# NOT


# ...inside the House!

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with Yves Huin

This year the fall months have been quite sunny and warm (at times hot), with a few days with "poor" or even "unhealthy" air quality. The Pacific Ocean breeze generally kick on at 16:00 (4 PM), and my wife likes the cool evenings; she keeps the doors open of both sides of our house, with a gauze-inspired curtain; then she watches NHK, CNN, or movies in the "TV" room.

On Sunday night October 3rd, around 21:00 (9 PM), she got up to collect the plastic containers of the remnants of cat food (pellets) of both decks, main and kitchen; then she went back to watch her movie. She has a very fine hearing, and an acute sense of smell. A few minutes into her movie watching, she heard a faint crunching noise; then again; and again. She got up, switched on the light in the kitchen: nothing unusual. She return to her movie, but the grinding/crunching faint noise kept recurring; she went back to the kitchen, then looked into our salon and here he was: a young adult raccoon, surprised, and frightened; the coon started running and jumping all over the room, full of vases, sculptures and collectibles. A blue vase (gift of my sister Françoise) fell and broke in small debris. And then the animal ran to the back-kitchen door: closed. (Emiko had opened the main deck door facing the kitchen one). The raccoon jumped into a collection of empty, ancient bottles, and mugs or small cup full of salt or spices (he just threw a small cup full of Guérande salt, that spilled on the floor), and my wife opened the kitchen door, through which he ran, FREE and unharmed. Emiko inspected the area and cleaned it; -and went back to watching her movie.

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The "raccoon" entry in Wikipedia is …encyclopedic! I am just copying relevant paragraphs -with some editing:

The **raccoon** (*Procyon lotor*) is a medium-sized mammal native to North America. The raccoon is the largest of the procyonid family, having a body length of 40 to 70 cm (16 to 28 in) and a body weight of 5 to 26 kg (11 to 57 lb.). Its grayish coat mostly consists of dense underfur which insulates it against cold weather. Three of the raccoon's most distinctive features are its extremely dexterous front paws, its facial

mask, and its ringed tail, which are themes in the mythologies of the indigenous peoples of the Americas. Raccoons are noted for their intelligence, as studies show that they are able to remember the solution to tasks for at least three years. They are usually nocturnal and omnivorous, eating about 40% invertebrates, 33% plants, and 27% vertebrates.

The original habitats of the raccoon are deciduous and mixed forests, but due to their adaptability they have extended their range to mountainous areas, coastal marshes, and urban areas, where some homeowners consider them to be pests. As a result of escapes and deliberate introductions in the mid-20th century, raccoons are now also distributed across much of mainland Europe, Caucasus, and Japan.

Though previously thought to be generally solitary, there is now evidence that raccoons engage in sex-specific social behavior. Related females often share a common area, while unrelated males live together in groups of up to four raccoons to maintain their positions against foreign males during the mating season, and other potential invaders. Home range sizes vary anywhere from 3 hectares (7.4 acres) for females in cities to 5,000 hectares (12,000 acres) for males in prairies. After a gestation period of about 65 days, two to five young, known as "*kits*", are born in spring. The kits are subsequently raised by their mother until dispersal in late fall. Although captive raccoons have been known to live over 20 years, their life expectancy in the wild is only 1.8 to 3.1 years. In many areas, hunting and vehicular injury are the two most common causes of death.

## *Senses*

The most important sense for the raccoon is its sense of touch. The "hypersensitive" front paws are protected by a thin horny layer that becomes pliable when wet. The five digits of the paws have no webbing between them, which is unusual for a carnivoran. Almost two-thirds of the area responsible for sensory perception in the raccoon's cerebral cortex is specialized for the interpretation of tactile impulses, more than in any other studied animal. They are able to identify objects before touching them with vibrissae located above their sharp, nonretractable claws. The raccoon's paws lack an opposable thumb; thus, it does not have the agility of the hands of primates. There is no observed negative effect on tactile perception when a raccoon stands in water below 10 °C (50 °F) for hours.

Raccoons are thought to be color blind or at least poorly able to distinguish color, though their eyes are well-adapted for sensing green light. Although their accommodation of 11 diopters is comparable to that of humans and they see well in twilight because of the *tapetum lucidum* behind the retina, visual perception is of subordinate importance to raccoons because of their poor long-distance vision. In addition to being useful for orientation in the dark, their sense of smell is important for intraspecific communication. Glandular secretions (usually from their anal glands), urine and feces are used for marking. With their broad auditory range, they can perceive tones up to 50–85 kHz as well as quiet noises, like those produced by earthworms underground.

## *Intelligence*

Zoologist Clinton Hart Merriam described raccoons as "*clever beasts*", and that "*in certain directions their cunning surpasses that of the fox*". The animal's intelligence gave rise to the epithet "*sly coon*". Only a few studies have been undertaken to determine the mental abilities of raccoons, most of them based on the animal's sense of touch. In a study by the ethologist H. B. Davis in 1908, raccoons were able to open 11 of 13 complex locks in fewer than 10 tries and had no problems repeating the action when the locks were rearranged or turned upside down. Davis concluded that they understood the abstract principles of the locking mechanisms and their learning speed was equivalent to that of rhesus macaques.

Studies in 1963, 1973, 1975 and 1992 concentrated on raccoon memory showed that they can remember the solutions to tasks for at least three years. In a study by B. Pohl in 1992, raccoons were able to instantly differentiate between identical and different symbols three years after the short initial learning phase. Stanislas Dehaene reports in his book *The Number Sense* that raccoons can distinguish boxes containing two or four grapes from those containing three. In research by Suzana Herculano-Houzel and other neuroscientists, raccoons have been found to be comparable to primates in density of neurons in the cerebral cortex, which they have proposed to be a neuroanatomical indicator of intelligence.

## *Social behavior*

Eastern raccoons (P. l. lotor) in a tree: The raccoon's social structure is grouped into what Ulf Hohmann calls a "three-class society".

Studies in the 1990s by the ethologists Stanley D. Gehrt and Ulf Hohmann suggest that raccoons engage in sex-specific social behaviors and are not typically solitary, as was previously thought. Related females often live in a so-called "*fission-fusion society*"; that is, they share a common area and occasionally meet at feeding or resting grounds. Unrelated males often form loose male social groups to maintain their position against foreign males during the mating season—or against other potential invaders. Such a group does not usually consist of more than four individuals. Since some males show aggressive behavior towards unrelated kits, mothers will isolate themselves from other raccoons until their kits are big enough to defend themselves.

With respect to these three different modes of life prevalent among raccoons, Hohmann called their social structure a "*three-class society*". Samuel I. Zeveloff, professor of zoology at Weber State University and author of the book *Raccoons: A Natural History*, is more cautious in his interpretation and concludes at least the females are solitary most of the time and, according to Erik K. Fritzell's study in North Dakota in 1978, males in areas with low population densities are solitary as well.

The shape and size of a raccoon's home range varies depending on age, sex, and habitat, with adults claiming areas more than twice as large as juveniles. While the

size of home ranges in the habitat of North Dakota's prairies lie between 7 and 50 km2 (3 and 20 sq mi) for males and between 2 and 16 km2 (1 and 6 sq mi) for females, the average size in a marsh at Lake Eriewas 0.5 km2 (0.19 sq mi). Irrespective of whether the home ranges of adjacent groups overlap, they are most likely not actively defended outside the mating season if food supplies are sufficient. Odor marks on prominent spots are assumed to establish home ranges and identify individuals. Urine and feces left at shared raccoon latrines may provide additional information about feeding grounds, since raccoons were observed to meet there later for collective eating, sleeping and playing.

Concerning the general behavior patterns of raccoons, Gehrt points out that "*typically you'll find 10 to 15 percent that will do the opposite*" of what is expected.

## *Dousing*

Captive raccoons often douse their food before eating.

One aspect of raccoon behavior is so well known that it gives the animal part of its scientific name, *Procyon lotor*; "*lotor*" is neo-Latin for "*washer*". In the wild, raccoons often dabble for underwater food near the shoreline. They then often pick up the food item with their front paws to examine it and rub the item, sometimes to remove

unwanted parts. This gives the appearance of the raccoon "*washing*" the food. The tactile sensitivity of raccoons' paws is increased if this rubbing action is performed underwater, since the water softens the hard layer covering the paws. However, the behavior observed in captive raccoons in which they carry their food to water to "*wash*" or douse it before eating has not been observed in the wild. Naturalist Georges-Louis Leclerc, Comte de Buffon, believed that raccoons do not have adequate saliva production to moisten food thereby necessitating dousing, but this hypothesis is now considered to be incorrect. Captive raccoons douse their food more frequently when a watering hole with a layout similar to a stream is not farther away than 3 m (10 ft). The widely accepted theory is that dousing in captive raccoons is a fixed action pattern from the dabbling behavior performed when foraging at shores for aquatic foods. This is supported by the observation that aquatic foods are doused more frequently. Cleaning dirty food does not seem to be a reason for "*washing*". Experts have cast doubt on the veracity of observations of wild raccoons dousing food.

## *Conflicts*

A skunk and a California raccoon (*P. l. psora*) share cat food morsels in a Hollywood, California, backyard

The increasing number of raccoons in urban areas has resulted in diverse reactions in humans, ranging from outrage at their presence to deliberate feeding. Some wildlife experts and most public authorities caution against feeding wild animals because they might become increasingly obtrusive and dependent on humans as a

food source. Other experts challenge such arguments and give advice on feeding raccoons and other wildlife in their books. Raccoons without a fear of humans are a concern to those who attribute this trait to rabies, but scientists point out this behavior is much more likely to be a behavioral adjustment to living in habitats with regular contact to humans for many generations. Raccoons usually do not prey on domestic cats and dogs, but isolated cases of killings have been reported. Attacks on pets may also target their owners.

A Florida raccoon (*P. l. elucus*) in the Everglades approaches a group of humans, hoping to be fed.

While overturned waste containers and raided fruit trees are just a nuisance to homeowners, it can cost several thousand dollars to repair damage caused by the use of attic space as dens. Relocating or killing raccoons without a permit is forbidden in many urban areas on grounds of animal welfare. These methods usually only solve problems with particularly wild or aggressive individuals, since adequate dens are either known to several raccoons or will quickly be rediscovered. Loud noises, flashing lights and unpleasant odors have proven particularly effective in driving away a mother and her kits before they would normally leave the nesting place (when the kits are about eight weeks old). Typically, though, only precautionary measures to restrict access to food waste and den sites are effective in the long term.

Among all fruits and crops cultivated in agricultural areas, sweet corn in its milk stage is particularly popular among raccoons. In a two-year study by Purdue University researchers, published in 2004, raccoons were responsible for 87% of the

damage to corn plants. Like other predators, raccoons searching for food can break into poultry houses to feed on chickens, ducks, their eggs, or food.

Since raccoons in high mortality areas have a higher rate of reproduction, extensive hunting may not solve problems with raccoon populations. Older males also claim larger home ranges than younger ones, resulting in a lower population density

### *Pet raccoons*

Raccoons are sometimes kept as pets, which is discouraged by many experts because the raccoon is not a domesticated species. Raccoons may act unpredictably and aggressively, and it is extremely difficult to teach them to obey commands. In places where keeping raccoons as pets is not forbidden, such as in Wisconsin and other U.S. states, an exotic pet permit may be required. One notable raccoon pet was Rebecca, kept by US president Calvin Coolidge.

Their propensity for unruly behavior exceeds that of captive skunks, and they are even less trustworthy when allowed to roam freely. Because of their intelligence and nimble forelimbs, even inexperienced raccoons are easily capable of unscrewing jars, uncorking bottles and opening door latches, with more experienced specimens having been recorded to open doorknobs. Sexually mature raccoons often show aggressive natural behaviors such as biting during the mating season. Neutering them at around five or six months of age decreases the chances of aggressive behavior developing. Raccoons can become obese and suffer from other disorders due to poor diet and lack of exercise. When fed with cat food over a long time period, raccoons can develop gout. With respect to the research results regarding their social behavior, it is now required by law in Austria and Germany to keep at least two individuals to prevent loneliness. Raccoons are usually kept in a pen (indoor or outdoor), also a legal requirement in Austria and Germany, rather than in the apartment where their natural curiosity may result in damage to property.

When orphaned, it is possible for kits to be rehabilitated and reintroduced to the wild. However, it is uncertain whether they readapt well to life in the wild. Feeding unweaned kits with cow's milk rather than a kitten replacement milk or a similar product can be dangerous to their health.

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Raccoons were on earth millennia before humans appeared. This coexistence with humans is lucky for them, but it is far from being the rule: wild animals are either (rarely) domesticated, or (more frequently) killed, exterminated. We live in the **Holocene Extinction**.

The **Holocene extinction**, otherwise referred to as the **sixth mass extinction** or **Anthropocene extinction**, is an ongoing extinction event of species during the present Holocene epoch (with the more recent time sometimes called Anthropocene) as a result of human activity. The included extinctions span numerous families of plants and animals, including mammals, birds, reptiles, amphibians, fishes and invertebrates. With widespread degradation of highly biodiverse habitats such as coral reefs and rainforests, as well as other areas, the vast majority of these extinctions are thought to be *undocumented*, as the species are undiscovered at the time of their extinction, or no one has yet discovered their extinction. The current rate of extinction of species is estimated at 100 to 1,000 times higher than natural background rates.

The Holocene extinction includes the disappearance of large land animals known as megafauna, starting at the end of the last glacial period. Megafauna outside of the African mainland (thus excluding Madagascar), which did not evolve alongside humans, proved highly sensitive to the introduction of new predation, and many died out shortly after early humans began spreading and hunting across the Earth (many African species have also gone extinct in the Holocene, but – with few exceptions – megafauna of the mainland was largely unaffected until a few hundred years ago). These extinctions, occurring near the Pleistocene–Holocene boundary, are sometimes referred to as the Quaternary extinction event.

The most popular theory is that human overhunting of species added to existing stress conditions as the extinction coincides with human emergence. Although there is debate regarding how much human predation affected their decline, certain population declines have been directly correlated with human activity, such as the extinction events of New Zealand and Hawaii. Aside from humans, climate change may have been a driving factor in the megafaunal extinctions, especially at the end of the Pleistocene.

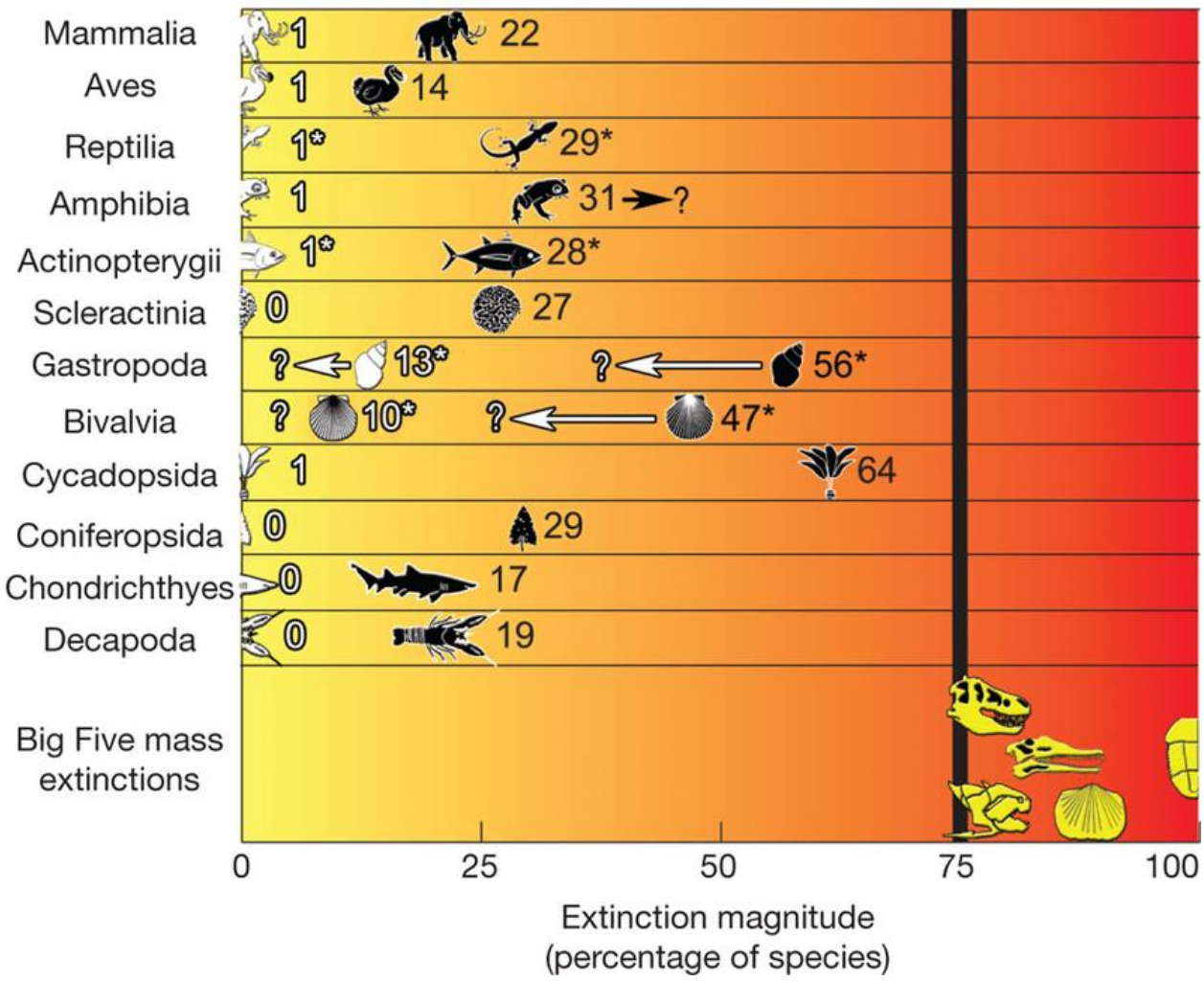
Ecologically, humanity has been noted as an unprecedented "*global super predator*" that consistently preys on the adults of other apex predators and has worldwide

effects on food webs. There have been extinctions of species on every land mass and in every ocean: there are many famous examples within Africa, Asia, Europe, Australia, North and South America, and on smaller islands. Overall, the Holocene extinction can be linked to the human impact on the environment. The Holocene extinction continues into the 21st century, with meat consumption, overfishing, and ocean acidification and the decline in amphibian populations being a few broader examples of a cosmopolitan decline in biodiversity. Human population growth and increasing per capita consumption are considered to be the primary drivers of this decline.

The 2019 *Global Assessment Report on Biodiversity and Ecosystem Services*, published by the United Nations' Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, posits that roughly one million species of plants and animals face extinction within decades as the result of human actions.

The abundance of species extinctions considered anthropogenic, or due to human activity, has sometimes (especially when referring to hypothesized future events) been collectively called the "*Anthropocene extinction*". "*Anthropocene*" is a term introduced in 2000. Some now postulate that a new geological epoch has begun, with the most abrupt and widespread extinction of species since the Cretaceous–Paleogene extinction event 66 million years ago.

The term "*anthropocene*" is being used more frequently by scientists, and some commentators may refer to the current and projected future extinctions as part of a longer Holocene extinction. The Holocene–Anthropocene boundary is contested, with some commentators asserting significant human influence on climate for much of what is normally regarded as the Holocene Epoch. Other commentators place the Holocene–Anthropocene boundary at the industrial revolution and also say that *"[f]formal adoption of this term in the near future will largely depend on its utility, particularly to earth scientists working on late Holocene successions*."






It has been suggested that human activity has made the period starting from the mid-20th century different enough from the rest of the Holocene to consider it a new geological epoch, known as the Anthropocene, a term which was considered for inclusion in the timeline of Earth's history by the International Commission on Stratigraphy in 2016. In order to constitute the Holocene as an extinction event, scientists must determine exactly when anthropogenic greenhouse gas emissions began to measurably alter natural atmospheric levels on a global scale, and when these alterations caused changes to global climate. Using chemical proxies from Antarctic ice cores, researchers have estimated the fluctuations of carbon dioxide

($CO_2$) and methane ($CH_4$) gases in the Earth's atmosphere during the late Pleistocene and Holocene epochs. Estimates of the fluctuations of these two gases in the atmosphere, using chemical proxies from Antarctic ice cores, generally indicate that the peak of the Anthropocene occurred within the previous two centuries: typically beginning with the Industrial Revolution, when the highest greenhouse gas levels were recorded.

The Holocene extinction is mainly caused by human activities. Extinction of animals, plants, and other organisms caused by human actions may go as far back as the late Pleistocene, over 12,000 years ago. There is a correlation between megafaunal extinction and the arrival of humans, and human population growth and per-capita consumption growth, prominently in the past two centuries, are regarded as the underlying causes of extinction.

## Biomass of mammals on Earth as of 2018

- Livestock, mostly cattle and pigs (60%)
- Humans (36%)
- Wild animals (4%)

Human civilization was founded on and grew from agriculture. The more land used for farming, the greater the population a civilization could sustain, and subsequent popularization of farming led to habitat conversion.

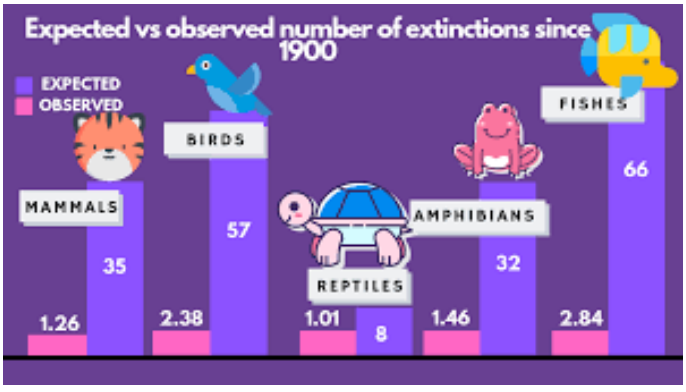
Habitat destruction by humans, including oceanic devastation, such as through overfishing and contamination; and the modification and destruction of vast tracts of land and river systems around the world to meet solely human-centered ends (with 13 percent of Earth's ice-free land surface now used as row-crop agricultural sites, 26 percent used as pastures, and 4 percent urban-industrial areas), thus replacing the original local ecosystems. The sustained conversion of biodiversity rich forests and wetlands into poorer fields and pastures (of lesser carrying capacity for wild species), over the last 10,000 years, has considerably reduced the Earth's carrying capacity for wild birds, among other organisms, in both population size and species count.

Other, related human causes of the extinction event include deforestation, hunting, pollution, the introduction in various regions of non-native species, and the widespread transmission of infectious diseases spread through livestock and crops. Humans both create and destroy crop cultivar and domesticated animal varieties. Advances in transportation and industrial farming has led to monoculture and the extinction of many cultivars. The use of certain plants and animals for food has also resulted in their extinction, including silphium and the passenger pigeon.

Some scholars assert that the emergence of capitalism as the dominant economic system has accelerated ecological exploitation and destruction, and has also exacerbated mass species extinction. CUNY professor David Harvey, for example, posits that the neoliberal era "*happens to be the era of the fastest mass extinction of species in the Earth's recent history*".

## *Apex predator*

Megafauna were once found on every continent of the world and large islands such as New Zealand and Madagascar, but are now almost exclusively found on the continent of Africa, with notable comparisons on Australia and the islands previously mentioned experiencing population crashes and trophic cascades shortly after the earliest human settlers. It has been suggested that the African megafauna survived because they evolved alongside humans. The timing of South American megafaunal extinction appears to precede human arrival, although the possibility that human activity at the time impacted the global climate enough to cause such an extinction has been suggested.

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It has been noted, in the face of such evidence, that humans are unique in ecology as an unprecedented "*global super predator*", regularly preying on large numbers of fully grown terrestrial and marine apex predators, and with a great deal of influence over food webs and climatic systems worldwide. Although significant debate exists as to how much human predation and indirect effects contributed to prehistoric extinctions, certain population crashes have been directly correlated with human arrival. Human activity has been the main cause of mammalian extinctions since the Late Pleistocene. A 2018 study published in *PNAS* found that since the dawn of human civilization, 83% of wild mammals, 80% of marine mammals, 50% of plants and 15% of fish have vanished. Currently, livestock make up 60% of the biomass of all mammals on earth, followed by humans (36%) and wild mammals (4%). As for birds, 70% are domesticated, such as poultry, whereas only 30% are wild.

## *Agriculture and climate change*

Recent investigations about hunter-gatherer landscape burning has a major implication for the current debate about the timing of the Anthropocene and the role that humans may have played in the production of greenhouse gases prior to the Industrial Revolution. Studies on early hunter-gatherers raises questions about the current use of population size or density as a proxy for the amount of land clearance and anthropogenic burning that took place in pre-industrial times. Scientists have questioned the correlation between population size and early territorial alterations. Ruddiman and Ellis' research paper in 2009 makes the case that early farmers involved in systems of agriculture used more land per capita than growers later in the Holocene, who intensified their labor to produce more food per unit of area (thus, per laborer); arguing that agricultural involvement in rice production implemented thousands of years ago by relatively small populations have created significant environmental impacts through large-scale means of deforestation.

While a number of human-derived factors are recognized as contributing to rising atmospheric concentrations of $CH_4$ (methane) and $CO_2$ (carbon dioxide), deforestation and territorial clearance practices associated with agricultural development may be contributing most to these concentrations globally. Scientists that are employing a variance of archaeological and palaeoecological data argue that the processes contributing to substantial human modification of the environment

spanned many thousands of years ago on a global scale and thus, not originating as early as the Industrial Revolution. Gaining popularity on his uncommon hypothesis, paleo-climatologist William Ruddiman in 2003, stipulated that in the early Holocene 11,000 years ago, atmospheric carbon dioxide and methane levels fluctuated in a pattern which was different from the Pleistocene epoch before it. He argued that the patterns of the significant decline of $CO_2$ levels during the last ice age of the Pleistocene inversely correlates to the Holocene where there have been dramatic increases of $CO_2$ around 8000 years ago and $CH_4$ levels 3000 years after that. The correlation between the decrease of $CO_2$ in the Pleistocene and the increase of it during the Holocene implies that the causation of this spark of greenhouse gases into the atmosphere was the growth of human agriculture during the Holocene such as the anthropogenic expansion of (human) land use and irrigation.

## *History*

There are roughly 880 mountain gorillas remaining. 60% of primate species face an anthropogenically driven extinction crisis and 75% have declining populations.

The loss of species from ecological communities, defaunation, is primarily driven by human activity. This has resulted in empty forests, ecological communities depleted of large vertebrates.] This is not to be confused with extinction, as it includes both

the disappearance of species and declines in abundance. Defaunation effects were first implied at the Symposium of Plant-Animal Interactions at the University of Campinas, Brazil in 1988 in the context of Neotropical forests. Since then, the term has gained broader usage in conservation biology as a global phenomenon.

Big cat populations have severely declined over the last half-century and could face extinction in the following decades. According to IUCN estimates: lions are down to 25,000, from 450,000; leopards are down to 50,000, from 750,000; cheetahs are down to 12,000, from 45,000; tigers are down to 3,000 in the wild, from 50,000. A December 2016 study by the Zoological Society of London, Panthera Corporation and Wildlife Conservation Society showed that cheetahs are far closer to extinction than previously thought, with only 7,100 remaining in the wild, and crammed within only 9% of their historic range. Human pressures are to blame for the cheetah population crash, including prey loss due to overhunting by people, retaliatory killing from farmers, habitat loss and the illegal wildlife trade.

> *We are seeing the effects of 7 billion people on the planet. At present rates, we will lose the big cats in 10 to 15 years.*
>
> *— Naturalist Dereck Joubert, co-founder of the National Geographic Big Cats Initiative*

The term pollinator decline refers to the reduction in abundance of insect and other animal pollinators in many ecosystems worldwide beginning at the end of the twentieth century, and continuing into the present day. Pollinators, which are necessary for 75% of food crops, are declining globally in both abundance and diversity. A 2017 study led by Radboud University's Hans de Kroon indicated that the biomass of insect life in Germany had declined by three-quarters in the previous 25 years. Participating researcher Dave Goulson of Sussex University stated that their study suggested that humans are making large parts of the planet uninhabitable for wildlife. Goulson characterized the situation as an approaching "*ecological Armageddon*", adding that "*if we lose the insects then everything is going to collapse*." As of 2019, 40% of insect species are in decline, and a third are endangered. The most significant drivers in the decline of insect populations are associated with intensive farming practices, along with pesticide use and climate change.

*We have driven the rate of biological extinction, the permanent loss of species, up several hundred times beyond its historical levels, and are threatened with the loss of a majority of all species by the end of the 21st century.*

*— Peter Raven, former president of the American Association for the Advancement of Science (AAAS), in the foreword to their publication AAAS Atlas of Population and Environment*

Angalifu, a male northern white rhinoceros at the San Diego Zoo Safari Park (died December 2014). Sudan, the last male of the subspecies died on March 19, 2018.

Various species are predicted to become extinct in the near future, among them the rhinoceros, nonhuman primates, pangolins, and giraffes. Hunting alone threatens bird and mammalian populations around the world. The direct killing of megafauna for meat and body parts is the primary driver of their destruction, with 70% of the 362 megafauna species in decline as of 2019. Mammals in particular have suffered such severe losses as the result of human activity that it could take several million years for them to recover. According to the WWF's 2020 *Living Planet Report*, wildlife populations have declined by 68% since 1970 as a result of overconsumption, population growth and intensive farming, which is further evidence that humans have unleashed a sixth mass extinction event. 189 countries, which are signatory to the Convention on Biological Diversity (Rio Accord), have committed to preparing a Biodiversity Action Plan, a first step at identifying specific endangered species and habitats, country by country.

*For the first time since the demise of the dinosaurs 65 million years ago, we face*

> *a global mass extinction of wildlife. We ignore the decline of other species at our peril – for they are the barometer that reveals our impact on the world that sustains us.*
>
> *— Mike Barrett, director of science and policy at WWF's UK branch*

A June 2020 study published in PNAS posits that the contemporary extinction crisis *"may be the most serious environmental threat to the persistence of civilization, because it is irreversible"* and that its acceleration *"is certain because of the still fast growth in human numbers and consumption rates."* The study found that more than 500 vertebrate species are poised to be lost in the next two decades.

## *Recent extinction*

Recent extinctions are more directly attributable to human influences, whereas prehistoric extinctions can be attributed to other factors, such as global climate change. The International Union for Conservation of Nature (IUCN) characterizes '*recent*' extinction as those that have occurred past the cut-off point of 1500, and at least 875 species have gone extinct since that time and 2012. Some species, such as the Père David's deer and the Hawaiian crow, are extinct in the wild, and survive solely in captive populations. Other species, such as the Florida panther, are ecologically extinct, surviving in such low numbers that they essentially have no impact on the ecosystem. Other populations are only locally extinct (extirpated), still existence elsewhere, but reduced in distribution, as with the extinction of gray whales in the Atlantic, and of the leatherback sea turtle in Malaysia.

Most recently, insect populations have experienced rapid surprising declines. Insects have declined at an annual rate of 2.5% over the last 25–30 years. The most severe effects may include Puerto Rico, where insect ground fall has declined by 98% in the previous 35 years. Butterflies and moths are experiencing some of the most severe effect. Butterfly species have declined by 58% on farmland in England. In the last ten years, 40% of insect species and 22% of mammal species have disappeared. Germany is experiencing a 75% decline. Climate change and agriculture are believed to be the most significant contributors to the change.

A 2019 study published in *Nature Communications* found that rapid biodiversity loss is impacting larger mammals and birds to a much greater extent than smaller ones,

with the body mass of such animals expected to shrink by 25% over the next century. Over the past 125,000 years, the average body size of wildlife has fallen by 14% as human actions eradicated megafauna on all continents with the exception of Africa. Another 2019 study published in *Biology Letters* found that extinction rates are perhaps much higher than previously estimated, in particular for bird species.

## *Habitat destruction*

Satellite image of rainforest converted to oil palm plantations.

Global warming is widely accepted as being a contributor to extinction worldwide, in a similar way that previous extinction events have generally included a rapid change in global climate and meteorology. It is also expected to disrupt sex ratios in many reptiles which have temperature-dependent sex determination.

The removal of land to clear way for palm oil plantations releases carbon emissions held in the peatlands of Indonesia. Palm oil mainly serves as a cheap cooking oil, and also as a (controversial) biofuel. However, damage to peatland contributes to 4% of global greenhouse gas emissions, and 8% of those caused by burning fossil fuels. Palm oil cultivation has also been criticized for other impacts to the environment, including deforestation, which has threatened critically endangered species such as the orangutan and the tree-kangaroo. The IUCN stated in 2016 that the species could go extinct within a decade if measures are not taken to preserve the rainforests in which they live.

Some scientists and academics assert that industrial agriculture and the growing demand for meat is contributing to significant global biodiversity loss as this is a significant driver of deforestation and habitat destruction; species-rich habitats, such as significant portions of the Amazon region, are being converted to agriculture for meat production. A 2017 study by the World Wildlife Fund (WWF) found that 60% of biodiversity loss can be attributed to the vast scale of feed crop cultivation required to rear tens of billions of farm animals. Moreover, a 2006 report by the Food and Agriculture Organization (FAO) of the United Nations, *Livestock's Long Shadow*, also found that the livestock sector is a "*leading player*" in biodiversity loss. More recently, in 2019, the IPBES *Global Assessment Report on Biodiversity and Ecosystem Services* attributed much of this ecological destruction to agriculture and fishing, with the meat and dairy industries having a very significant impact. Since the 1970s food production has soared in order to feed a growing human population and bolster economic growth, but at a huge price to the environment and other species. The report says some 25% of the earth's ice-free land is used for cattle grazing. A 2020 study published in *Nature Communications* warned that human impacts from housing, industrial agriculture and in particular meat consumption are wiping out 50 billion years of earth's evolutionary history and driving to extinction some of the "*most unique animals on the planet*," among them the Aye-aye lemur, the Chinese crocodile lizard and the pangolin. Said lead author Rikki Gumbs:

> *"We know from all the data we have for threatened species, that the biggest threats are agriculture expansion and the global demand for meat. Pasture land, and the clearing of rainforests for production of soy, for me, are the largest drivers -- and the direct consumption of animals."*

Rising levels of carbon dioxide are resulting in influx of this gas into the ocean, increasing its acidity. Marine organisms which possess calcium carbonate shells or exoskeletons experience physiological pressure as the carbonate reacts with acid. For example, this is already resulting in coral bleaching on various coral reefs worldwide, which provide valuable habitat and maintain a high biodiversity. Marine gastropods, bivalves and other invertebrates are also affected, as are the organisms that feed on them. According to a 2018 study published in *Science*, global Orca populations are poised to collapse due to toxic chemical and PCB pollution. PCBs are still leaking into the sea in spite of being banned for decades.

Some researchers suggest that by 2050 there could be more plastic than fish in the oceans by weight, with about 8,800,000 metric tons (9,700,000 short tons) of plastic being discharged into the oceans annually. Single-use plastics, such as plastic shopping bags, make up the bulk of this, and can often be ingested by marine life, such as with sea turtles. These plastics can degrade into microplastics, smaller particles that can affect a larger array of species. Microplastics make up the bulk of the Great Pacific Garbage Patch, and their smaller size is detrimental to cleanup efforts.

In March 2019, *Nature Climate Change* published a study by ecologists from Yale University, who found that over the next half century, human land use will reduce the habitats of 1,700 species by up to 50%, pushing them closer to extinction. That same month *PLOS Biology* published a similar study drawing on work at the University of Queensland, which found that "*more than 1,200 species globally face threats to their survival in more than 90% of their habitat and will almost certainly face extinction without conservation intervention*".

Since 1970, the populations of migratory freshwater fish have declined by 76%, according to research published by the Zoological Society of London in July 2020. Overall, around one in three freshwater fish species are threatened with extinction due to human-driven habitat degradation and overfishing.

## *Mitigation*

Climate March 2017


Extinction symbol

Some leading scientists have advocated for the global community to designate as protected areas 30 percent of the planet by 2030, and 50 percent by 2050, in order

to mitigate the contemporary extinction crisis as the human population is projected to grow to 10 billion by the middle of the century. Human consumption of food and water resources is also projected to double by this time.

In November 2018, the UN's biodiversity chief Cristiana Paşca Palmer urged people around the world to put pressure on governments to implement significant protections for wildlife by 2020, as rampant biodiversity loss is a "*silent killer*" as dangerous as global warming but has received little attention by comparison. She says that "*It's different from climate change, where people feel the impact in everyday life. With biodiversity, it is not so clear but by the time you feel what is happening, it may be too late."* In January 2020, the UN Convention on Biological Diversity drafted a Paris-style plan to stop biodiversity and ecosystem collapse by setting a deadline of 2030 to protect 30% of the earth's land and oceans and reduce pollution by 50%, with the goal of allowing for the restoration of ecosystems by 2050. The world failed to meet similar targets for 2020 set by the convention during a summit in Japan in 2010. Of the 20 biodiversity targets proposed, only six were "*partially achieved*" by the deadline. It was called a global failure by Inger Andersen, head of the United Nations Environment Program:

> *"From COVID-19 to massive wildfires, floods, melting glaciers and unprecedented heat, our failure to meet the Aichi (biodiversity) targets — protect our home — has very real consequences. We can no longer afford to cast nature to the side."*

Some scientists have proposed keeping extinctions below 20 per year for the next century as a global target to reduce species loss, which is the biodiversity equivalent of the 2 °C climate target, although it is still much higher than the normal background rate of two per year prior to anthropogenic impacts on the natural world.

***

So, here we are: the **destructors-in-chief**. And remember the we just have **ONE** planet Earth, this Pale Blue Dot as Carl Sagan immortalized it.

In the meantime, the young raccoon was here early this morning, looking for the plastic container of cat food pellets. He waited, and waited, and decided to come back later. Or another time.

# Acknowledgements

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And -again- Yves P. Huin is the editor, formatter and architect of this essay. Without him, I would just babble in the wind….

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