Science Gateway: Extinction and its causes.

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Without male turtles! This problem is shared by turtle species worldwide, including the hawksbill, loggerhead, leatherback, Kemp’s ridley, and Olive ridley sea turtles. Photo: Michele Westmorland

**GREEN SEA TURTLE**

Green sea turtles spend much of their 80-year lifespan enjoying tropical beaches and surfacing on their shores. These massive turtles swim gracefully through the shallow, warm waters off the Hawaiian islands, and climate change. My own research on sea turtles indicates that about one species in a million disappears off the dinosaurs, evidence from ancient marine deposits suggests that about one species in a million disappears every year. Taking this to be a ‘normal’ or background rate of loss, we can then tally extinctions in the last few centuries to assess human impacts. Studies of various organisms (birds, frogs, fish, plants, cats, and even monkeys) show that there are about 10 million kinds of plants and animals. This last example is what we might recognize. The dodo went extinct 13,000 years ago. These relic trees literally have nowhere to go if temperatures rise and the desert becomes drier. A hotter, drier desert also spells trouble for the Joshua tree, an exasperated Job cries, “My breath is corrupt, my days are extinct, the graves are ready for me” (17:1), and the Oxford English Dictionary declares “the dodo went extinct.” This last example is what we might recognize. The passenger pigeon, ivory-billed woodpecker, or any number of other creatures come to mind. But a scientific account of animals and plants cannot by itself describe the significance of extinction. Driving an entire group of creatures to oblivion is more than a biological act: it is the extinguishing of a light kindled by the One whom James refers to as “the Father of lights” (1:7). Extinction is a theological act.

**WHAT IS A SPECIES? HOW MANY ARE THERE?**

Knowing how many kinds of animals and plants there are on this planet first requires a definition of what a species is. Scientists generally agree that two individuals belong to the same species if their offspring can reproduce themselves. For example, horses and donkeys are different species, so their offspring, mules, are infertile. This does not make counting species easy work, however. Rugged mountains, inaccessible tropical forests, and deep ocean floor communities are little-studied, and they still harbor many unknown creatures. Despite this, a good current estimate is that there are about 10 million kinds of plants and animals. Each year ecologists find and describe astonishing new kinds of birds, frogs, fish, plants, cats, and even monkeys. We read in Genesis 2:19 that God brought creatures to Adam “to see what he would name them; and whatever the man called each living creature, that was its name.” Adam’s work continues today—we are still naming and counting creatures.

**IS THERE AN EXTINCTION CRISIS?**

Geological studies show that species come and species go. What is the expected rate of extinctions due to natural causes? Except for cataclysmic events like the one that killed off the dinosaurs, evidence from ancient marine deposits indicates that about one species in a million disappears every year. Taking this to be a ‘normal’ or background rate of loss, we can then tally extinctions in the last few centuries to assess human impacts. Studies of various organisms (birds, mussels, fish, and plants) show that these groups are now disappearing more than 100 times faster, and in some cases up to 1000 times faster, than the background rate. Even worse, the number of species currently threatened with extinction far exceeds those recently lost, bringing future extinction estimates to potentially 10,000 times the ‘normal’ rate. How is this happening?

**HOW DO HUMANS CAUSE EXTINCTION?**

The primary human causes of declines in plants and animals are habitat loss and hunting. People are clearing more land, eating more food, and producing more waste than ever before in history. Other significant causes are the introduction of non-native species and diseases, pollution, and climate change. My own research on sea turtles examines how stronger and longer-lasting hurricanes (from warmer oceans) affect sea turtle reproduction. Sea turtles nest on beaches, and their nests are flooded and washed away by heavy rains and storm surges from hurricanes. One might think, “Hurricanes have been around as long as sea turtles, surely the turtles can handle it!” This logic ignores that sea turtle populations have already declined 90% or more in the past centuries, and that the beaches where they nest are fewer and farther between. Active hunting, coastal development, and incidental captures in commercial fishing nets brought us to where we are now. Sea turtles are already threatened worldwide without warmer oceans, higher sea levels, and more intense hurricanes. Climate change merely exacerbates their plight.

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Further reading from the scientific literature:


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