Oxford Research Encyclopedia of Latin American History

Animals in Latin American History

Germán Vergara

Subject: History of Latin America and the Oceanic World, Environmental History
Online Publication Date: May 2018 DOI: 10.1093/acrefore/9780199366439.013.436

Summary and Keywords

The evolutionary history of vertebrate nonhuman animals such as mammals in what is now Latin America extends back tens of millions of years. Given that anatomically modern humans first appeared in Africa a mere 200,000 years ago and would not reach Latin America until some 12,000 years ago, nonhuman animals in the region evolved for most of their history without interference from human activities. Once they appeared, humans began to shape the history of the region's animals in profound ways. In fact, one could argue that animal history in Latin America has been a story of increasing human impact; from the Paleo-Indians, who may have driven countless species of megafauna to extinction; to the agrarian societies that domesticated species such as dogs, turkeys, and llamas (or tolerated the animals' self-domestication); to the radical transformations brought about by the Columbian Exchange; to the industrialization process of the last two centuries. But animal history in the region is also marked by adaptation and agency on the part of animals, who have influenced the course of human history. This dynamic and adaptive human–animal relationship has been pushed to the limit during extinction pulses, manifest in the currently accelerating biodiversity crisis. Environmental history makes the convincing case that any historical account that neglects the environment offers an inaccurate depiction of the past. By the same token, animal historians suggest that a more complete understanding of history requires redefining its boundaries to include the often underappreciated story of nonhuman species and their interrelationships with human societies.

Keywords: animals, mammals, environment, Latin America, evolution, nonhuman agency, Columbian Exchange, industrialization, extinction

Mammal Evolution

The first placental mammals originated during the Mesozoic era (251–66 million years ago) with the oldest fossils dating back 125 Mya.[1] Paleontologists debate the exact origin and divergence of most placental orders, with some evidence indicating a northern origin in Laurasia, the supercontinent in the Northern Hemisphere, and a subsequent southward radiation to Gondwana, the supercontinent that included most of the landmasses located in the Southern Hemisphere today, including South America. These shrew-like creatures of the late Cretaceous period (145–65 Mya) remained small and unspecialized with an insectivorous diet. The bolide that seems to have ended the Cretaceous period in a ball of fire—marked by dramatic temperature swings due to clouds of ash and giant tsunamis that doomed non-avian dinosaurs and caused a mass extinction—incidentally opened up numerous ecological niches into which mammals expanded.[2]

From the beginning, the Cenozoic era (66 Mya–present) saw an explosive radiation of primitive mammalian taxa. Species diversity increased rapidly from a couple dozen to about sixty over the following five million years. Though most remained small bodied, some mammals developed medium and large bodies, including primitive ungulate herbivores and the first carnivores. From their center of origin in the Asian landmass, mammals crossed the temporarily dry Bering Straits into North America in several waves, with several Asian taxa occurring in the fossil record between about 57 and 54 Mya. The mammalian fauna of North America remained largely similar to those of Europe and Asia during the Eocene epoch (54.8–33.7 Mya) since exchanges between these areas were frequent. The late Eocene and early Oligocene epoch (33.7 Mya–23.8 Mya) saw the emergence of essentially modern placental mammals and the divergence of North American taxa from those of the Old World due to complete opening of the Atlantic Ocean and climatic changes that led to drier and cooler conditions in North America.[3]

For most of the Cenozoic, South America was isolated from most other landmasses, although it shared a contiguous placental fauna with Antarctica until their final separation about 30 Mya. South America drifted westward, separated from North America by a sea corridor in what is now the Isthmus of Panama. As an island continent, South American mammals evolved in isolation, which caused a high degree of endemism. There were exceptions, as with the immigration of rodent species and the most ancient platyrrhine (New World) monkey, probably by means of rafting across a much narrower Atlantic ocean.[4] After about 30 Mya, the tropical conditions that characterized “greenhouse Earth” during most of the Eocene gave way to the cooler and drier conditions of “icehouse Earth.” Grasslands replaced big swaths of tropical forest belts, which led to the appearance of early mammalian grazers. South America during the Eocene was an entirely different place from today: vast open woodlands and savannahs stretching across a low-lying continent with an Andean range that elevated an average of 1 km instead of 4–5 km. Orders of marsupials, primates, edentates (mammals lacking teeth such as armadillos and sloths), sirenians (sea cows), and rodents populated this insular world.[5]

The rise of the Andes during the Miocene epoch (23.8 Mya–5.3 Mya) created a rift that separated South American mammalian fauna into western members that adapted to upland conditions and species that continued to evolve in the eastern, tropical lowlands. Monkeys, rodents, bats, and edentates further diversified in the rainforest ecosystem of the lowlands, a menagerie that already resembled today's New World tropical mammalian biodiversity. Farther north in Central America and Mexico, across the Isthmian seaway, mammalian fauna was, despite its proximity, entirely of North American origin and included horses, rodents, rhinos, a variety of carnivores, and artiodactyls (even-toed, hoofed animals such as camels). This menagerie occupied habitats that ranged from dense tropical rainforests to more open woodlands.[6]

A major episode in the evolution of animal species in Latin America was the Great American Biotic Interchange (about 3 Mya).[7] During the Pliocene (5.3 Mya–1.8 Mya) and Pleistocene epochs (1.8 Mya–10 000 BP), the planet experienced the onset of recurring glaciations, increased aridity, and seasonality. Lower sea levels and continental shift led to the opening of a land corridor between South and North America. This enabled the dispersal both northward and southward of mammalian and other faunas between continents, with profound long-term effects on the biodiversity of the New World tropics. For instance, before the connection through the Isthmus of Panama, all South American carnivores, large and small, were marsupials. Prior to the formation of the Isthmus, some animals had managed to island-hop between the continents, including some species of ground sloth, rodents, and raccoons. But the overland corridor allowed for an unprecedented number of taxa to cross both ways in at least four large waves over a period of 2 million years. Xenarthrans such as armadillos, anteaters, and tree sloths as well as porcupine rodents, monkeys, and opossums moved northward, representing a wide diversity of ecologies. The southward expansion included many savannah-adapted taxa such as camelids and a wide procession of skunks, horses, dogs, cats, bears, elephants, tapirs, deer, shrews, and rodents. In addition, the new land corridor blocked further exchanges between the marine faunas of the Caribbean and the eastern Pacific.

The southern migration was far more extensive and had a more lasting effect than its northern counterpart.[8] Northern immigrants not only had higher speciation rates but became extinct less often than native taxa. While paleontologists disagree on the reasons for this, with most citing a complex interplay of environmental and climatic factors, they agree on the consequences: over half of present-day genera of mammals in South America are of North American origin and either appeared or evolved after the interchange. Part of South America's enormous mammalian biodiversity, then, may be attributed to the Great Biotic American Interchange.[9] Only North American horses and gomphothere elephants went extinct in South America, whereas most mammals of South American origin eventually disappeared in the north, including most marsupials (with the exception of opossums and a few other Central American species), ground sloths, glyptodonts, and toxodonts. Only the descendants of a few monkeys, armadillos,

anteaters, and rodents linked to those southern immigrant taxa survive in North and Central America today.

The Arrival of Humans

Around 18,000 years ago, the ice sheets that had covered North America during most of the Pleistocene began to recede with the onset of the latest of a series of warming cycles that had recurred every 100,000 years or so for two million years. With every glaciation, the ice sheets expanded southward; likewise, with every warming, they moved northward, trapped in a global dance that played out over geological time. The last warming cycle opened up a corridor that, in combination with the overland passage in Beringia created by sea level that was 300 feet (100 meters) lower than today, granted hunter-gatherers access to an entire hemisphere that had never seen a human before. This new world was also the last landmass to be colonized by *Homo sapiens*. Lured by the mammoth, mastodon, and other megafauna they used to hunt, waves of humans trekked (or, perhaps, paddled) south into the tundra, grasslands, and woodlands of North America. Although this is a hotly contested topic among experts, most evidence suggests that the human presence in North America dates to twelve or thirteen thousand years ago.[10]

Covering approximately 60 miles (100 kilometers) per year, groups of hunter-gatherers reached Tierra del Fuego around 11,000 years ago. They seemed to have followed the coastline south and then moved inland, perhaps avoiding increasingly crowded conditions on the resource-rich coastal areas and seeking new prey. Another possibility is that these new settlers belonged to late Paleolithic seafaring populations, which would account for the presence of human remains in places such as Monte Verde, Chile, which have been dated by radiocarbon to 13,000 BP. Such groups may have followed routes along the west coast of what is now Canada and the United States and then continued southward along the Pacific coast until they reached the southern tip of South America.[11]

These early humans may have been responsible, in combination with rapid climate change, for the extinction of the majority of megafauna (animals over 97 pounds or 44 kilograms) in both North and South America by the end of the last Ice Age, which occurred around 11,000 BP. Key species for the trajectory of human history such as horses and camels, which originally evolved in the Americas, along with an extraordinary menagerie of large mammals such as the wooly mammoth, the mastodon, the sabre-tooth lion, the giant beaver, two species of giant sloth, the American lion, and the glyptodont—a giant armadillo-like animal—vanished in a geological instant. Known as the Late Pleistocene Extinction, experts still debate the exact nature of the event, with some underlining the role of humans while others point to abrupt climate swings as the main culprit. Recent research suggests a “synergy of human impacts and rapid climate change” is most likely responsible.[12] Called press-pulse theory, it suggests that an extinction event is more likely when two ecological perturbations coincide. Sudden climate change may have disrupted the ecosystems upon which large mammals depended, providing the first blow, while the appearance of new, dangerous human predators dealt the knockout blow. Whatever the exact combination of factors, the

disappearance of many of these large animals meant that later indigenous societies lost a number of potential domesticates, with important long-term consequences for different aspects of their civilizations such as food production and warfare.[13]

The Pleistocene wave of extinctions was a global event that wiped two-thirds of the planet's megafauna. South America and North America were, along with Australia, the regions of the world hardest hit. In Australia, 14 mammalian genera of megafauna or 88 percent of the total megafauna, were lost, most between 50,000 and 32,000 BP, the first ones roughly coinciding with the arrival of humans to the island continent. In North America, most extinctions happened during a much shorter time span by the end of the Pleistocene, between 13.5 and 11.5k BP. There, Clovis hunters combined with rapid cooling and then warming to drive an astonishing thirty-four genera of megafauna to extinction (72 percent of the total).[14] South America suffered the most severe losses globally in absolute numbers: fifty-two genera or 83 percent of the total number of megafauna, spread over approximately 5,000 years. (By contrast, northern Eurasia lost only nine genera or 35 percent.) Although in some parts of South America megafauna survived for several thousand years after humans first arrived, in other areas like the Pampas, Patagonia, and Brazil, extinctions became much more common once humans were present. The oldest date for an extinction in South America is Monte Verde in Chile at 14.8k BP, which suggests that some species had vanished by the time humans appeared on the scene; in Brazil, at a place called Pedra Pintada, the oldest record is at 13k BP; in Patagonia's Cueva del Medio, 13k BP; in the Argentine Pampas at Cerro El Sombrero, 12.7k BP; in Peru at Quebrada Tacahuay, 12.7k BP; and, in Colombia at San Isidro, 11.6k BP. In short, the ecological pressure of human hunting in addition to abrupt climatic swings devastated large mammal species. By the time the Holocene epoch began (11,700 BP–present), most of the megafauna of North and South America had disappeared forever.[15]

While Paleolithic humans contributed to the obliteration of dozens of mammal species during the late Pleistocene, some of their descendants assisted in the proliferation of other species through domestication a few thousand years later. The conventional view of animal domestication was as a relatively swift process, controlled by humans, whose incalculable benefits were so obvious that it had to be the result of human ingenuity. Recent research has upended that picture dramatically. Animal domestication seems to have been a long, messy process that may have lasted for thousands of years, that experienced reversals, and where humans and animals dynamically adapted to each other. After millennia of co-adaptation, nonhuman animals became fully "domesticated." In other words, recent research has moved away from a perspective that views animal domestication as a purely human-controlled, relatively straightforward event to one that underscores animal agency, mutualism between humans and animals, long periods of time, and a developmental continuum between wildness and domestication.[16] Animals such as wolves may have begun the domestication process on their own accord, with little to no human intervention. Then human selection for certain traits, especially tameness,

may have triggered a host of genetic, behavioral, and morphological changes over time (a process called pleiotropy), such as neoteny (the persistence of juvenile traits into adulthood), smaller size, and shorter limbs.[17]

Unlike regions of the Old World such as the Middle East, China, and India, where humans established mutually beneficial (and often exploitative) associations with a wide number of mammals, Paleo-Indians only "domesticated" a handful of species, including the dog, turkey, Muscovy duck (*Cairina moschata*), guinea pig (*Cavia porcellus*), and two camelids (llama and alpaca).[18] The dog (*Canis familiaris*), of great importance to Amerindian societies from the Artic to Tierra del Fuego as pets, hunting companions, food source, and ritual objects (see below), was probably domesticated in northeast Asia and crossed Beringia into the New World in the company of Paleolithic hunter-gatherers.[19] A wild turkey (*Meleagris gallopavo*) whose native range included most of Central America, Mexico, and the continental United States and another subspecies (*M. g. intermedia and/or silvestris*) became domesticated independently, the former in Mesoamerica, the latter in the US Southwest. Despite major challenges to determine when domestication happened, not least because of the seeming absence of clear morphological differences between wild and domesticated turkeys, it is clear that domestication was well under way during the Preclassic period in Mesoamerica (roughly the two millennia before our common era). North America's only indigenous domesticate, *Meleagris gallopavo*, is the ancestor of all the turkeys bred and raised worldwide today.[20]

Also of great importance was the association between humans and camelids in South America. The only large herd animals to be domesticated in the Americas, the llama (*Lama glama L.*) and the alpaca (*Lama pacos L.*) originated from two wild ancestors still extant in the Andean highlands, the guanaco (*Lama guanicoe*) and the vicuña (*Vicugna vicugna*), respectively.[21] Evidence such as bone assemblages, fiber samples, teeth, and other zooarchaeological sources suggest that camelids had become essential for most human groups in the Andean highlands as early as 8,500 BP. Full domestication, however, may have not occurred until a few thousand years later; the first appearance of a domesticated camelid in the Andean archaeological record dates back to 6,500 BP. An intensified human–camelid relationship combined with increased specialization in hunting them seems to have led to the domestication of the alpaca by 6,000 BP in the central Andes and of the llama around 4,000 BP in the south-central Andes.[22]

Pre-Columbian Era

Despite the fact that only a handful of animal species became domesticated in the Americas, both domesticates and wild animals played key roles in pre-Columbian societies. Domesticates could serve simultaneously as sources of food and objects of trade, tribute, and ritual and religious practice. The dog exemplifies this multifaceted role. Native Americans across the Americas, from Greenland to Mesoamerica, ate dogs during pre-Columbian times. As early as the 1st millennium BCE, Olmec peasants were farming dogs and paying part of their tribute to elites with maize-fattened dogs. This starch-heavy diet was the result of a long process of artificial selection for the digestive capacity to survive on a plant-based diet. The Maya ate dogs, as well. For the Chichimecs in the north, dogs also formed an important part of their diet; the Aztecs called them “dog people” precisely for their appetite for dog meat. The Aztecs themselves developed the hairless *xoloxcuintle* to be eaten at royal feasts. The pre-Columbian cultures of western Mexico (Jalisco, Colima, Nayarit) also fattened dogs for consumption and left a vast array of ceramics memorializing them.[23] In all of these cases, however, the divide between dogs as a food source and as, say, pets, guards, or as inspiration for religious thought and innumerable artistic depictions was very fluid.[24]

Across the Americas, other animals formed part of the indigenous pharmacopeia and medical treatments. The Nahuas, for example, used a variety of animals for their purported healing properties. Sixteenth-century chronicles and treatises recovered part of this native lore and made it accessible to European readers. One recipe recommended the burning and pounding of nine spines from the “porcupine of New Spain,” which administered with water was believed to clean the urinary tract, dissolve kidney stones, and serve as an aphrodisiac. The tail of the opossum mixed in water was used to treat a wide variety of ailments and injuries, including bone fractures, constipation, lack of sexual desire, and urinary tract infections. The flesh, bones, skins, feathers, organs, and even the dung of armadillos, skunks, vultures, and a host of other animals were burned, cooked, pounded, turned into powder, and consumed in every imaginable form among the Nahuas.[25]

If many indigenous societies relied on animals (and plants) to cure themselves, others, such as Andean peoples, built their civilizations around certain animals. Although other human groups in the Pampas, Patagonia, and the central highlands of present-day Argentina exploited the two South American camelid domesticates, the llama and the alpaca, it was pre-Columbian central Andean societies that centered their economy, and their social and ritual life around these herd mammals. During pre-Hispanic times, the two species were widely distributed across the different Andean zones, from the coast to the highlands, valleys, and lowlands. Their reliability and adaptability made them vital agents in the expansion and operation of Andean states such as Tiwanaku and later the Inca Empire. The llama was the most versatile of the two domesticates and was used as a

source of food, hides, fiber, and as beasts of burden that traversed the Inca empire's vast system of roads. The political unity and economic integration of the Inca Empire depended thus in no small measure on its two domesticated camelids (see figure 1).[26]

Click to view larger

Figure 1. "The Inca sings with his red llama," Felipe Guaman Poma de Ayala, *El primer nueva corónica y buen gobierno*, 1615/1616, p. 320.

Credit: København, Det Kongelige Bibliotek.

Indigenous societies of the Neotropical lowlands seem to have preferred to "domesticate" entire landscapes rather than individual animal species; most of these societies, however, had complex relationships with the rich and highly diverse fauna that inhabited these ecosystems. Classical and postclassical Maya, for instance, consumed and kept a wide variety of animals such as white-tailed deer (heavily managed by Maya women, but never fully domesticated), dogs, domestic and wild turkeys, iguanas, and peccaries, among the most important.[27] Less important species included quails, parrots, cormorants, crocodiles, sea turtles, mud turtles, snakes, armadillo, gophers, opossums, rabbits, mice, agoutis, porcupines, and coatis. The Maya also hunted large animals including tapirs, manatees, and felines—jaguars, ocelots, jaguarundis, and pumas. Tapir and jaguar bones, teeth, and skins seemed to have been important trade and ritual items. The Maya also consumed various species of fish such as catfish and tarpon. Evidence suggests there was trade between inland cities and communities and coastal ones, the former sending deer in exchange for fish. For post-classical Maya cities like Mayapán, raising, hunting, and trading animals were at the center of their urban economy, much of which was controlled by women. In short, animals stood at the center of daily life, ritual practices, gender relationships, and regional trade networks in the classical and post-classical Maya world.[28]

South of the Maya world, in Amazonia, a similarly complex picture has emerged. Research published during the past few decades has dramatically changed the habitual depiction of pre-Columbian Amazonia as a place with small, itinerant human populations that had limited impact on landscapes. The current consensus is that pre-Columbian Amazonia had large human populations; people often lived in semi-permanent, even urban settlements and practiced semi-intensive forms of agriculture that involved the creation of fertile, deep soils (dark earths), and built sophisticated networks of roads that allowed for the existence of complex societies. More importantly, it is clear by now that

Amazonian peoples dramatically altered and managed the various natural environments of Amazonia, including the flood plains, *terra firme* forest, and savannahs. Indigenous Amazonians cleared forests, extended savannahs through annual burning, and collected and dispersed the seeds of many different fruit trees. These various activities had far-reaching effects on plant distribution across vast areas and, therefore, on animal populations. Hunting of a wide number of species likewise impacted the distribution and concentration of animals throughout pre-Columbian Amazonia.[29] There is also evidence for the deliberate and extensive human movement of domesticated and wild faunas in the entire Neotropical lowlands before the arrival of Europeans and their accompanying animals.[30]

The Columbian Exchange

The Columbian Exchange marks a turning point for animal history in Latin America. The connection between the Old and New Worlds—which had disappeared under rising sea levels as the massive ice sheets of the northern hemisphere melted sometime in the 10th millennium BCE—was reestablished on October 12, 1492. This momentous episode brought to the Americas a vast array of organisms, animals, humans, and, tragically for millions of Amerindians who lacked immunity to them, new pathogens. Less well known than the human demographic collapse is that the population of some New World species such as llamas also declined precipitously.[31] The influx of organisms from the Old World to the new one was enormous and much larger than the introduction of New World species to Europe. With contact, Europeans introduced a plethora of species to the Americas, including domesticated animals such as horses, cows, pigs, sheep, goats, chickens, cats, and dogs, as well as synanthropes (from a Greek root that means “together with humans”) that thrived in humanized Old World environments such as the Norway rat (*Rattus norvegicus*) and the house mouse (*Mus musculus*). Europeans also brought over plants, including wheat, rye, oranges, sugarcane, and coffee, all of which took easily to the new environment. New World exports consisted mostly of plants: maize, potatoes, cassava, tomatoes, peanuts, tobacco, and cotton. The turkey became the only American animal species widely adopted in the Old World, but its impact on landscapes and societies was limited.[32]

Eurasian domesticate herbivores had virtually no equivalent in the Americas. This means that when Columbus brought a few horses, cattle, pigs, sheep, and goats to Espanola on his second voyage, their populations exploded. Within a few decades, many individuals became semi-feral and spread through the forests of the island. They displaced local fauna and often radically transformed these ecosystems by trampling and eating a flora that had no evolutionary defenses against the new attackers. Such ungulate irruptions, as experts call them, follow a somewhat predictable pattern. A new herbivore species colonizes a new habitat. The abundance of ungrazed vegetation leads to explosive population growth through the reduction of the time between births. Soon after, the

demographic increase overshoots the carrying capacity of the local ecosystem, and the population crashes and roughly stabilizes at a much lower number, though not before severely degrading the landscape and causing the replacement of the native grasses by unpalatable varieties of plants armed with thorns to dissuade enemies.

One such ungulate irruption appears to have taken place in 16th-century New Spain. The Spaniards introduced cattle and sheep into the Valle del Mezquital, northeast of Mexico City. After overstocking their new properties, the animal population crashed. For one historian, this event led to the permanent degradation of what used to be a rich agricultural region into an eroded landscape covered in scrub vegetation. Especially culpable were the animals' Spanish masters, who according to this account prevented the return of the sheep population to a sustainable number by keeping them artificially high and above the carrying capacity of the region.[33] Other scholars, geographers in particular, have criticized this analysis as simplistic, attempting to explain a complex process such as land degradation through the use of a single factor (overgrazing). Critics point to evidence that the Spanish used transhumance, a strategy habitual in Spain to prevent land erosion due to overgrazing, to mitigate this problem in the Valle del Mezquital. The indigenous demographic collapse in the 16th century due to exposure to new diseases with the resulting abandonment of agricultural terraces may have also contributed to rapid soil erosion. Finally, the onset of the Little Ice Age (roughly 1400–1800) likely increased the aridity of the region.[34] All of these factors point to a more complex story of irruption and crash than basic human error. Still missing from this picture is an account that takes animal behavior and agency more seriously in explaining the environmental transformations of the Valley del Mezquital in the 16th century (and of the Spanish colonial world at large).[35] Despite this, there is no doubt that the introduction of Eurasian domesticated herbivores profoundly shaped the landscapes of Spanish America.

Although no animal from the Americas colonized Eurasian ecosystems the way Old World domesticates did in the Americas, New World animals did "colonize" European science and thought, especially natural history. Along with silver and gold, the newly conquered territories of the Americas were sending hundreds of ships to Seville every year loaded with birds, monkeys, jaguars, armadillos, and a great variety of other animals. The first cabinets of curiosities (the precursors to museums) that appeared in the 16th century in Europe prized American animals for their exotic qualities.[36] The influx of animals from the New World and the chronicles on the enormous diversity of animal life in the Americas had a profound influence on natural history in the 16th century onward, driving the discipline away from reliance on ancient authorities and toward a more empirical approach.[37] This new method would eventually lead to the emergence in the 19th century of the biological sciences and evolutionary theory. In fact, contact with the natural environment and the fossil and extant fauna of Brazil, Argentina, Chile, and the Galapagos Archipelago, among other places in what is today Latin America, was central to the thought of Alexander von Humboldt and Charles Darwin, the two main figures in

European natural history during the first and second halves of the 19th century, respectively.[38] These developments, in turn, provided the foundation for environmental science and animal-focused disciplines such as ethology in the 20th.

Industrialization

If animals were “good to think with,” they were also good to work with, as they demonstrated during the early phases of the industrialization process of Latin America. Cuba, which began to industrialize in the first decades of the 19th century on the basis of its sugar industry, is an illustrative case. New technologies such as the steam engine, mechanized vacuum evaporators, and railroads linking increasingly mechanized sugar mills with shipping ports were introduced and built across the country starting in the 1820s to serve sugar production. By mid-century, Cuba had one of the most extensive railway systems in the world and was one the most rapidly industrializing economies in Latin America. Cuba’s early industrialization, however, did not make animal labor obsolete. To the contrary, animals became crucial components of this emerging industrial society. Oxen, horses, and mules remained ubiquitous in factories, sugar mills, and cities in Cuba. Oxen teams were particularly common, for they were hardy and relatively cheap animals compared to horses. Oxen carried the sugarcane to railway stations or nearby shipping ports and brought back merchandise and various goods to the sugar plantations. Oxen also provided essential services by hauling firewood and sugar pulp within the plantations. As late as the 1870s, one of Cuba’s largest sugar mills required the labor of 530 slaves, 500 oxen, 14 mules, and 30 horses, decades after the first steam engines were introduced.[39]

The relevance of working animals diminished as the transition to fossil-fuel technology in industry and the mechanization of agriculture became more widespread in Latin America during the 20th century. Eventually, animals became marginal as a source of energy in the region. This shift away from animal labor marked a profound historical transition. Since the arrival of human beings in the Americas at the end of the Pleistocene until the advent of the steam engine and, later on, of the internal combustion engine, humans relied on their own bodies and those of other animals for power. This fundamental socioenvironmental arrangement, what historian Fernand Braudel called the “biological ancien régime,” persisted in most of Latin America until the 20th century and, in some remote areas, to the present day. The transition from an animal-based energy regime to a fossil-fueled society enabled the unprecedented rates of economic and population growth, industrial production, and environmental change that characterized 20th-century Latin America.

While animals served Latin America’s industrialization mostly with their muscle power, their hides, fur, flesh, and, above all, excrement played a significant role in the development of global industrial capitalism.[40] Before the invention of the fossil-fuel–dependent Haber-Bosch process in the early 20th century that allowed for the conversion of atmospheric nitrogen into ammonia on an industrial scale, the rapidly expanding agricultural production in the industrializing economies of Europe required vast and constant supplies of nitrogen soil fertilizer. Much of this nutrient came in the form of bird excrement or guano, which had accumulated over centuries on islands off the rainless

Peruvian coast and across the Pacific Ocean. The guano trade collapse in the late 19th century underwent a revival in the first decades of the 20th and received a death blow when overfishing for the production of fishmeal (to serve as feed to livestock in the meat-hungry post-1945 affluent North) caused the decline of bird populations along the coast of Peru.

The rise of industrial societies in Latin America has had a profound effect on animal lives, both domesticated and wild. Not only have fossil-fueled technologies rid cities and farms of animal laborers and turned domesticates into either pets or sources of food, but industrialization has also given humans an enormous capacity to transform nature and become a geological agent in its own right.[41] The phenomenal power to raze forests, expand farmland, divert rivers, introduce non-native species, and exploit ecosystems on an unprecedented scale has led to a dramatic spike in the extinction rate and population loss of animal species over the last hundred years or so in Latin America.[42] At current rates, there could be a mass extinction (defined as the disappearance of 50 percent or more of all species) over the next few hundred years. The earth has witnessed only five similar events. The worst of these events occurred around 252 million years ago and wiped out about 95 percent of all species extant at the time. The last event occurred 66 million years ago and marked the demise of as much as 80 percent of animal and plant species, including non-avian dinosaurs. If the sixth mass extinction takes place, it will be unique. Not only will it occur faster than any of the previous five (which unfolded over tens of thousands to millions of years), but there will be no doubting its cause: human beings.

Latin America is a crucial center for global biodiversity and offers illustrative cases of the current extinction crisis.[43] In the 1870s, the Falkland Island Wolf (*Anodorhynchus glaucus*) was exterminated, most likely due to the establishment of sheep farms that sought to provide the British wool industry with raw material. Due to overhunting and the overexploitation of its marine food sources by humans, the Caribbean monk seal (*Monachus tropicalis*) vanished in the 1950s. In the 1960s, the last Mexican grizzly bear (*Ursus arctos*) was shot in northwestern Mexico after decades of a relentless extermination campaign that sought to protect ranching interests. In all of these cases, increasing human activity—enabled by the vast demographic and technological changes brought about by fossil-fueled industrialization—was the ultimate cause of extinction.

Discussion of the Literature

The history of animals in Latin America, broadly conceived, has explored a wide variety of topics, regions, and periods.[44] These include human representations of animals in religious, scientific, and intellectual traditions; the role of domesticated animals in shaping historical developments (from enabling the European colonization of Latin America to the creation of colonial and postcolonial economies); and the multiple ways in which humans have exploited wild animals from pre-Columbian times to the present. Most of this scholarship takes a decidedly anthropocentric perspective and has been done by archaeologists, historians of different stripes, and anthropologists. In addition to this humanistic tradition, there is a vast, separate body of work on animals in natural history, evolutionary biology, zoology, and ethology that dates back to the 19th century and remains vibrant to this day.

Few, if any, of these scholars would consider themselves animal historians. In that sense, the animal history of Latin America, as practiced in the United States and Europe, where animals are the focus of the story, has barely begun. Most recent work has explored the history of animal welfare and conservation efforts, elite hunting practices, colonial understandings of animals and their place in human society, and the relationship between animals and science as well as that between animals and modern states. This new literature on Latin American animal history seems to be characterized by two traits. First, there is certain skepticism of the notion that animals have culture and a concomitant resistance to think of animals as historical actors with a different (nonhuman) type of agency. This tendency diverges from scholars in animal studies, environmental humanities, and ethology, many of whom have abandoned such reservations. Second, animal historians of Latin America remain drawn to the methods and theories of disciplines such as literary studies and cultural anthropology, rather than to research in evolutionary biology, animal cognition, and animal behavior. This latter work may provide historians with tools to work around a historical record with few animal traces by, for instance, using present-day ethological research to interpret past animal behavior.

Primary Sources

Animal historians have become quite creative in extracting information about animals from a wide variety of primary sources, both published and unpublished. Although social historians face similar challenges when writing histories from below, animal historians confront an even more acute problem with animals. Unlike human subalterns, animals communicate in ways that humans have historically been unable to understand or uninterested in understanding. Regarding archival sources, scholars have used judicial files at the *Archivo General de las Indias* to explore colonial understandings of animals (and, thus, of humans); municipal ordinances in archives throughout Latin America for glimpses on animal welfare, protection, and abuse; and official reports from state

agencies stored in the *Archivo General Histórico* of Chile to track hunting practices of marine mammals, to give a few examples. A wide array of police and legislative records, photographs, logbooks, tribute lists, and hunting permits await the inquisitive animal historian. Historians with the appropriate skills and training can take advantage of zooarcheological and paleontological evidence stored in specialized collections. Historians working on the colonial period can consult a wide variety of published primary sources, from hunting manuals to the chronicles, natural histories, treatises, and dictionaries by Spanish and colonial authors. The work of the Inca Garcilaso de la Vega, Fray Bernardino de Sahagún's book 11 in his *Códice florentino* (devoted to animals), Felipe Guaman Poma de Ayala's *El primer nueva corónica y buen gobierno*, the *Relaciones Geográficas* ordered by Philipp II of Spain in the late 16th century, the natural and moral histories of José de Acosta and Fernando de Oviedo, the works of Alexander von Humboldt, and the various materials produced by the numerous Spanish scientific expeditions sent to the Americas during the second half of the 18th century will certainly yield valuable information when examined through the lens of animal history.

For historians focused on more recent periods, published works in natural history and, after circa 1850, more specialized Latin American, European, and US journals and bulletins on zoology, veterinary medicine, and agronomy, as well as animal, scientific, and natural-history collections represent an invaluable source. To give a few examples, historians have consulted sources as varied as the correspondence of American ornithologists working in Latin America at the Academy of Natural Sciences in Philadelphia and the vast collections at the *Instituto de Ciencias Naturales* at the *Universidad Nacional de Colombia*; and records from the Peruvian *Compañía Administradora del Guano*, the Peruvian *Ministerio de Fomento y Obras Públicas*, the National Archives at Kew in the United Kingdom, and the Scripps Institution of Oceanography Archives at the University of California, San Diego. Traditional sources such as newspapers and travelers' accounts are also useful resources for the animal historian. Some of the largest and most varied collections of these items for Latin America can be found at the *Hemeroteca Nacional* at the *Universidad Nacional Autónoma de México*, the Nettie Lee Benson Library at the University of Texas at Austin, the Bancroft Library at the University of California, Berkeley, and the *Iberoamerikanisches Institut* in Berlin.

Further Reading

Alves, Abel. *The Animals of Spain: An Introduction to Imperial Perceptions and Human Interaction with Other Animals, 1492–1826*. Leiden, The Netherlands: Brill, 2011.

Asúa, Miguel de, and Roger French. *A New World of Animals: Early Modern Europeans on the Creatures of Iberian America*. Burlington, VT: Routledge, 2005.

Benson, Elizabeth P. *Birds and Beasts of Ancient Latin America*. Gainesville: University Press of Florida, 1997.

Cowie, Helen. *Llama*. London: Reaktion Books, 2017.

Crosby Jr., Alfred W. *The Columbian Exchange: Biological and Cultural Consequences of 1492, 30th Anniversary Edition*. Westport: Praeger, 2003.

Domínguez, Daisy. "At the Intersection of Animal and Area Studies: Fostering Latin Americanist and Caribbeanist Animal Studies." *Humanimalia* 8, no. 1 (Fall 2016): 66–92.

Few, Martha, and Zeb Tortorici, eds. *Centering Animals in Latin American History*. Durham, NC: Duke University Press, 2013.

Grier Varner, John. *Dogs of the Conquest*. Norman: University of Oklahoma Press, 1983.

Kalof, Linda. **Animal Studies Bibliography**. Animal Studies at Michigan State University, 2018.

Melville, Elinor. *A Plague of Sheep: Environmental Consequences of the Conquest of Mexico*. New York: Cambridge University Press, 1994.

Montero, Iris. "The Slow Science of Swift Nature: Hummingbirds and Humans in New Spain." In *Global Scientific Practice in an Age of Revolutions, 1750–1850*, 127–146. Edited by Patrick Manning and Daniel Rood. Pittsburgh, PA: University of Pittsburgh Press, 2016.

Norton, Marcy. "The Chicken or the *Iegue*: Human-Animal Relationships and the Columbian Exchange." *American Historical Review* 120, no. 1 (2015): 28–60.

Quintero, Camilo, "Trading in Birds: Imperial Power, National Pride, and the Place of Nature in U.S.–Colombia Relations." *Isis: A Journal of the History of Science* 102 (2011): 421–445.

Schwartz, Marion. *A History of Dogs in the Early Americas*. New Haven, CT: Yale University Press, 1997.

Sluyter, Andrew. *Black Ranching Frontiers: African Cattle Herders of the Atlantic World, 1500–1900*. New Haven, CT: Yale University Press, 2012.

Ulloa Cubillos, Elsa Astrid, et al. *Rostros culturales de la fauna: las relaciones entre los humanos y los animales en el contexto colombiano*. Bogotá: Instituto Colombiano de Antropología e Historia: Fundación Natura, 2002.

Valadez Azúa, Raúl. *La domesticación animal*. México, D.F.: Plaza y Valdés, 2007.

Wilcox, Robert W. *Cattle in the Backlands: Mato Grosso and the Evolution of Ranching in the Brazilian Tropics*. Austin: University of Texas Press, 2017.

Notes:

(1.) The article uses Millions of Years (Mya) for geological timescales and Before Present (BP) for events estimated through radiocarbon dating, which can reliably date objects up to 50,000 years old. The standard reference point for the BP dating system is 1950. For events that took place in the last few millennia, the article uses the Before Common Era/ Common Era notation system.

(2.) Thomas S. Kemp, *The Origin and Evolution of Mammals* (Oxford: Oxford University Press, 2005), 274–290.

(3.) Kemp, *The Origin and Evolution of Mammals*.

(4.) Bruce J. MacFadden, "Extinct Mammalian Biodiversity of the Ancient New World Tropics," *Trends in Ecology and Evolution* 21, no. 3 (March 1, 2006): 157–165.

(5.) MacFadden, "Extinct Mammalian Biodiversity."

(6.) MacFadden, "Extinct Mammalian Biodiversity."

(7.) Michael O. Woodburne, "The Great American Biotic Interchange: Dispersals, Tectonics, Climate, Sea Level and Holding Pens," *Journal of Mammalian Evolution* 17, no. 4 (December 1, 2010): 245–264.

(8.) Kemp, *The Origin and Evolution of Mammals*, 284–290.

(9.) Juan J. Morrone, "Cladistic Biogeography of the Neotropical Region: Identifying the Main Events in the Diversification of the Terrestrial Biota," *Cladistics* 30, no. 2 (April 1, 2014): 202–214.

(10.) Steven J. Mithen, *After the Ice: A Global Human History, 20,000–5000 BC* (Cambridge, MA: Harvard University Press, 2004), 210–300.

(11.) Mithen, *After the Ice*, 221–285.

(12.) Anthony D. Barnosky and Emily L. Lindsey, "Timing of Quaternary Megafaunal Extinction in South America in Relation to Human Arrival and Climate Change," *Quaternary International*, Faunal Dynamics and Extinction in the Quaternary: Studies in Honor of Ernest L. Lundelius, Jr., 217, no. 1 (April 15, 2010): 10–29. In some regions of South America such as the Argentine Pampas, humans and megafauna coexisted for several millennia: see Gustavo G. Politis and Pablo G. Messineo, "The Campo Laborde Site: New Evidence for the Holocene Survival of Pleistocene Megafauna in the Argentine Pampas," *Quaternary International*, ICAZ 2006: Zooarchaeology of the Late Pleistocene/ Early Holocene in the Americas and Zooarchaeological Evidence of the Ancient Maya and Their Environment 191, no. 1 (November 15, 2008): 98–114.

(13.) For the "overkill hypothesis," see Paul S. Martin, "Pleistocene Overkill," *Natural History* 76, no. 10 (1967): 32–38. An overview of the debate is in Mithen, *After the Ice*, ch. 27. On the consequences of the extinction of the megafauna for the indigenous population

of the Americas, see the engaging and controversial work of Jared M. Diamond, *Guns, Germs, and Steel: The Fates of Human Societies* (New York: W. W. Norton & Co., 1998), part 1.

(14.) Clovis people were among the first groups of Paleo-Indians to colonize the New World. They are especially known for the beautifully crafted arrow and spear points they left behind, which scholars have dug up at countless sites across North America. For a recent discussion of Clovis culture and technology, see Michael R. Waters and Thomas W. Stafford, "Redefining the Age of Clovis: Implications for the Peopling of the Americas," *Science* 315, no. 5815 (February 23, 2007): 1122–1126.

(15.) Barnosky and Lindsey, "Timing of Quaternary Megafaunal Extinction in South America in Relation to Human Arrival and Climate Change."

(16.) Erin Kennedy Thornton and Kitty F. Emery, "The Uncertain Origins of Mesoamerican Turkey Domestication," *Journal of Archaeological Method and Theory* 24, no. 2 (June 1, 2017): 328–351.

(17.) Richard C. Francis, *Domesticated: Evolution in a Man-Made World* (New York: W. W. Norton & Company, 2015), Kindle edition, ch. 1.

(18.) Peter W. Stahl, "Animal Domestication in South America," in *The Handbook of South American Archaeology* (New York: Springer, 2008), 121–130.

(19.) Marion Schwartz, *A History of Dogs in the Early Americas* (New Haven, CT: Yale University Press, 1997).

(20.) Thornton and Emery, "The Uncertain Origins of Mesoamerican Turkey Domestication."

(21.) M. Kadwell et al., "Genetic Analysis Reveals the Wild Ancestors of the Llama and the Alpaca," *Proceedings of the Royal Society B: Biological Sciences* 268, no. 1485 (December 22, 2001): 2575–2584; and Guillermo Luis Mengoni Goñalons, "Camelids in Ancient Andean Societies: A Review of the Zooarchaeological Evidence," *Quaternary International*, Contributions to Latin American Zooarchaeology in Honour of Oscar J. Polaco, Fryxell Award recipient for Interdisciplinary Research, 185, no. 1 (July 1, 2008): 59–68.

(22.) Mengoni Goñalons, "Camelids in Ancient Andean Societies."

(23.) Richard C. Francis, *Domesticated: Evolution in a Man-Made World*, ch. 2.

(24.) Schwartz, *A History of Dogs in the Early Americas*.

(25.) Miguel de Asúa and Roger French, *A New World of Animals: Early Modern Europeans on the Creatures of Iberian America* (Burlington, VT: Routledge, 2017), 101–103. For an overview of animal use in Mesoamerican societies, see Christopher M. Götz

and Kitty F. Emery, *The Archaeology of Mesoamerican Animals* (Atlanta, GA: Lockwood Press, 2013).

(26.) Kadwell et al., "Genetic Analysis Reveals the Wild Ancestors of the Llama and the Alpaca"; Mengoni Goñalons, "Camelids in Ancient Andean Societies"; and Peter W. Stahl, "Pre-Columbian Andean Animal Domesticates at the Edge of Empire," *World Archaeology* 34, no. 3 (2003): 470–483.

(27.) Diego de Landa observed as much in the 16th century. See Diego de Landa, *Relación de Las Cosas de Yucatán* (Newark, NJ: Juan de la Cuesta, 2011), 127.

(28.) Marilyn A. Masson and Carlos Peraza Lope, "Animal Use at the Postclassic Maya Center of Mayapán," *Quaternary International*, ICAZ 2006: Zooarchaeology of the Late Pleistocene/Early Holocene in the Americas and Zooarchaeological Evidence of the Ancient Maya and Their Environment 191, no. 1 (November 15, 2008): 170–183. For a regional study of animal use in five Maya cities that covers both the classical and postclassical periods, see Christopher M. Götz, "Coastal and Inland Patterns of Faunal Exploitation in the Prehispanic Northern Maya Lowlands," *Quaternary International*, ICAZ 2006: Zooarchaeology of the Late Pleistocene/Early Holocene in the Americas and Zooarchaeological Evidence of the Ancient Maya and Their Environment, 191, no. 1 (November 15, 2008): 154–169.

(29.) William M. Denevan, "Rewriting the Late Pre-European History of Amazonia," *Journal of Latin American Geography* 11, no. 1 (2012): 9–24.

(30.) Peter W. Stahl, "Adventive Vertebrates and Historical Ecology in the Pre-Columbian Neotropics," *Diversity* 1, no. 2 (December 8, 2009): 151–165.

(31.) Jane C. Wheeler, A. J. F. Russel, and Hilary Redden, "Llamas and Alpacas: Pre-Conquest Breeds and Post-Conquest Hybrids," *Journal of Archaeological Science* 22, no. 6 (November 1, 1995): 833–840.

(32.) Alfred W. Crosby Jr., *The Columbian Exchange: Biological and Cultural Consequences of 1492, 30th Anniversary Edition* (Westport, CT: Praeger, 2003).

(33.) Elinor G. K. Melville, *A Plague of Sheep: Environmental Consequences of the Conquest of Mexico* (New York: Cambridge University Press, 1994).

(34.) Karl W. Butzer, "The Americas before and after 1492: An Introduction to Current Geographical Research," *ANNA Annals of the Association of American Geographers* 82, no. 3 (1992): 345–368; and Richard William Hunter, *People, Sheep, and Landscape Change in Colonial Mexico the Sixteenth-Century Transformation of the Valle Del Mezquital* (Baton Rouge: Louisiana State University, 2009), ch. 1.

(35.) A good example, for Anglo North America, of a narrative that underlines animal agency is Andrea L. Smalley, *Wild by Nature: North American Animals Confront Colonization* (Baltimore: Johns Hopkins University Press, 2017).

(36.) Asúa and French, *A New World of Animals*, 109–114.

(37.) Asúa and French, *A New World of Animals*, 114.

(38.) On Humboldt, see Jorge Cañizares-Esguerra, *Nature, Empire, And Nation: Explorations of the History of Science in the Iberian World* (Stanford: Stanford University Press, 2006), ch. 6; Andrea Wulf, *The Invention of Nature: Alexander von Humboldt's New World* (New York: Vintage, 2016), part 2; Karl S. Zimmerer, "Humboldt's Nodes and Modes of Interdisciplinary Environmental Science in the Andean World," *The Geographical Review* 96, no. 3 (July 2006): 335–360. A detailed account of Darwin's experience in South America and the Galapagos is in Richard Keynes, *Fossils, Finches, and Fuegians: Darwin's Adventures and Discoveries on the Beagle* (New York: Oxford University Press, 2003).

(39.) Reinaldo Funes Monzote, "Animal Labor and Protection in Cuba: Changes in Relationships with Animals in the Nineteenth Century," in *Centering Animals in Latin American History* (Durham, NC: Duke University Press, 2013), 210–242.

(40.) Gregory T. Cushman, *Guano and the Opening of the Pacific World: A Global Ecological History* (New York: Cambridge University Press, 2013).

(41.) J. R. McNeill and Peter Engelke, *The Great Acceleration: An Environmental History of the Anthropocene since 1945* (Cambridge, MA: Belknap Press: An Imprint of Harvard University Press, 2016).

(42.) On the current extinction crisis, see Gerardo Ceballos et al., "Accelerated Modern Human–induced Species Losses: Entering the Sixth Mass Extinction," *Science Advances* 1, no. 5 (June 1, 2015); Gerardo Ceballos, Pilar Rodriguez, and Rodrigo A. Medellin, "Assessing Conservation Priorities in Megadiverse Mexico: Mammalian Diversity, Endemicity, and Endangerment," *Ecological Applications* 8, no. 1 (1998): 8–17. On deforestation in Latin America, see Michael Williams, *Deforesting the Earth from Prehistory to Global Crisis* (Chicago: University of Chicago Press, 2010), ch. 11. On river damming, see Catherine M. Pringle, Mary C. Freeman, and Byron J. Freeman, "Regional Effects of Hydrologic Alterations on Riverine Macrobiota in the New World: Tropical-Temperate Comparisons," *BioScience* 50, no. 9 (September 1, 2000): 807–823. For an example of the effect of introducing an animal non-native species in a Latin American ecosystem, see Alejandro G. Pietrek and Laura Fasola, "Origin and History of the Beaver Introduction in South America," *Mastozoología Neotropical* 21, no. 2 (December 2014): 355–359.

(43.) Gerardo Ceballos, ed., *Mammals of Mexico* (Baltimore: Johns Hopkins University Press, 2014), 1–44.

(44.) For overviews of the literature, see Lauren Derby, "Bringing the Animals Back in: Writing Quadrupeds into the Environmental History of Latin America and the Caribbean,"

History Compass 9, no. 8 (2011): 602–621; and Daisy Domínguez, “At the Intersection of Animal and Area Studies: Fostering Latin Americanist and Caribbeanist Animal Studies,” Humanimalia 8, no. 1 (Fall 2016): 66–92.

Germán Vergara

School of History and Sociology, Georgia Institutue of Technology