TRAGEDY OF THE COMMON

The extinction crisis extends far beyond rare and endangered species.

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White-rumped vultures were one of the most common large birds on the planet. There were an estimated 40 million of them in India alone. One famous bird sanctuary, Keoladeo National Park, had 30 vulture nests per square mile. Even in Delhi, India's capital city and the second-largest urban agglomeration in the world, they averaged eight per square mile.

Biologist Vibhu Prakash found it captivating to see hordes of the hungry scavengers feeding, their backs like a phalanx of shields that heaved with the rhythm of beaks tugging flesh. In just 20 minutes, the birds could pick a cow carcass clean.

"They were in so big a number, villagers would be scared passing near the congregation," said Prakash, a principal scientist with the Bombay Natural History Society. "When they are feeding on a dead body and all, they look a little scary."

In 1997, Prakash headed into Keoladeo, a small UNESCO World Heritage site 100 miles south of Delhi, in order to update a count of white-rumped vultures that he had carried out a decade earlier. He was about to become the principal witness to an accelerating vanishment that, even in this age of extinctions, retains its power to shock.

When his tally was complete, Prakash had recorded a 58 percent drop in the Keoladeo vulture population. "I saw the dead vultures almost

everywhere," he said. "We saw dead birds inside the park, and then we also saw dead birds outside the park." Local villagers, who relied on vultures to keep rotting livestock carcasses from spreading disease and sold the cleaned bones to be ground into fertilizer, confirmed that there were far fewer of the birds around. Prakash began to investigate further, ultimately launching a 7,000-mile road survey that uncovered a 90 percent decrease in vultures nationwide.

Years of study finally determined that a veterinary drug, diclofenac, was persisting in livestock carcasses and poisoning vultures after so much as a single exposure. Though the drug is now banned, illegal use remains a problem. The white-rumped vulture die-off has now reached 99.9 percent, and the species has joined the dismal roster of more than 5,000 life forms assessed as critically endangered by the International Union for Conservation of Nature.

Today, Prakash said, many Indians under the age of 25—roughly half the population—don't believe him when he describes the birds' recent omnipresence. "They've not actually seen a vulture," he said. "They think I'm telling stories."

Nature is like granola: The list of ingredients is long, but the bowl is mostly filled with just a few of them. Take England, for example, which is small and critter-obsessed enough to count its wildlife nearly one by one. Population estimates for 58 species of land mammal in that country, ranging from the familiar to the obscure, total about 173 million animals. But just three species—the common shrew, rabbit, and mole—account for half of those individuals. All told, the most common 25 percent of English mammal species add up to 97 percent of all the individual animals. Similar patterns play out on land and at sea, in your local park or across whole continents, and whether you're counting beetles, shellfish, or tropical trees. The most common land bird in the United States and Canada is the

American robin, harbinger of spring. Robins alone are as numerous as the two countries' 277 least-common bird species combined.

That species of such incredible abundance can decline as quickly as the white-rumped vulture did points to a counterintuitive idea in conservation: that common species may need protection just as much as rare ones do.

The first scientist to propose the conservation of the common was, almost too perfectly, the author of a book called *Rarity*. But after 20 years of studying what made some species rare, Kevin Gaston, an ecologist at the University of Exeter, in England, started to wonder why other species are widespread and abundant. He soon came to a seemingly contradictory conclusion: "The state of being common is rare." While any given common species is made up of many individuals, only a small fraction of species are common.

Gaston's work culminated in "Common Ecology," a paper published in the journal *BioScience* in 2011 that found that commonness was not a well-studied phenomenon, and that "many common species are as poorly studied as many rare ones." The work triggered a quiet surge of research. A study from 2014 hints at the scale of what's been overlooked. Its authors found that the number of birds nesting in Europe has dropped by 421 million—fully one-fifth of the continent's bird population, gone—since 1980, and that this decline in sheer birdiness is accounted for almost entirely by common species, among them such household names as the skylark.

Industrial agriculture carries much of the blame for Europe's disappearing birds. "They've been taking out hedgerows, taking out trees, making fields bigger, increasing inputs of insecticide, pesticides—just essentially squeezing out the opportunities for wild organisms to live in those kinds of environments," Gaston told me. "We're talking just massive losses."

But even the most human-adapted and urban of birds, such as starlings and house sparrows, have steeply decreased—in fact, those two very common birds were among the top five birds experiencing population declines. Most of the rarest birds in Europe are actually increasing at present, due to successful conservation efforts, although they remain uncommon; meanwhile, most of the common birds are declining toward scarcity. "The inevitable place you end up," said Gaston, "is that everything is rare."

In the annals of extinction and near-extinction, many of the most infamous cases involved species that were once incredibly common: the plains bison, the passenger pigeon, the Carolina parakeet. The pattern continues today. Consider the radiated tortoise, one of the world's most beautiful tortoises, its carapace a geodesic dome roofed with elaborate parquet tiles.

The tortoise is capable of extraordinary plenitude—a survey from the year 2000 estimated 10 tortoises per acre in the most pristine redoubts of the species' range on the African island of Madagascar. But after millennia of co-existence with Malagasy peoples (many of whom considered eating the tortoises *fady*, or taboo), the species began to fade. Local traditions broke down, the human population shot up, and tortoise hunting and collection for the pet trade surged (one biologist followed a local transit bus as it stopped 11 times in 10 miles to let passengers capture every shuffling shellback they saw). In 2000, researchers declared the prospects for the radiated tortoise "worrisome." A decade later, the species had leapt to critically endangered status, one step away from extinction in the wild.

Other recent examples include the saiga (an Asian antelope that looks like something out of *Star Wars*, which has plummeted from almost a million to 50,000—a 95 percent drop—since the end of the Soviet era); the European horse chestnut; sharks in general; and, of course, the white-rumped vulture.

And yet, formerly common species make up only a small fraction of the living things that are threatened with near-term extinction today. The vast majority of critically endangered species are those that were relatively rare to begin with, for the simple reason that it's much easier to drive a species with low numbers or very limited distribution to the brink.

To focus only on that final moment of total extinction, however, is to downplay the breadth of the extinction crisis. A far more frequent occurrence is *extirpation*, or local extinction—the disappearance of a species from one or another place that it used to live. Tigers, for example, have vanished from 93 percent (and counting) of their former habitat, including 10 entire nations in Asia. The Pashford pot beetle, on the other hand, is thought to be extinct, but was never known to live beyond certain bogs in east-central England. One species is gone, but was never abundant in the first place; the other is still with us, but has experienced staggering losses.

The authors of one recent study found that the rate of population loss among terrestrial vertebrates is extremely high, even in "species of low concern." They wrote that "beyond global species extinctions Earth is experiencing a huge episode of population declines and extirpations" and used the term "biological annihilation" to describe the magnitude of the crisis. Remarkably, they characterized the wave of local extirpations as a "much more serious and rapid" decline than mass extinctions.

The current estimate among population biologists is that the planet has lost half the individual animals, plants, and other living things that make up our visible world. Most of these accumulated deaths have come at the expense of common species. They are the animals killed most often by hunters, the creatures most likely to end up as roadkill, the trees and plants that die in large numbers each time land is cleared for a farm or a housing

development. Even birdwatchers dismiss the most familiar species as "dirt birds." The term derives from the saying "common as dirt."

Widespread and abundant species are often seen as natural resources, like copper or oil, rather than as living things. Of all the fish in the oceans, just 10 species account for almost a third of the global catch—Alaska pollock, chub mackerel, Atlantic herring, yellowfin tuna, and Japanese anchovy among them. The United Nations' Food and Agriculture Organization classifies every one of these fish stocks as either "fully fished" or "overfished." Similarly, the 10 most common tree species in any given nation will, on average, provide 76 percent of the wood and pulp production. In the U.S., home to sprawling forests and more than a thousand native tree species, just three—Douglas fir, loblolly pine, and western hemlock—account for one-quarter of the timber harvest. It has been the lot of common species to be mistakenly thought of as infinite in number. Until, one day, it turns out that they aren't.

Despite all this doom and destruction, even protectors of the environment have tended to overlook the plight of common species. Conservation biology is forever scrambling to pull yet another species back from the void. One result has been the paradox witnessed among nesting birds in Europe, where rarer species are generally increasing while common species have declined by the tens of millions.

Two humble species of newt illustrate how this kind of situation can arise. The great crested newt, which looks like a tiny dragon carrying fire in its belly, is endangered in Belgium. The smooth newt, itself decorated with polka dots and a mini-dinosaur crest, is a common species.

Researchers looked at 74 farmland ponds in Belgium; crested newts turned up in just 12 of them, while smooth newts were found in 33. One way to save the endangered crested newt is obvious: Protect its dozen ponds. Yet

if the remaining ponds are polluted, drained, or otherwise destroyed, then eventually the smooth newt, too, will have only 12 ponds to dwell in. That trend again: *Everything ends up rare*.

To conserve the commonness of smooth newts, you must preserve a larger number of ponds, which will have the parallel effect of conserving the crested newt as well. All of which sounds manageable when you're talking about a scattering of water holes. But setting aside habitat to save a species no longer works at the scale of, say, a continent.

Take wolves, which were once the most widespread large mammal on Earth, having roamed from Japan to India to Ireland and from Mexico to the High Arctic. In the continental U.S., the only place you couldn't find wolves was the sliver of California west of the Sierra Nevada.

But by the time the Endangered Species Act was signed into law in 1973, wolves were among the first animals needing protection—they had been all but eradicated in the Lower 48. Red wolves today survive only in a postage-stamp parcel of North Carolina. But gray wolves, thanks to protection and reintroduction efforts, have sprung back: 5,550 of them now roam in the western Great Lakes states, the northern Rockies, small patches of Arizona and New Mexico, and Washington State near the border with Canada.

The gray wolf is no longer at immediate risk of extinction in the Lower 48. With a relatively stable population now occupying 10 percent of its former range, the federal government has gone so far as to argue that the species has "recovered." Critics have called this interpretation of the Endangered Species Act a "museum-piece approach," because it retains species as cloistered artifacts in the smallest possible areas in which they can survive. But much of this is an accident of design. The act was created to keep rare species from going extinct; it was never up to the task of preventing species from becoming rare in the first place.

By some estimates, there is still enough habitat available to see wolves howling again in 31 states, among them California, Texas, Kentucky, New York, and Alabama. Yet it's impossible to bring back common species, or to preserve what commonness remains, through the traditional approach of setting aside protected areas—the whole planet would soon be a park. As one wolf researcher put it, "Society has not yet answered the question of how much of the landscape ought to be shared with the non-human world."

"The maintenance of commonness presents a different set of challenges," Gaston said. "It's much more about what you're doing across entire landscapes. How environmentally friendly is your farming? How sustainable are your fisheries?" The conservation of the common represents a deeper ambition than the 20th century's lopsided division of the world into islands of wild, protected places in a sea of ruinous human activity. It calls on us to integrate conservation into every aspect of human life.

In the age of Donald Trump, however, such high-mindedness is upstaged by more practical questions: Is it wise to point out inadequacies in the Endangered Species Act when the act itself is imperiled? Is it sane to worry about commonness while species after species is frog-marched into actual oblivion? On the day of his inauguration, the president put a hold on a U.S. Fish and Wildlife Service ruling that the rusty-patched bumblebee be listed as an endangered species.

In the end, the bee prevailed—at least on paper. Its listing became effective on March 21st, 2017. Though it's not yet clear what actions the federal government will take to save the species, the case was too clear-cut to dismiss out of hand. Rusty-patched bumblebees now occupy just 0.1 percent of their historical range, and have declined in number by an

estimated 93 percent. The causes are exactly the kind of large-scale, modern-life challenges that Gaston talks about: pesticide use, the conversion of grasslands into industrial farms, climate change, novel diseases.

One other point that should not go unmentioned: Little more than two decades ago, rusty-patched bumblebees still buzzed in 28 states. Residents of Midwest cities remember shooing them out of the way as they walked the streets. The bee was, according to one Fish and Wildlife Service report, "so ordinary that it went almost unnoticed as it moved from flower to flower." In other words, America's newest endangered species used to be common.

It is the curse of today's biologists that they are forever being asked to justify the continued existence of non-human life. Every species, common or rare, is the product of millions of years of evolution, its journey to this point in time exactly as miraculous as our own, but this is evidently not justification enough. Can you eat it? Does it suck carbon out of the atmosphere? Could it cure cancer? If you squeeze it hard enough, will it ooze oil that can run my car?

The defense of rare species on such grounds is often difficult. The extinction of one or another rarity—rest in peace Perrin's cave beetle, hazel pigtoe, hairy wikstroemia—often comes at no obvious cost to humans or the larger landscape. I'm not saying that these plants and animals matter only to themselves. Taken together, rare species are the fail-safes, special teams, niche players, and understudies of the living world—today's rarity could, with a sudden shift in evolutionary pressures, be tomorrow's common species. Yet the loss of any single rare species amounts mainly to an incremental waning in originality, redundancy, and specialization in the environment. A wound, but largely an invisible one.

Now consider the consequences of losing a common species. Atlantic herring gather every autumn on the northern flank of the Gulf of Maine in spawning shoals that, if you could drag one ashore, would bury the whole of Manhattan six stories deep in sparkling silver fish. We know this because scientists, hailing mainly from various Massachusetts research institutions, set out in 2006 to measure them by bouncing sound waves off those giant schools. Through their technology, they witnessed what they described at the time as "perhaps the largest massing of animals ever instantaneously imaged in nature." In a study published last year, the researchers referred to the spawning event as a "massive ecological hotspot"—though the spot wasn't a place, so much as a species.

When they got back to the lab and analyzed their audio recordings, the researchers discovered something equally stunning: a chorus of underwater songs, cries, down-sweeping "meows," whistles, creaks, buzzing, clicking, chirping—tens of thousands of sounds, many of them outside the range of human hearing. They were the vocalizations (the voices, we might even say) of whales and dolphins.

It was a vast assembly of marine giants, from fin and humpback whales that plowed with gaping mouths through the herring schools by night, to sperm and killer whales gorging on the fish by day. The scientists were able to identify 10 of the whale and dolphin species; four of them are endangered throughout U.S. waters. Other herring predators include sharks, rockfish, dogfish, bluefish, hake, pollock, seals, sea lions, tuna, and an enormous variety of seabirds—it's almost easier to draft a list of what doesn't eat herring than a list of what does. Even squid eat herring—and so do we. Atlantic herring is currently our sixth most important fish stock.

It wasn't always this way. In 1977, the herring population had collapsed—plummeting to 10 percent of its historical size—due to overfishing. Today, the Gulf of Maine herring are a rare good news story, once again as

numerous as they were half a century ago. Michael Jech, a biologist with the Northeast Fisheries Science Center who was a part of the recent herring study, characterized that abundance with the understatement of a government scientist: "It seemed to be quite important."

When you lose the commonness of a common species, the consequences are immediate and undeniable. Plainly put, common species are the foundation of ecosystems. They eat or are eaten by other species in large numbers. They influence and engineer their surroundings; in many cases, as with coral reefs and forests, common species effectively *are* the environment.

The most familiar plants and animals are also the ones best known to our eyes, ears, and imaginations, providing touchstones for our relationship with the non-human world and even helping to form our sense of place—rock pigeons in New York, Inca doves in Mexico City, peaceful doves in Bangkok. The 20 percent decline in European songbirds (like the 24 common land birds that have declined by 50 to 90 percent in the U.S. and Canada since 1970) represents a 20 percent reduction in their big-picture roles in pest control, pollination, and seed dispersal, but also to the opportunity to see wild birds and hear birdsong—a hard drop in the small pleasures of being alive.

The role of common species in nature and culture, both physical and metaphysical, all collide in the story of India's white-rumped vultures. They were the subcontinent's primary scavengers of carrion. Without them, putrefying carcasses began to litter the landscape. (India had other vulture species, but each was either far less common to begin with, or declined just as steeply as their white-rumped cousins.) The role the vultures played was soon filled by feral dogs, but this led to a spike in fatal dog-bite and rabies cases. The absence of vultures may even have contributed to an

outbreak of bubonic plague, when the rotting bodies of cattle killed by a heat wave triggered an explosion of rats that carry the disease.

Until the vulture die-off, traditionalists within the Parsi religious minority had placed their dead in "towers of silence," where the bodies were consumed by the birds, a funeral rite believed to preserve the purity of the Earth; they have now lost that link in what one Parsi leader called the chain of "creation, destruction, and regeneration." Might even the Hindu epic of Ramayana, in which one of the principal figures, Jatayu, is usually depicted as a vulture, lose some quality of meaning in the absence of the actual birds?

None of this, I suspect, is quite convincing enough. I can sense that collective human shrug, the one that says, *we adapt, we survive*. In an India without vultures, people now bury or burn their livestock carcasses, while the Parsi inter their dead in sealed caskets or render them into skeletons using solar-heat concentrators that cost $3,000 apiece. Our common birds are less common than they were, but they are still the most common birds around. Until the recent recovery of the fish stock, the Gulf of Maine had gone decades with very few herring, hardly any whales. We got by, we made do.

We can live without this or that common species; the price is only a little more hardship, a little less awe. It may behoove us to pay attention to the pattern, though. If even the planet's most widespread, abundant, and adaptable species are reaching tipping points, it is because the changes caused by humans have become so overwhelming, inescapable, and complex. "Common species are quite nice bellwethers of the systematic, insidious, and often unrecognized changes and detriments that we’re making to the environment," Gaston said.

More and more, the cause of a common species' sudden free fall is impossible to discern, takes years to unravel, or is ultimately given that most modern diagnosis, "multiple causes." They are falling between invisible fault lines, collapsing into the unforeseen fractures of a biosphere under intensifying stress.

Widespread, abundant, adaptable—and damned. Why does it matter what happens to common species? Because we happen to be one of them.