

# Human organisms from the class mammalia all share

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Human Impact on Mammals All the living organisms on Earth are categorized into three domains of life known as Archaea, Bacteria and Eukarya. These domains are further sorted into kingdoms, phyla, classes and so on.

One major category of life is in the domain Eukarya, kingdom Animalia, phylum Chordata, subphylum Vertebrata and lastly, class Mammalia. As humans this category is very important to us because we are a part of it. Organisms from the class Mammalia all share a set of similar characteristics that distinguishes them from all other living organisms. Mammals are a unique group of animals with unique traits. In this paper, I will discuss an overview on what it means to be a mammal and how mammals are affected by humans.

Characteristics of mammals                      Similar to all other organisms from the kingdom Animalia, mammals are multicellular organisms, they reproduce sexually and they are heterotrophic (Strauss 2017). A heterotrophic animal is one that needs to consume other organisms in order to obtain energy, unlike autotrophs that can produce their own energy by the use of sunlight. However, unlike all other animals, the category of mammals also has other traits that help scientists to classify them. Mammals are an extremely diverse group of animals.

Mammals primarily live on land and are categorized as terrestrial. However, they can live in a variety of different habitats, such as deep seas, tropical rainforests and deserts. They also range in size from tiny shrew organisms to giant whales in the ocean.                      One unique trait of mammals is that they have hair covering their entire bodies at some stage of their life.

The type of hair can also be diverse between mammals. Some mammals have thick fur, some have long whiskers, quills and some even have horns. The main purpose of possessing hair is insulation for cold, protection against infections and even camouflage to deceive predators, such as for giraffes and zebras. One amazing function of hair is sensory feedback, an example of this is observed in the whiskers of house cats (Strauss 2017).

Unlike other vertebrates, mammals are unique in the way that they nurse their young with milk from their mammary glands. The presence of mammary glands is seen in both males and females, but only females are able to produce milk to feed their offspring.

One exception to this is the Dayak fruit bat, of whom the male has the responsibility to breast feed the young (Strauss 2017). Breastfeeding is an amazing process that delivers not only nutritious, fat, and protein rich milk from the mother to the baby but through that milk the mother is able to transfer vitamins, and antibodies to the baby as well. Another, less prevalent, but important trait of mammals is how the lower jawbone, known as the mandible in humans, is a single bone that connects directly to the skull. This bone is also called the dentary in other mammals because it is the bone that holds the teeth. The fact that the lower jaw attaches directly to the skull gives mammals the ability to have a powerful bite (Strauss 2017).

The teeth and jaw also function for chewing, grinding, and cutting. Mammals are also diphyodonts, which means they replace their set of teeth once in their life, unlike sharks who are polyphodonts and continuously replace their teeth (Strauss 2017). The teeth of young mammals are weaker and the adult

set are stronger and permanent. However, only some but not all mammals are born with teeth, such as humans. Another unique characteristic only seen in mammals is the presence of three inner ear bones, the incus, malleus, and the stapes (Strauss 2017). Unlike other animals, these inner ear bones give mammals the ability to transmit sound vibrations from the tympanic membrane (ear drum) to the inner ear and changes these vibrations into neural signals. These bones have evolved from the lower jaw bone of ancestral mammals which were a mammal-reptile organism, known as therapsids.

Therefore, it shows the link between mammals and reptiles. Even though being warm-blooded, endothermic, is not only exclusive for mammals, it is also seen in birds. Mammals however use their endothermic metabolisms efficiently in the strenuous physical activities they perform (Strauss 2017). Being endothermic also allows mammals to be active in a range of temperatures that other exothermic groups such as, reptiles, cannot. Similar to other vertebrates, mammals also possess diaphragms, which is the muscle located within the thoracic cavity that expands and contracts in order to force air to enter and leave the lungs during respiration.

In mammals, the diaphragm is highly advanced and this allows them to breathe in more oxygen and utilize it more efficiently. This combined with their warm-blooded metabolisms allows them to perform a wide range of activities, as stated previously. Once again, similar to all vertebrates, mammals have cardiac muscles that make up the walls of the heart and allows for pumping of blood in order to deliver oxygen to the body tissues and

remove carbon dioxide. The unique characteristic of mammalian hearts is that it consists of four chambers.

The four chambers make the heart more efficient because it separates the oxygenated and deoxygenated blood. Overall, this gives mammals the ability to deliver only oxygen rich blood to the tissues. This good quality of oxygen delivered to the tissues also gives them the ability to sustain longer periods of physical activity.

Most mammals are polygynous or promiscuous. Polygynous means one male mates with multiple females, whereas promiscuous means both males and females have multiple mates in their lifetime. Due to the fact that females put more energy into the care of their young, they cannot mate more than once in a mating season. Therefore, males have to compete with one another to mate and females are pickier in their choice of mates. Only a few percent of mammals, 3 percent, are actually monogamous, one being human beings (Strauss 2017).

Being monogamous means males only mate with one female and thus they also have to put in care for the offspring. Lastly, mammals can be polyandrous which means they display a cooperative breeding system, where groups of males and females care for each other's offspring. The behavior of mammals is as diverse as their type of habitat. Due to the fact that mammals can be terrestrial, aquatic or both, means that they are able to walk, run, swim, fly and climb (Wund 2012). Their lifestyles are also diverse. Some mammals choose to live in groups and some live alone. They can be carnivorous, herbivorous and even omnivorous, which means mammals can eat plants, animals and fungi. This shows that mammals as a

group are generalists with a widerange of food choices, unlike a specialist that can only one type of diet orprey.

Mammalian diversity gradientin North America            The diversity of mammals allows them to live uniuqelifestyles in all the corners of the Earth. Mammals can be found to range asfar north as the Arctic Circle, from east to west, and everything in between. Especially looking at the continent of North America we can see that mammalsare found everywhere. North America has a diverse range of ecosystems thatchanges drastically from one location to the next. This range of ecosystemsallows for a wide range of mammalian species to coexist.            A study was done to show that diversity of mammals foundin North America is dependent to their latitudinal position (Rodriguez et al. 2004).

The latitudinal diversity gradient (LDG) explainsthat the biodiversity of animals decreases as it goes from the equator tohigher altitudes. Jonathan Marcot, a University of Illinois animalbiology professor, states that “ theLDG says there are more species at the equator than at the poles” (Marcotet al. 2016). He also states in the journal that this pattern in ecology isseen in mammals, birds, insects, plants, in the oceans and on land.

Even thoughit might seem simple enough to think that more species can thrive in warmlatitudes, this does not mean it is always true. Marcot states that going backthousands of years it is evident to see that large mammals like horses, mammoths and rhinoceroses that were once present in North America lived inhigher latitudes. Therefore, things that we mostly find in

southern latitudes today may have lived in higher latitudes in the past.

Another study done by Marcot and colleagues in 2011 looked primarily at mammals from latitudes in western North America between 58 million and 63 million years ago. In this study Marcot states that “ it turns out the mammalian fossil record of North America is the best- or one of the best-sampled terrestrial records for this sort of analysis” (Marcot et al. 2016).

Overall, the study found no evidence in latitudinal diversity gradient for North American mammals, Marcot states that “ there was no biodiversity gradient back then as there is now” (Marcot et al. 2016). In order to answer this question, the team went back to the fossil records of all latitudes of North America from 63 million years of mammalian life.

They compared the results of mammalian species diversity for every latitude in North America for every time period. They also looked at and analyzed the diversity in comparison to the temperature changes during that time. Marcot states that “ there were roughly as many animal species in the northern parts of North America as there were in the southern regions” (Marcot et al. 2016).

Then, between 10 million to 4 million years ago they saw a stronger gradient forming. Finally, they found more species in the south than in the north, starting around 4 million years ago. The team also analyzed the gradient in relation to the record of temperature changes over the same time period and found “ a statistically significant correlation between temperature and the diversity gradient, meaning that the colder it gets, the stronger the diversity gradient gets for North American mammals” (Marcot et al.

2016). The study shows that in order to study patterns of ecology for a group of animals, one must study not only the living organisms but also the fossil records of the species past. Examples of mammals found in North

America        When we think about a mammalian safari we automatically think about African mammals like lions, elephants, leopards and rhinos. What we don't stop to think about is the great diversity of mammals found right here in North America. North America, specifically the United States, offers the best large mammal safaris. There are a diverse number of large mammals found in national parks in the United States.

One historic national park located in the heart of Wyoming is Yellowstone National Park, which is home to a great number of amazing mammals.

Yellowstone houses the Lamar Canyon wolf pack, which is a great place to see these gray wolves in the wild. Another place that is great for seeing wolves roam in the wild are Alaska, which houses approximately 7,000 to 11,000 wolves (Nalewicki 2016). Yellowstone is also home to the grizzly bears of the country. Approximately 800 bears can be found in the park, seen primarily during June to September, when they are not hibernating (Nalewicki 2016).        One of the largest mammals of North America are

the North American Bison, also known as buffalo.

These creatures can weigh up to 2000 pounds. As of 2016, President Obama named them the official mammals of the United States (Nalewicki 2016). The best place to see these great mammals is in Theodore Roosevelt National Park located in western North Dakota, which is home to around 750 of these mammals (Nalewicki 2016).        Other mammals, such as polar bears live



deep in the Arctic Circle and some can be found in Alaska. The polar bear populations are constantly threatened due to lack of prey and habitat destruction.

Moose can be found ranging from coast to coast, mostly found in northern Michigan in the Isle Royale National Park. They can also be found in herds roaming around in Maine. An example of aquatic marine mammals found in North America are humpback whales usually found off the coast of Hawaii, also in the Gulf of Maine and even New Jersey. Similar to the great lions of Africa, mountain lions, pumas, panthers and cougars can be found in North America. Cougars are especially found in places such as Arizona, Texas, and California.

These were just a few examples of the variety of different mammals that live in North America. The list can go on and on with a range of unique mammals all over North America (Nalewicki 2016). Evolution of mammals: The evolution of mammals is studied to have begun primarily after the extinction of dinosaurs. The first ancestor to the modern mammals we have today are creatures known as synapsid. Synapsid is believed to be approximately 250 million years old and have reptile-mammal like characteristics. The first mammals colonized the joined land masses formerly known as Pangea (Carrasco et.

al. 2009). One group of mammals, the marsupials first evolved in North America and spread to South America, Australia, and the Arctic. Another group of mammals evolved simultaneously in Asia and Europe.

Some mammals are believed to have colonized North America through the Bering Land Bridge. The bridge allowed mammalian species to cross from Asia and Europe to North America and vice versa. One example is the colonization of mammoths. Mammoths crossed the Bering landbridge and came to North America from Europe approximately 100, 000 years ago (Carrasco et. al. 2009). Another example is Bison reaching Alaska around 129, 000 years ago (Carrasco et. al.

2009). Other mammals that have evolved in North America are dogs and wolves. Whereas, mammals such as cats, bears, bison, buffalo and deer are from Eurasia. Horses are unique in their presence in North America.

Horses first originated in North America but they left and went to Eurasia and Africa. Therefore, they disappeared from North America. Other species such as camels also originated in North America but have now disappeared.

There has been a debate over the extinction of ancient mammalian species in North America for many years.

New findings from Tyler Faith, Ph. D, and Todd Surovell, associate professor of anthropology at the University of Wyoming, states that the mass extinction occurred in a geological instant. Approximately 40, 000 to 10, 000 years ago is where there was a loss of almost 50 percent of large mammal species in North America (Faith et al. 2009). This period is known as the Pleistocene era where species such as mammoths, mastodons, giant ground sloths and others disappeared. Some hypothesized causes for this sudden loss of species can be change in climate, comet impact, human overkill and disease

(Faith et al. 2009). The exact extinction time is unknown due to the fact that the fossil records are incomplete.

Therefore, it is hard to know whether the extinction was sudden or over a gradual period of time. According to Faith and Surovell the extinction is said to be a more sudden event than a gradual process. They hypothesized that the extinction may have occurred between 13.8 to 11.4 thousands years ago (Faith et al. 2009). Therefore, Faith and Surovell conclude that the extinction was primarily due to human overkill, comet impact or other rapid events instead of slow effects. Faith states that "the massive extinction coincides precisely with human arrival on the continent, abrupt climate change, and a possible extraterrestrial impact event.

It remains possible that any one of these or all, contributed to the sudden extinctions. We now have a better understanding of when the extinctions took place and the next step is to figure out why" (Faith et al. 2009).

Human impact on mammals: Human impact has continuously been prevalent on this group of animals. Humans have had an impact on mammals in past, present, and will continue to affect them in the future. Mammals are an important economic resource for humans. In the past, mammals have been domesticated by humans to provide us with goods such as milk and meat from mammals such as cows and goats (Doughty 2013). Other domesticated mammals by humans in the past are dogs and cats. Dogs were and are continuously used as service animals and companions for humans. In

some areas of the world these mammals, dogs and cats, are also used for their meat.

In general, mammals in zoos provide an important benefit to the ecotourism industry. In present day, human populations are continuously growing which means more rooms needed to accommodate for the people. Making space for humans means destroying or fragmenting the habitats of mammals (Mariana et al. 2016).

Destruction of habitats has killed either prey or predator populations of mammals. An example of this is seen through the increased populations of deer in New Jersey. The reason why deer have flourished so profoundly is due to the extinction of their natural predators, wolves.

Due to loss of habitat by humans and hunting of these predators eventually caused their extinction and consequently the rise of their prey, the deer. These mammals have adapted well to novel urban environments and thus are able to reproduce effectively. Another group of mammals that are well adapted are black bears also found in New Jersey. Due to less hunting by humans because of ethical reasons, the populations of black bears has gone up over the years. From the start of the industrial revolution, human civilizations have had negative impact on mammals.

Humans have overfished, hunted, and destroyed the habitats of mammals for agriculture. The use of chemicals, such as pesticides and herbicides, during farming has had a toll on mammalian species in North America (Hunter 2017). However, some mammals have adapted to these stresses put on

by humans. Mammals living in urban environments today have adapted to using the food sources wisely and they now thrive in the presence and close proximity of humans. This shows that their adaptations are a source of study of natural selection and it is valuable to see how these species will continuously affect mammals in the future. Those mammal species that are unable to adapt to novel urban societies will go extinct and those that can adapt will survive, which is a basic definition of natural selection.

Mammals are an amazing group of animals. Their unique traits set them apart from other classes of Animalia.

Most importantly is their diversity in species and lifestyles. There is a diverse number of mammalian species found in North American national parks. One of the great mammals to have existed in North America are mammoths and now there are many other species of mammals such as bears, wolves, etc.

Overall, humans have continuously impacted mammalian populations.

Mammals and humans are always in close contact with each other and thus will impact one and another all the time.