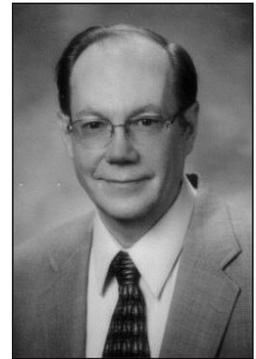


The History of the Dodo Bird and the Cause of Its Extinction

Jerry Bergman

A careful reevaluation of the Dodo bird by several contemporary researchers has found that many of the widely accepted conclusions about it are erroneous. For example, the Dodo was not a fat, slow, inferior, defenseless bird but was a swift and fierce fighter if it was threatened. The common conclusion that it was defenseless is due partly to the fact that it did not have a natural fear of humans or many animals. Often used as the prime example of how evolution prunes out the weak, its extinction does not demonstrate the efficacy of natural selection in eliminating inferior animals but the wanton disregard of animal life by humans. Now regarded by contemporary researchers as a wonderful, magnificent creature, its loss is a tragic event in history that eloquently illustrates the need for stewardship of the Earth's resources, a topic to be discussed in the conclusion.



Jerry Bergman

A classic example of Darwinism in action (and the most widely publicized symbol of extinction due to inferiority) is the Dodo bird.¹ Since their discovery by Westerners in the 1500s, Dodos were sketched, painted, and sometimes lampooned. It was just the right bird for Lewis Carroll's *Alice's Adventures In Wonderland's* menagerie of off-beat animals. The Dodo that Alice met was "faintly absurd ... [and] spoke in words of many syllables."² The Dodo has been the subject of an "exceptional amount of popular commentary, folklore and illustrations."³ The Dodo bird (formerly *Didus ineptus*, and now *Raphus cucullatus*) is in the order Columbiformes. This extinct, nonflying, allegedly "obviously unfit," fat, dumb bird has also been used as a prime example of proof of evolution by natural selection, as illustrated by Stevens' claim: "Less successful organisms would seem to argue for the messy, often dead-end process of evolution: the dodo ..."⁴

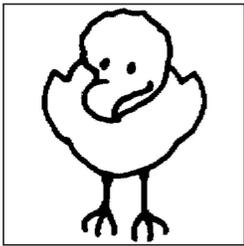
Some may conclude that the humans won and the Dodos lost in the struggle for life. Darwin and the developers of natural selection have defined natural selection since his classic 1859 *Origin of Species* in terms of competition between animals for food or mates. The animals that possessed a superior ability

to gather food and escape enemies would eventually become dominant, and the inferior animals would become extinct. The Dodo, though, did not become extinct because humans or animals were competing with them for the same food supply. They became extinct for the same reason that animals, such as the passenger pigeon, became extinct—human greed, carelessness, and the contingencies of history.⁵

The demise of the Dodo has become a fixture of our language, and a symbol of the extinction of inferior animals. Expressions such as "dead as a Dodo," referring to something that is forever gone and very much a thing of the past, is one example.⁶ The term as applied to a person refers to one who lacks intelligence, is addled, or looks silly.

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Although the word “Dodo” is Portuguese for simpleton, the Portuguese did not remain on the island where Dodos lived after discovering them and, evidently, Portuguese writings of the time do not contain references to Dodo birds.⁷ Others argue that the word “Dodo” came from an onomatopoeia mimicking the bird’s call.⁸

Illustrations and reconstructions often show the Dodo as a magnificently overweight, pigeon-like bird that allegedly had a “large body and small wings, far too small to permit him to fly.”⁹ The most famous reconstruction of the Dodo was conducted in the taxidermy studio of Roland Ward in London. Ward’s reconstruction is now in the American Museum of Natural History Flying Bird Hall located near a completely restored Dodo skeleton.¹⁰ The popularity of these exhibits indicate the modern interest in the Dodo.

The Dodo probably is not only the best-known extinct modern species, but also a *prime* exhibit of the efficacy of natural selection’s ability to prune out the weak and inferior animals. Owen even argued that the simple fact of its extinction by itself sealed the case for its inferiority.¹¹ Some scientists go even further, using evolution to justify, or at least condone, the extinction of the Dodo and other animals. Darlington writes:

Extinction is a natural process essential to evolution ... man’s role in it, and ethical implications ... is a difficult subject for me to write about. Many conservationists ... will not like what I say. But the subject is evolution-related, and I have to treat it. Man’s evolution, multiplication, and occupation of the world have inevitably caused the extinction of many plants and animals, directly or indirectly. Man has hunted or is hunting many animals to extinction, either for food (for example, the Dodo on Mauritius, some of the giant tortoises on the Galapagos, and probably the moas in New Zealand), for sport (for example, the Ostrich in Arabia), or in self-defense (for example, the Lion, which has been retreating before man for 2000 years). Current lists of extinct and vanished species include many more examples.¹²

Darlington then admits that “it has been man’s role in changing the face of the earth

that has caused the most massive extinctions.”¹³ Our failure to steward creation will be discussed in more detail below.

The Dodo’s Habitat and Discovery

The Dodo species group (formerly *Raphidae*) consisted of at least four similar flightless birds called “didine” birds that lived in similar, but different, habitats. These are the Dodo of Mauritius, the White Dodo, the Solitaire of Reunion, and the Rodriguez Solitaire. Both the Dodo of Mauritius and the White Dodo lived on Mauritius, a small island of 809 square miles located five hundred miles east of Madagascar in the Indian Ocean. The Solitaire of Reunion (once called Baurbon) lived on Reunion Island, and the Rodriguez Solitaire lived on tiny Rodriguez island.¹⁴ Mauritius, Reunion, and Rodriguez are a group of volcanic upthrust islands collectively called the Mascarenes, located between Madagascar and Australia. Other members of the Dodo family lived on widely separated, small, neighboring islands that stand alone in a water wilderness thousands of miles from any neighboring island or land.¹⁵

These birds evidently thrived in their island habitat.¹⁶ Like many small remote islands, the Mascarenes did not contain mammals, and the only vertebrates were a few reptiles and several kinds of birds. Among the many varieties of birds that lived there were parrots, crows, sparrows, owls, geese, ducks, and doves.¹⁷

The Mauritius Dodos were discovered in the early 1500s by the Portuguese and became extinct after a mere 174 years. The enormous slaughter during this brief time decimated this very “remarkable bird” that once “existed in considerable abundance.”¹⁸ Contemporary accounts claim that sailors killed as many as fifty large birds a day, about half of which were Dodos.¹⁹ The Reunion Solitaire has been extinct since the end of the seventeenth century, and the Rodriguez Solitaire since the latter half of the eighteenth century.

Since many drawings were completed from live specimens, and travelers’ accounts substantially agree on its physical traits, a good understanding of this species’ physiology can now be determined (see Figure 1).

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The major differences in descriptions of the Solitaire pertain to its color, which probably reflects actual color variations in the wild. The Rodriguez Solitaire was a “delightfully beautiful” bird and also “delightfully edible” according to contemporary accounts.²⁰

Evidence for Dodo Evolution

No account of the Dodo is complete without an attempt to understand the Dodo’s origins and its relationship with other birds. Unfortunately, the “evolutionary history of the Dodo is very poorly understood.”²¹ Because the evolution of the Dodo can only be speculated, this topic has been a subject of much controversy for decades.²² One major reason is because a complete lack of transitional forms exists, and no evidence of its evolution has been discovered thus far in the fossil record.²³

Some claim that one reason for this may be that the thin bones of birds are often poorly preserved. Others note, as a comparatively heavy, nonflying bird, the Dodo’s bones were thicker than those of most birds and would have had a better chance of becoming fossilized than the bones of most birds. Actually, a large number of bird fossils exist, and bird bones are often preserved quite well, including Dodo bones.²⁴ Many examples of good preservation of bones from large birds, such as giant moa (200 kg body mass), to small birds, such as wrens (10 g body mass) exist.²⁵ Depositional environment is, as a whole, far more important than bone thickness. Fortunately, many complete Mauritius Dodo skeletons exist (mostly assembled from bones found in the late 1800s) that help us under-

stand Dodo anatomy. Also, a large number of bone fragments of the Solitaire Dodo exist, but unfortunately, no bones exist for the White Dodo, which is known only by drawings made by contemporary travelers.

It is assumed that Dodos evolved from hypothetical large, tooth-billed pigeons whose ancestors flew to the Mascarenes.²⁶ Dodos are also speculated to have lost the ability to fly because their new homeland lacked enemies and had plenty of food that did not require flight to obtain.²⁷ Fuller concluded that the evolution from pigeon to Dodo may have taken place “quite rapidly” (and thus, left no fossil record), even though the “visual differences between a Dodo and the familiar pigeon species are immediately apparent and a vast gulf seems to lie between them.”²⁸

Kitchener concludes that Dodos “probably evolved from African fruit pigeons of the genus *Treron* which became stranded on the blissfully predator-free island of Mauritius.”²⁹ Whitlock speculates that Dodos are related to pigeons (or perhaps rails) and now are usually classified as members of the pigeon family.³⁰ Shapiro, et al. conclude that “the Dodo has been linked with avian groups ranging from the ratites to the raptors.” Furthermore, morphological studies have linked the Dodo “and its presumed close relative the solitaire (*Pezophaps solitaria*) with the Columbiformes (pigeons and doves), but their exact position is unresolved and they have been placed in many positions within the cosmopolitan *Columbidae* or in their own family, *Raphidae*, outside the *Columbidae* but within Columbiformes.”³¹

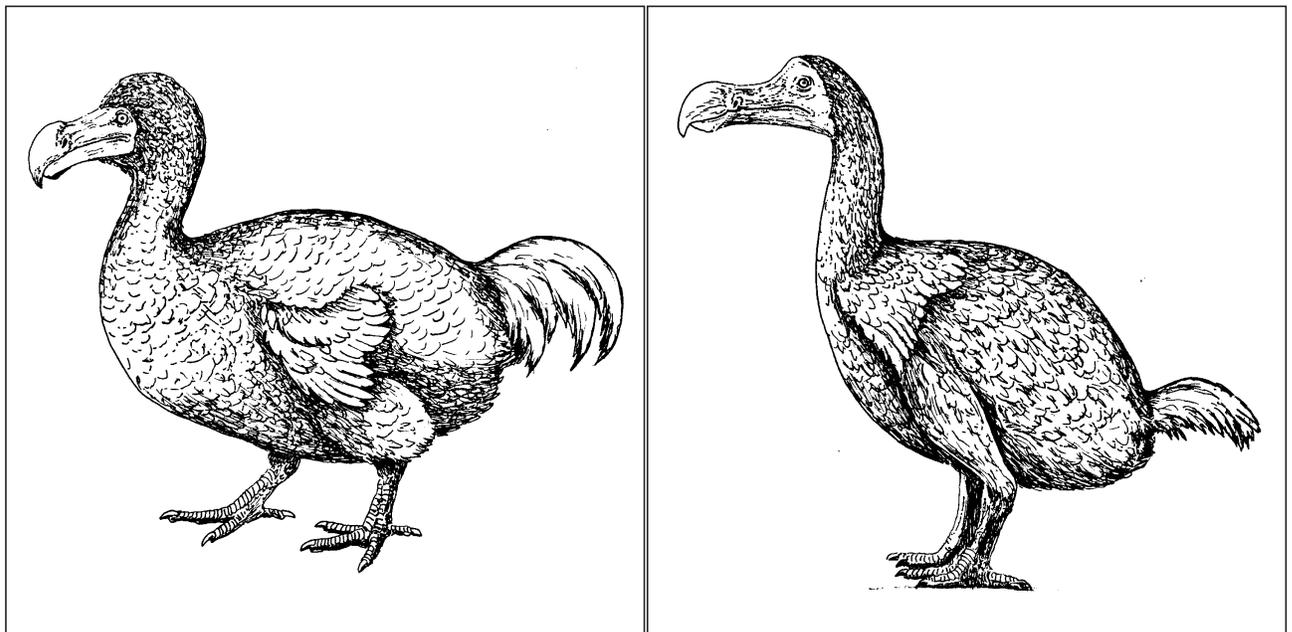
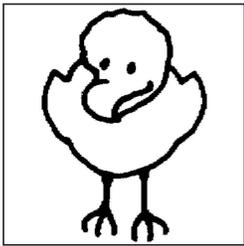


Figure 1. Artist rendering of the older view (left) of the Dodo compared to the newer view (right) that resulted from the work of Kitchener and others. Note that the primary difference is that in the newer view the Dodo is thinner. Drawing by artist Richard Geer, East Lansing, MI.



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Classification is made more difficult by the fact that a study of its feathers has shown that it had unique traits not found in “any other bird.”³² The DNA evidence evaluated so far indicates they are part of the order *Columbidae*.³³

Other scientists have argued that the Dodo, which was once called a “gentle dove,” was an evolutionary link that “was of considerable importance.”³⁴ Livezey even concludes that, in spite of their extinction, both *R. cucullatus* and *P. solitaria* were “evolutionarily innovative in ontogeny, morphological characters and life-history strategies.”³⁵ No fossil evidence for any of these theories of its evolutionary origins has ever been discovered, even though we have uncovered hundreds of fossilized Dodo bones.³⁶

Modern Reexamination of the Dodo

The bird’s putative obesity, slowness, lack of intelligence, and inability to fly are all commonly used as reasons for its alleged evolutionary inferiority.³⁷ Dodos were believed to be not only large, but also grossly overweight to the point that they could not fly. Consequently, they lost their flight ability and could not escape from their ground enemies. A careful recent reexamination of the Dodo has revealed that many of the common negative perceptions about the bird (such as its obesity) are probably incorrect.³⁸ In the words of Maddox, “The Dodo deserves a better press.”³⁹ Specifically, recent studies, such as those by Livezey on 387 Dodo skeletal fragments and by Kitchener at the Royal Museum of Scotland, have radically changed our view about the bird’s size and behavior.⁴⁰ The latter work has questioned the role of the bird in evolutionary history. Kitchener writes:

Rivaling the dinosaurs as a symbol of extinction, the Dodo is renown for being slow, stupid and fat. An evolutionary disaster, *Raphus cucullatus* was doomed to extinction from the day it was discovered by hungry Dutch sailors in the forest of Mauritius in 1589. Wasn’t it? Maybe not.⁴¹

Kitchener’s work is based on detailed study of the many bones unearthed, as well as the extant dried head specimens. His major finding is that the Dodo was much

thinner and sleeker than previously believed. Many of our modern conclusions about the Dodo’s appearance were based on seventeenth-century oil paintings of overweight, under-exercised birds—a condition that usually resulted from their being kept as pets by wealthy Europeans who fed them a high-fat diet.⁴² Pet Dodos often ballooned up to almost twice what they would have weighed in the wild. At their normal thirty pounds, they were good-sized birds but not much heavier than a comparably sized bird, such as a swan.

After studying the Dodo’s history, Kitchener found that the *earliest* Dodo drawings showed rather thin birds—and only those paintings completed later display the familiar pudgy variety.⁴³ Over a dozen original pictures (both drawings and paintings) of the Dodo now exist.⁴⁴ Kitchener further found that while the thin Dodos were drawn by those who actually had visited Mauritius, the plump portraits were produced mostly by artists working in Europe. This factor supports the conclusion that the Dodos brought to Europe were fattened by their owners.

Kitchener next evaluated the hundreds of Dodo bones that have been unearthed so far. Using the methods developed by criminologists and archeologists to reconstruct flesh on bones, he was able to determine that the skeletal pattern produced a bird “remarkably similar” to the *early* drawings of the Dodo—i.e., thinner, far less obese birds. Kitchener concluded from his work that the actual weight of the wild adult Dodo was probably between 11 to 17 kilograms.⁴⁵ This is close to the weight of a male great bustard, the heaviest flying living bird. Even an obese Dodo, Kitchener estimated, would weigh only 21.7 to 27.8 kilograms. This number compares closely with the only published record of a Dodo body weight that he could locate, a 1634 estimate of 23 kilograms (50 pounds), which may represent the bird’s upper limit. Males weighed about four kilograms more than females (Dodos were more sexually dimorphic in terms of size than most birds).

An evaluation of eggshells also can be used to produce a body weight index, because the mass of the eggshell varies in proportion to the mass of the bird that lays it. No confirmed surviving Dodo bird egg exists, but from descriptions of their eggs in

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literature, Kitchener was able to estimate the Dodo's weight at about 13.7 kilograms—the same value that he obtained from an analysis of the relationship between the length of the leg bone and other bone measurements.⁴⁶ Using both bones and research on living birds, Kitchener demonstrated that a bird's skeleton accounts for a fixed proportion of its body weight. The leg-bone analysis method is based on a direct relationship between leg-bone dimensions and the weight that the bone must carry, a relationship that holds for every size of bird from a hummingbird to an ostrich.⁴⁷

Many of our modern conclusions about the Dodo's appearance were based on seventeenth-century oil paintings of overweight, under-exercised birds—a condition that usually resulted from their being kept as pets by wealthy Europeans who fed them a high-fat diet.

Kitchener concluded that “according to four different methods, all based on the Dodo's bones, the famous flightless pigeon weighed between 10.6 and 17.5 kilograms.”⁴⁸ His conclusion may be an underestimate, but it still supports the lower values for weight. These estimates held up, even when he compared bone-body weight ratios of flying and nonflying birds, such as that of a flightless kakapo, the world's largest parrot.

Evaluation of the cantilever strength of leg bones produces a relationship that can be used to determine the running abilities of different-size animals. This method provided evidence that Dodos were indeed “swift of foot”—a conclusion that corresponds with eyewitness accounts stating that the Dodo “could run very fast” (quoted in Kitchener⁴⁹). While Kitchener's analysis is not without problems, his conclusions are very reasonable, especially in view of the fact that the opposite thesis has little empirical evidence in its favor. One problem in obtaining weight estimates is that the Dodo deposition of body fat varied greatly by season, and considerable intra-generic and intergeneric diversity in body mass existed.⁵⁰

Since Kitchener's first evaluation, original unpublished Dodo drawings from the early 1600s were rediscovered in a Hague, Netherlands museum that support his revisionism conclusions. The Dodos in the drawings are thinner

than those in European paintings, and the femur was tilted downward, reducing the bending forces on it and allowing it to rapidly shift its center of gravity.⁵¹ This evidence demonstrates that the Dodo was an effective, fast runner. Kitchener concludes:

[for over] 350 years the Dodo has been thoroughly misrepresented as plump and immobile. The reality is, however, that in the forests of Mauritius it was lithe and active. Like other Mauritian birds it would have undergone a seasonal fat cycle to overcome shortages of food, but never to the extent that those wonderful oil paintings suggest.⁵²

Several other studies have also confirmed Kitchener's results. Livezey examined 387 skeletal elements and concluded that the body mass of the Dodo was 21 kg for males and 17 kg for females.⁵³ Lindstedt and Calder estimated the mass for the Dodo at 15 kg and 17 kg for the solitaire.⁵⁴

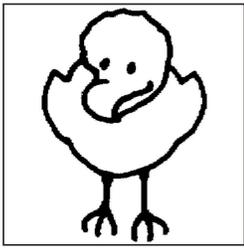
Even minor details that gave the birds a “stupid” look, in harmony with their historical image, are being modified with our new understanding. For example, its tail, often shown as a sparse collection of feathers located rather high on the bird's back, likely was much fuller and far more dignified. The existing reconstructions, which Edwards states have caused the bird to look “sedately amusing” and produced “vast amusement” for observers,⁵⁵ may now all have to be reexamined.

The Mauritius Dodo's bill was as long as nine inches, and was prominently hooked downward at the tip. The beak and the area up to and behind the eyes lacked plumage, the feet and legs were yellow, and the skin was light ash in color. Furthermore, a 1634 account stated their irises were a whitish color; their eyes were round, small, and bright as diamonds; and their covering was of the “finest downe” (quoted in Gosse⁵⁶). The Dodos also ate “stones” that their gizzards used to crush food.⁵⁷ Their diet consisted of plants—most likely seeds, fruit, and foliage.⁵⁸

Human Mistreatment of Dodo Birds

The earliest accounts of the Dodos by the Dutch navigator, Admiral Jacob Corneliszoon van Neck, date from 1598. The Dodos were first found on an island he named Mauritius in honor of his patron, Prince Maurice of Nassau, ruler of the Netherlands.⁵⁹ Since Arab ships sailed the Indian Ocean as early as the Middle Ages, it is quite likely that they were aware of the bird but left no known written records. The other two islands on which Dodos lived, Reunion and Rodriguez, lacked names in the 1500s or had names that we have not yet associated with these islands, making it difficult to relate early accounts of Dodos to specific islands.

Admiral Jacob extensively described the island's abundant ebony tree forests and exotic wildlife. He also discussed the Dodos in some detail, claiming that they were



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quite unlike any other bird with which he was familiar. He concluded that, having no predators, the birds did not fear humans, which is one reason why they were thought stupid—just as sheep are so easily led to slaughter and are thought stupid. It was reasoned that an intelligent animal would perceive its fate and struggle to escape death.

When the soldiers encountered chicks, though, the birds pecked “mighty hard.”⁶⁰ Adult Dodos could also bite hard with their “remarkably strong” bill and run fast with their strong legs.⁶¹ The crew killed many of the birds and soon found that, although their flesh was tough and bitter, the longer the Dodos were cooked, the more palatable the flesh became. They also took home a pair of adults, one of which ended up in the Netherlands. The birds were a sensation in Europe and were described in a fair amount of detail in numerous contemporary accounts. These records were critical in Kitchener’s reassessment of the bird.

Emperor Rudolph of Germany also purchased a Dodo and soon had its portrait painted. Pictures of the birds rapidly circulated throughout Europe, and the demand for them was evidently so great that ships soon began bringing Dodos back to Europe for sale to the wealthy or to naturalists.⁶² Dodos were also shipped to India, Java, and Japan.⁶³ Many died en route, and only about a dozen reached Europe alive before they became extinct.⁶⁴ The original Netherlands bird was honored with fourteen oil and watercolor portraits before it died. The Dodos were excellent subjects for portraits—once posed, they remained virtually motionless until the picture was completed.

Unfortunately, these paintings cannot be relied upon exclusively, because artists took “considerable anatomical license,” some making the birds’ hooked beaks “more fearsome” and turning “their forked dovelike feet into the webbed toes of a duck.”⁶⁵ Nonetheless, enough paintings of the Dodo exist to provide clear evidence to help us piece together a reasonably accurate picture of them.

Since the birds were easy to capture, within a short time the Dutch colonists (along with sailors and visitors) soon killed most of the Dodo population. Most sailors

spent months at a time at sea and, confined to meager rations on the ship and, no doubt relished their sojourn to a set of islands that contained fresh meat.⁶⁶ Fresh meat was also important for sailors to reduce the problem of scurvy, a concern until it was discovered fresh fruit such as lemons could treat the problem. The animals that the sailors brought with them, especially dogs, cats, monkeys, farm hogs, and the inevitable rat, ate the fledglings and broke the Dodo eggs open to consume the yolks. By about 1690, the Mauritius Dodo was extinct, and the White Dodo became extinct in about 1770 (see Roberts and Solow for a discussion of the problem of determining extinction⁶⁷). Actually, despite the unceasing slaughter of wildlife carried out “by the hundreds of European ships that visited Mauritius, the Dodo survived for generations.”⁶⁸

It was only when the colonists “displayed a grim dedication to the cause of exterminating the Dodo” that their demise was sealed. According to Panati, “Not a single naturalist had attempted to mate any of the captive Dodos; they left no descendants.”⁶⁹ The sailors would arrive at the island, not caring if a breeding stock remained, because most were not animal connoisseurs and few had any plans to return anyway. Even if a ship’s crew ensured that breeding stock remained, the next shipload of sailors often would have nullified their forethought. Furthermore, many persons then did not consider the total extinction of any animal type a possibility.⁷⁰ Rather than demonstrate their weakness, the history of the Dodos effectively argues for the gross irresponsibility and even viciousness of their caretakers.⁷¹

Kitchener argues that it was not the Dodo’s physical inferiority that caused its extinction, but the “rats, pigs, and monkeys that arrived with the sailors and pillaged the Dodo’s vulnerable ground nests.”⁷² Smith concludes they became extinct not because of natural selection, but due to “direct predation—as is true of probably all recent cases of extinction by man.”⁷³

The extinction of a fat, slow, inferior, defenseless Dodo argued for Darwinism far more effectively than similarly threatened, better-adapted birds that were saved only through the heroic and deliberate efforts of a large number of concerned individuals.

Now that the bird has been extensively studied, we realize it did not support the myth but instead eloquently supported the human callousness.⁷⁴ Not only did the Dodo become extinct on the Mascarene Islands, but Day⁷⁵ claims that “countless pathetic slaughters wiped out tortoises, gray parrots, blue pigeons and many other birds and reptiles” that once thrived there in peace. In the words of Livezey:

[the view that] *R. cucullatus* and (to a lesser degree) *P. solitaria* represent aberrant, overly specialized, degenerate, evolutionary oddities is misleading. The comparatively brief, largely anagenetic and ecogeographically limited morphological trends manifest in *R. cucullatus* and *P. solitaria* render moot the question of “evolutionary progress” by most accepted criteria.⁷⁶

Gould concludes that to argue that the Dodo became extinct because it was inferior is to blame the victim. He compares the situation to the native Bohemians who also became extinct at the hands of their Spanish conquerors. He regards claims that, as a primitive savage race, “they were doomed by their own inherent inferiority is racist in the extreme.”⁷⁷ As Gould concludes, victory does not inevitably go to the brave, the strong, or the smart, but time and chance “happens to them all.”⁷⁸ Likewise, as this paper argues, it is clear that human irresponsibility was the reason for the Dodo’s demise, not their supposed inferiority.

The Dodo Myth

When English naturalist John Tradescant died in 1662, his entire nature collection including his Dodo’s was bequeathed to an acquaintance, Elias Ashmole.⁷⁹ Due to his irresponsibility and the poor preservation methods used then, the entire collection’s condition soon deteriorated. Two years after the last living Dodo was seen on Mauritius, Elias donated his mounted Dodo to Oxford University in 1683. Even Oxford did not take very good care of the bird, and except for the head and foot that were saved by a foresighted curator, it was burned as trash in 1755.⁸⁰ Evidently, the museum’s board of directors “took one look at the dusty, stupid-looking bird and unanimously voted to discard it.”⁸¹

Many people did not share the opinion of Oxford University. Interest in the bird was such that, by 1800, “professional naturalists were casting doubt on written descriptions of the bird, as well as on extant drawings.” It even became in vogue scientifically “to deny the bird’s existence and to challenge the Oxford head and foot as fakes.”⁸² If it was a genuine bird, the critics reasoned, certainly there would have been extensive systematic efforts to preserve it—or at least to save a good skeleton. A group of zoologists that searched Mauritius in 1850 looking for bones found none. Soon the Dodo was denounced as a “scientific fraud.”⁸³

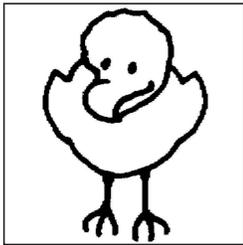
Evidence for its existence did not surface until a resident of Mauritius, George Clark, extensively searched the island and eventually discovered numerous scattered bones. His bone specimens were soon shipped to major museums and, after extensive study, they were pronounced authentic. These researchers later attempted to assemble the bone fragments (many of which were in poor condition) into complete Dodo skeletons. The Dodos are now recognized as real animals, but the many other myths surrounding them died slowly.⁸⁴

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Summary and Implications for Christianity

Human-caused animal extinction almost always has little to do with direct competition for food, and extinction in the long run causes loss of food supplies and resources for humans. Humans now have the ability to cause most all life to become extinct by virtue of their knowledge of such tools as poisons, guns, and atomic bombs. This has nothing to do with survival of the fittest or natural selection in the Darwinian sense. Eldredge states that “predators generally do not hunt their prey into oblivion,”⁸⁵ as humans have often done.

Humans are increasingly taking over land that was once dominated by animals, but as ecologists stress, this need not cause their extinction. Only if larger numbers of humans wantonly disregard the welfare of the animals living in an area and refuse cooperation with conservationists will this happen. Selfishness, shortsightedness, greed, and lack of planning have caused most recent animal extinctions—not direct human competition with animals in the Darwinian sense. This is supported by the fact that “very many of our game birds, shore birds, and waterfowl, would today be extinct, or near extinction, were it not for coddling through refuges and protective laws.”⁸⁶



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The comparison of the Dodo, which appeared to be inferior, and other birds which became extinct, such as the passenger pigeon (which was clearly superior as judged by the evolutionary naturalists of the day), helps us to better assess the role of natural selection in history. Its role seems to be primarily to reduce the rate of the accumulation of harmful mutations, often called devolution, and not the role that Darwin ascribed to it. The Dodo example also supports Raup's conclusion from his extensive study of the cause of extinction, namely that bad luck is by far more important than bad genes.⁸⁷ Most animals that have become extinct are not in any clear way inferior than those still around today but (in most cases) were the victim of circumstances, chance, and the irresponsibility of humans.

The Dodo case fits Raup's observations and is a lesson in irresponsible Christian stewardship of the Earth's limited resources.⁸⁸ All the Abrahamic religions (Judaism, Christianity, and Islam) teach the environmental ethic which supports the "belief in the holiness of the Earth and the perception of nature as God's handiwork" that must be cared for and maintained.⁸⁹ As far back as the thirteenth century, Saint Francis of Assisi "prayed for the welfare of God's creatures" and extolled the "beautiful relationship" of humankind and nature by humans.⁹⁰

In Gen. 1:28, God instructs Adam and Eve to "fill the earth, and subdue it, and rule over the fishes of the sea, and the birds of the air, and all living creatures that move upon the earth." Some have construed this passage as permission to exploit nature exclusively for human needs. As Wilson notes though, it is now "more commonly interpreted" to refer to a command by God for humans to be "stewardship of nature."⁹¹ He adds:

Pope John Paul II has affirmed that "the ecological crisis is a moral issue." And Patriarch Bartholomew I, spiritual leader of the world's 250 million Orthodox Christians, has declared, in the clarion tones of an Old Testament prophet, that "for humans to cause species to become extinct and to destroy the biological diversity of God's creation, for humans to degrade the integrity of the earth by causing changes in its climate, by stripping

the earth of its natural forests, or destroying its wetlands, for humans to contaminate the earth's waters, its land, its air and its life with poisonous substances, these are sins."⁹²

Many evangelical denominations and sects, even those that teach a literal interpretation of the Bible, support this view. Wilson cites Stan L. LeQuire, director of the Evangelical Environmental Network, who stated the issue very incisively:

"We evangelicals are recognizing more and more that environmental issues ... really come from the most wonderful teachings that we have in Scripture, which commend us to honor God by caring for creation." His network, organized into "Noah Congregations," proved its mettle: it contributed \$1 million to the successful campaign against congressional efforts to weaken the Endangered Species Act.⁹³

The loss of the Dodo is only one of many stirring reminders of the need for this Christian environmental ethic today. ♦

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