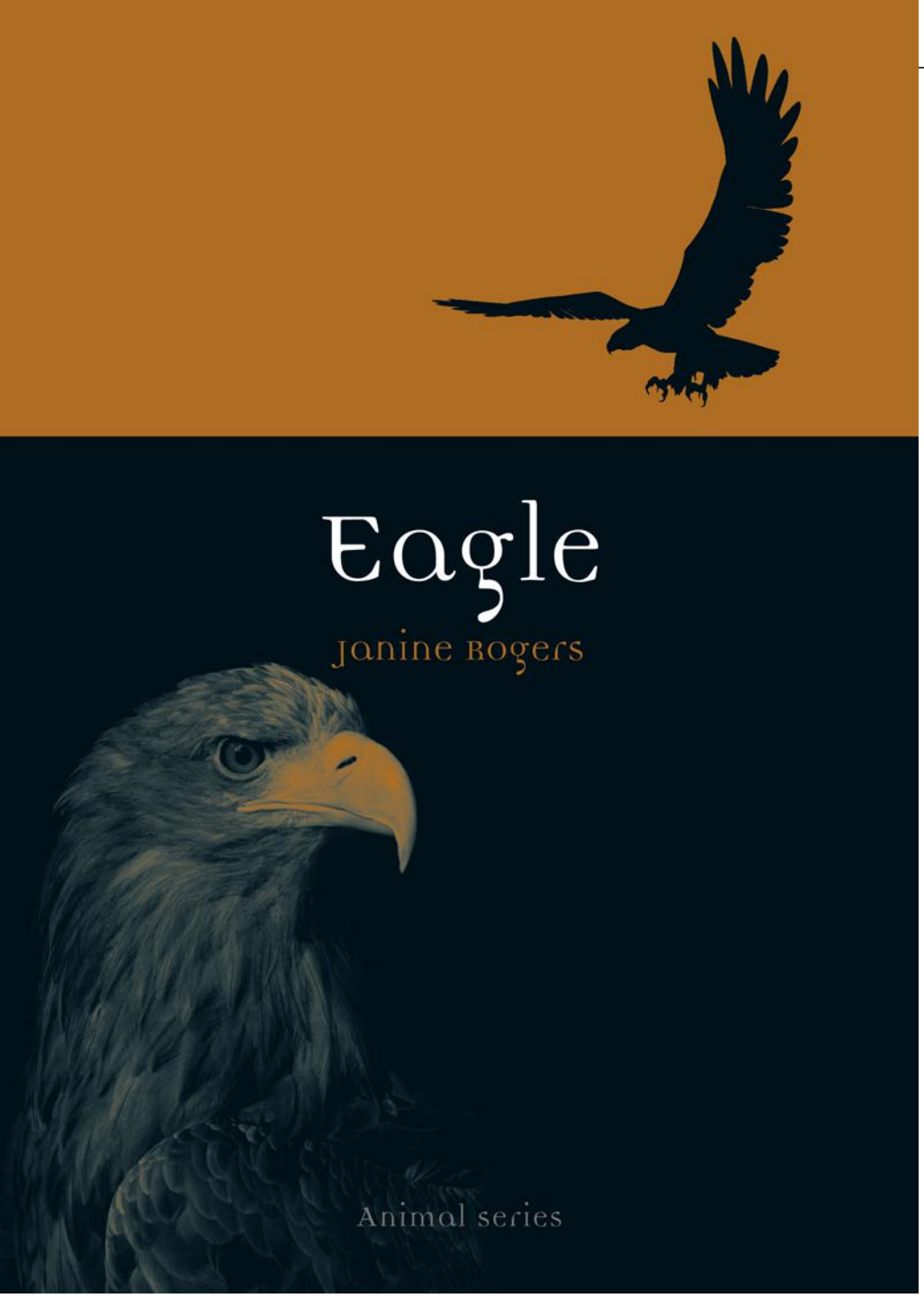
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Janine Rogers
Animal series

Eagle

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Eagle

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Introduction

A few years ago I sat with a friend on a beach on the Northumberland Strait, a narrow body of water that divides Prince Edward Island from Nova Scotia and New Brunswick, watching the birds take advantage of the low tide. A bald eagle flew into view; we admired its dramatic markings and powerful flight. It made a few passes over the flats, moving more slowly and deliberately than the other seabirds. Suddenly it became a dark streak and struck a black cormorant in mid-air with breathtaking speed and precision. The two birds fell to the sea floor, the cormorant (which is not a small bird) struggling desperately. On the ground the eagle looked twice the size it had in the air – it dragged its frantic prey behind a low rock and began to tear at it. Although the rock hid the worse of the violence, we were horrified at what followed. For long moments we could see the cormorant's head or wing wave over the rock as the victim thrashed: the eagle was eating it alive.

In those few minutes we had witnessed many of the associations people have with eagles. Across cultures and through millennia, eagles have been known for their elegance, power and cruelty, and these characteristics have caused eagles to be among the most mythologized and storied of birds. Human emotions towards eagles range from reverence to repugnance and yet they are also deeply mysterious to us. As a general rule,

A majestic bald eagle flies over its nest.

they tend to live on the fringes of the human world – they are rarely tamed – and, even in the case of the largest and most dramatic eagles like the golden eagle and the bald eagle, our imaginations about their lives often outstrip our actual knowledge because we are forced to observe them at a distance. And yet while our scientific understanding of eagles has been hard-won, eagles are far from unknown in the larger sense: being birds of such rough beauty and aggression, they are a conspicuous presence in many cultural narratives. Often called 'the king of the birds', eagles rule in the human imagination as much as they rule the ecosystems they inhabit.

Their place at the top of the food chain, however, presents an inborn vulnerability for these magnificent birds. Like many other major predators, they breed slowly; even in optimal conditions eagles just barely maintain their populations. Our modern world, of course, is forming ecologies that are far from optimal for eagles and many species are endangered by pollution, urban sprawl, habitat destruction and direct persecution by people. As a result, we are at risk of losing a key character in our ecological, cultural and perhaps even psychological landscapes.

Broadly speaking, the eagle is a symbol of paradox and liminality – states of contradiction and in-betweenness. Symbols like this can refer simultaneously to two oppositional things at once or to something that refuses absolute categories of understanding. Much of this symbolic ambiguity can be traced to the real lives of eagles and their function in the biological world. They are the *über*-hunter, often seen as the red tooth and claw of nature as they weed out the sick, the weak, the slow and the unlucky. They gorge themselves on the flesh of the innocent, and not only that, but on the decaying corpses of the already dead. They seem voracious and indiscriminate – a random killing machine, a thief and a scavenger who is lazy with the opportunistic cruelty

A red fox devoured in the snow.

of the criminal. Even their infants kill – each other. On the positive side, we see eagles as noble: large, powerful, with the proverbially piercing eyes that seem to watch over us. They soar amazingly high and fast, with apparently little effort. They are long-lived, (mostly) loyal to their mates and attentive parents. They are clever and resourceful. They are beautiful. Religious beliefs are built around them.

In all of our imaginative ideas of eagles these polarities and contradictions persist. And indeed, in the realm of the gods eagles are the bringers of life and death equally. Fair-minded observers have long noticed that even the apparently disgusting behaviours of eagles have positive effects; carrion eaters clean the world of decayed corpses, bacteria and disease, creating a healthy environment so that others may live. We come full circle; the eagle is a resurrectionist. The eagles of Zeus communicate his often arbitrary and inscrutable wishes to men; capable of great vision, but also motiveless cruelty, the god and his familiars are perfectly matched. North American eagles carry us between the land of the living and the land of the dead – and it is not necessarily a one-way

journey. As a bird of destruction and resurrection the eagle is extended into fantastical creatures like the phoenix, as well as hybrid beings like the gryphon and the sphinx. A figure of death, but also regeneration; a symbol of freedom, but also tyranny; we look to the eagle to exemplify the best and the worst qualities of our own existence, and of ourselves.

1 Eagles Themselves: Biology and Ecology

Would you know an eagle if you saw one? Most of us, even those of us who are not birdwatchers or biologists, think we have a rough idea of what eagles are, although our specific images might be quite different. If you live in North America as I do, you would almost certainly think first of the bald eagle. If you are British or Continental European, the golden eagle might spring to mind if you are in the north, or the imperial eagle if you are in the Mediterranean area. If you are Australian, the wedge-tailed eagle is probably your primary image; if you are South American, the harpy eagle. Readers from Africa or the Indian subcontinent may have the most varied concept of 'eagle'; there are many there to choose from. Wherever you are, and whatever your specific eagle impressions, you might be surprised to discover how broad and fluid the term 'eagle' actually is.

The word 'eagle' is not a scientific word; it does not refer to a single species or even a specific genus. Rather, it refers to a general category of raptors that possess certain attributes that together constitute a type of bird that is carnivorous, diurnal and often large in comparison to most other flighted birds. Colloquially speaking, many of us who live in Eurasia, Australia or North America probably have a fairly clear idea of what we mean by 'eagles': when asked to describe an eagle we probably refer to some common features. Size might be the first, for many eagles are big, often

the biggest of the predatory birds in a given area. Indeed the standard definition of 'eagle' in the *Oxford English Dictionary* begins with size: 'large bird of prey of family Accipitridae, with keen vision and powerful flight'.

In fact, the word 'eagle' is an Anglicization of the French *aigle*, which comes from the Latin *aquila*, meaning dark or black. As the eminent ornithologist Leslie Brown points out, however, the idea that eagles are big, dark birds comes primarily from a European context – it is the sort of definition Aristotle used in describing eagles, for example – and the definition does not always apply to more southerly contexts, especially Africa and South America, where eagles like the harpy eagle are often grey or have significant amounts of white, red and tawny colours.[1] Furthermore, some species of eagles are actually quite small, especially the genus called 'snake-eagles' or 'serpent-eagles', as well as a group of birds designated 'hawk-eagles' that, as their name suggests, combine some characteristics of the two types of bird, including the smaller size of the hawks. The Great Nicobar serpent eagle is usually considered the smallest eagle and weighs only about a pound (the 'Great' is in reference to its island home, not the bird itself).

Other attributes that we may associate with 'eagles' are their hunting behaviour, their power in flight and their intimidating appearance. These general impressions connect to specific physical features: a vicious-looking beak; powerful, grasping claws; piercing eyes and so on. These broad strokes of identification are indeed useful in labelling eagles as a category to the non-specialist. But for biologists the word 'eagle' is a broad and somewhat loose descriptor that actually includes birds from a few different classifications.

In terms of most of the evolutionary story of eagles, they share a narrative with the majority of other birds on the planet.

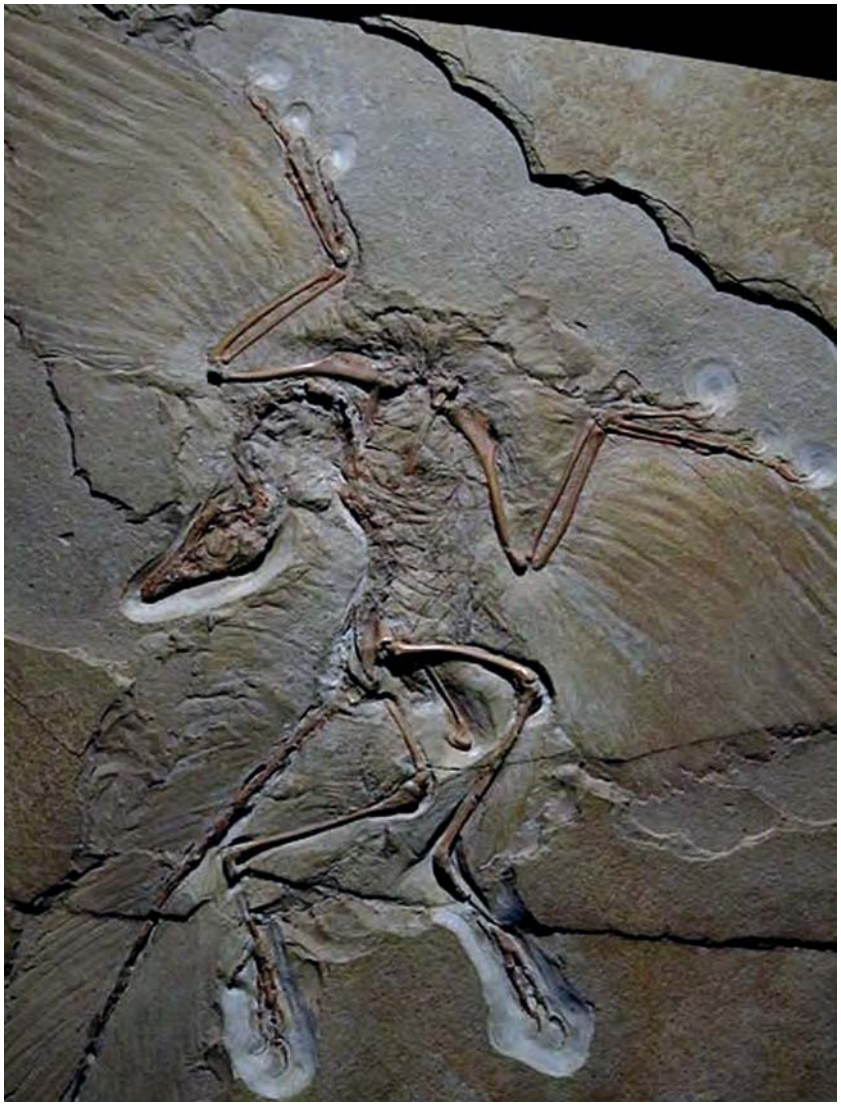
The earliest reptiles of the Paleozoic era split into two lines, the synapsids from which came the mammals, and the diapsids from which came the crocodiles, lizards, snakes and birds. The diapsids led to the archosaurs and then the dinosaurs, which after a couple of more divisions produced the theropods and then the maniraptors. Some characteristics of eagles were becoming evident with the evolution of the latter. Even the name, maniraptor (or 'hand seizer', that which grabs with its hands or claws), provides a hint as to what this line will become, especially in regard to raptors like eagles, which do indeed seize their prey in their claws. While the evolutionary history of birds is still complex and contested, the maniraptors excite ornithologists because there is considerable evidence that they may have had feathers (including the venerable *T. rex* – at least at birth); this, however, is still speculative.[2] We do know, however, that some had feathers,

A white-tailed eagle in Svolvaer, Norway soars above the treeline.

although feathers do not necessarily mean flight in these cases. The maniraptors subdivided many times, eventually producing the Avialae class, which produced the (usually) flying, feathered animals that today we recognize as 'birds'. This included both the Jurassic *Archaeopteryx*, which is widely (and somewhat controversially) described as the earliest bird, although it is not a direct ancestor of modern birds.[3] The Avialae class also produced the neornithines,'new birds', in the Cretaceous period (145–66 MYA), from which we get our modern birds. Subdividing further, we come to the Neoaves, and further still, to the order Falconiformes, which includes the eagles, hawks, falcons and vultures. Thus today's eagles are the result of millennia of evolution and diversification.

The classification of bird species is confusing. One of the first attempts to classify and account for animal life comes from Aristotle. Unfortunately Aristotle made some errors in his eagle classification, sometimes confusing eagles with other types of bird, especially vultures and falcons. He also had only limited information drawn from direct observation and came to some dodgy conclusions regarding the habits and life cycles of birds, including eagles. For centuries other writers on ornithology, such as Pliny the Elder and Aelian of Praeneste, perpetuated Aristotle's mistakes. In the Middle Ages Aristotle's ideas were mixed in with folkloric and theological interpretations of animals in medieval bestiaries (books of beasts), a popular form that descended from the *Physiologus*, an ancient bestiary compiled in Alexandria. In the thirteenth century the Hohenstaufen Emperor Frederick II noted the weaknesses in Aristotle's ornithology and aimed to correct some of these misconceptions in *The Art of Falconry*, based on his own experience with raptors in falconry, although very little of his book deals with eagles.[4] Nevertheless, some of Aristotle's misapprehensions regarding birds persisted into the twentieth

A fossil of the eagle's prehistoric ancestor, the *Archaeopteryx*, in the Museum für Naturkunde, Berlin.



century.[5] Even today, however, there are problems categorizing certain eagle types and their relationship to other birds.

Today the problem with classifying eagles is that, as in virtually all other fields of taxonomy, different systems of classification are used by different researchers. Field ornithologists tend to use morphological systems that categorize the birds according to their physical and behavioural attributes, while evolutionary biologists use biochemical methods to classify birds according to their evolutionary relationships. According to current classification, all eagles belong to the biological order Falconiformes, which includes all the diurnal raptors: vultures, hawks, falcons and osprey. The largest family of the Falconiformes order is the Accipitridae, which includes 237 species, about 75 of which are eagles, grouped into about 21 genera. Recently DNA research has resulted in significant reclassifications of eagle genera; most notably, the group of eagles once in the *Hieraaetus* genus have been moved to the *Aquila* genus, and two *Aquila* eagles – the greater and lesser spotted eagles – have been moved to the *Lophaetus* genus.[6] Some of the suggested changes are contentious and at the time of writing are still under discussion; there are almost certainly other changes to come. Because the classifications keep shifting, it might be helpful to group eagles according to five categories determined by broad characteristics: booted or 'true' eagles, sea or fish eagles, snake or serpent eagles, hawk-eagles and large tropical forest eagles.

The booted or 'true' eagles include such high-profile species as the golden eagle, wedge-tailed eagle and Spanish imperial eagle. These are called booted eagles because they have feathers on their tarsi, which are the shanks of the legs that are usually featherless. Note, though, that there is also a species in the *Aquila* genus called in English the 'Booted Eagle', so all Booted Eagles are booted eagles, but not all booted eagles are Booted Eagles. Confused? Welcome to the wacky world of bird classification:

A falconer holding a Steller's sea eagle in the Yorkshire Dales, England.

this is why ornithologists prefer to used scientific species terms; the Booted Eagle species name is *Aquila pennata* . . . but it used to be *Hieraaetus pennata*. The original *Aquila* eagles tended to be large, although the addition of the *Hieraaetus* genus to the *Aquila* genus has added more modest-sized birds to this group.

The second category of eagles consists of the sea eagles, including the bald eagle and the white-tailed eagle, as well as the impressive Steller's sea eagle, which is one of the largest eagles. Sea eagles are actually genetically closer to kites than other eagle types, but of course they are commonly recognized as eagles. The third category, snake or serpent eagles, are also not considered 'true' eagles in the strictest genetic classification.[7] These smaller eagles, which, as their name suggests, eat snakes and other small reptiles, are found mostly in Africa and Indomalayan regions, although the short-toed snake eagle is also found in parts of Europe. Very little is known about some of the serpent eagles, including the mysterious Nias and Semeulue serpent eagles, which are hardly ever seen and have rarely been studied.

The fourth category – the hawk-eagles – is made up of tropical forest birds that often have crested feathers on their head. There are thirteen species of hawk-eagle in the forests of the Indomalaya ecozone and Central and South America. The ambiguity of their name reflects the overlap possible with other raptor categories. In the tropical forests we also find the eagle category with the fewest members: the four large tropical eagles, consisting of the massive harpy eagle and Philippine eagle, as well as the crested eagle and the New Guinea harpy eagle. These four eagles are grouped together because they fill a similar ecological niche, eating monkeys, sloths and other large mammals of the forest. Their ecological similarities may be an example of convergent evolution, as not all four seem to be closely connected in DNA studies. Convergent evolution is when two distinct evolutionary lines develop similar ecological functions and therefore similar body forms; so two birds, like the Philippine eagle and harpy eagle, might

Taxidermied Philippine eagle at Ninoy Aquino Parks and Wildlife Center.

A harpy eagle in falconry.

look very similar and behave in similar ways, but actually not come from the same evolutionary line. In fact, the Philippine eagle has recently been found to be genetically closer to snake eagles.[8] Many still group the Philippine eagle with the harpy eagle because of its size and eating habits, but its genetic affiliations are important as well and thus it can be said to have a foot in both categories. To make matters even more confusing, these four eagles are sometimes called 'harpy eagles' as a group (as distinct from the harpy eagle species, *Harpia harpyja*).

Finally there are some species of eagle that don't appear to fit neatly into any of the five major groups: the black-chested buzzard

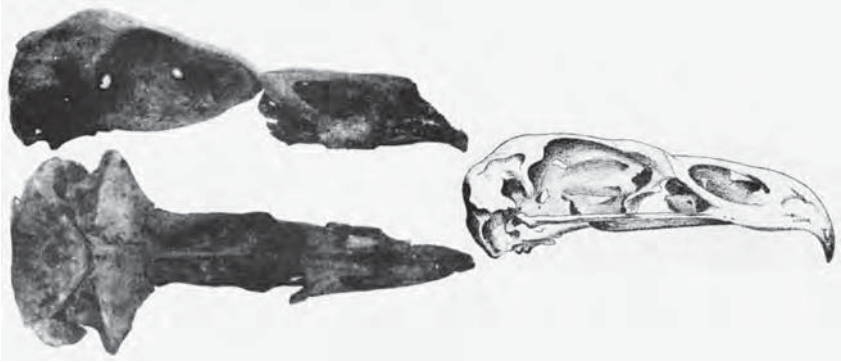
eagle, the martial eagle, the African crowned eagle, the Indian black eagle and the long-crested eagle are all distinct from each other and other eagle species, while the crowned and black solitary eagles are related only to each other. Further genetic research may determine the nature of the relationships between these 'miscellaneous' eagles and other kinds of eagles.

Many eagle species have subspecies, although these levels of classification are also contested. Still, some ornithologists distinguish between northern and southern bald eagles, for example, or six subspecies of golden eagle. Subspecies are often determined by subtle differences found among species that cover very large territories. The six subspecies of the golden eagle give an indication of its immense range: *Aquila chrysaetos chrysaetos* (northwest Europe, including Britain), *A. c. homeyeri* (North Africa, Iberian peninsula and Middle East), *A. c. daphanea* (Himalayas), *A. c. kamtschatica* (Siberia), *A. c. canadenis* (North America) and *A. c. japonica* (Japan and Korea).[9] Eagles are also sometimes grouped into superspecies, wherein multiple closely related species inhabit the same ecological niche in different but connected areas: for example, several large *Aquila* eagles – golden eagle, Verreaux's eagle, wedge-tailed eagle and Gurney's eagle – replace each other as we move around the globe until we get to South America, where this superspecies group is not represented (large eagles are represented in South America by the harpy eagle).[10]

The eagles we have today do not constitute all the eagles that have ever existed on earth. There are eagle species that went extinct centuries ago; Haast's eagle is a fascinating example of this. Haast's eagle (named after Julian Haast, who found the first skeleton in 1871) lived in New Zealand, apparently until the fifteenth or sixteenth century. It had a wingspan of nine feet or more, and weighed almost 30 lb (14 kg). It is speculated that it fed mostly on moas, ostrich-like birds that are now also extinct. The moas

were bigger than modern ostriches, so the fact that Haast's eagle was able to kill them (hitting them from the side and taking them down that way) is even more impressive. Unfortunately the extinction of Haast's eagle was almost certainly caused by the arrival of humans in New Zealand, who competed with the great birds for food sources, especially the moas, which were hunted to extinction. Other eagle species became extinct on the islands of Hawaii and in North America as people arrived in previously unpopulated areas. As is the case today, human-caused extinctions of eagles were more likely to be the result of habitat destruction than hunting the birds directly.[11]

Today eagles exist on every continent except Antarctica. Some species are highly localized and are found only in a very small area, such as individual islands like Madagascar. Other species are much more broad-ranging, especially the golden eagle, as mentioned above, which is the species that covers the largest global area since much of the northern hemisphere is home to one of its six subspecies. Most eagle species live in Eurasia and Africa. Only the bald eagle and the golden eagle can be found in North America; in Central and South America we find several eagle species.



Images of a Haast's eagle (*Harpagornis moorei*) skull from *Transactions and Proceedings of the Royal Society of New Zealand* (1893).

Aquila gurneyi, or Gurney's eagle.