BEING A BRIEF OUTLINE OF THE PROBLEM

A large stock of individuals of the same species, relative to the number of its enemies, is absolutely necessary for its preservation.

—Charles Darwin, On the Origin of Species

MOST STORIES ABOUT THE DESTRUCTION OF THE PLANET INVOLVE A VILLAIN WITH AN EVIL PLOT.

BUT THIS IS THE STORY OF HOW THE EARTH COULD BE DESTROYED

BY WELL-MEANING PEOPLE WHO FAIL TO SOLVE A PROBLEM SIMPLY BECAUSE THEIR CALCULATIONS ARE WRONG.

MOST OF THE FISH WE COMMONLY EAT, MOST OF THE FISH WE KNOW, COULD BE GONE IN THE NEXT FIFTY YEARS.

THIS INCLUDES SALMON, TUNA, COD, SWORDFISH, and anchovies. If this happens, many other fish that depend on these fish will also be in trouble. So will seabirds that eat fish, such as seagulls and cormorants. So will mammals that eat fish, such as whales, porpoises, and seals. And insects that depend on seabirds, such as beetles and lizards. And mammals that depend on beetles and lizards. Slowly—or maybe not so slowly—in less time than the several billion years it took to create it—life on planet Earth could completely unravel.

People who are in school today are lucky to have been born at a special moment in history. The Industrial Revolution, beginning in the mid-eighteenth century and continuing for the next 120 years shifted production from handcrafts

to machine-made factory goods and in so doing completely changed the relationship of people to nature, the relationship of people to each other, politics, art, and architecture—the look and thought of the world. In the next fifty years, much of your working life, there will be as much change in less than half the time. The future of the world, perhaps even

THE SURVIVAL OF THE PLANET, WILL DEPEND ON HOW WELL THESE CHANGES ARE HANDLED.

AND SO YOU HAVE MORE OPPORTUNITIES AND MORE RESPONSIBILITIES THAN ANY OTHER GENERATION IN HISTORY.

CHARLES DARWIN
(February 12, 1809–April 19 1882)
Darwin was born, coincidentally, on the same day as Abraham Lincoln, another great thinker of his age.

ONE OF THE GREAT THINKERS of the Industrial Revolution was an Englishman named Charles Darwin. In 1859, he had published one of the most important books ever written: *On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life*, more commonly known by its shortened title: *On the Origin of Species.*

In his book, Darwin explained the order

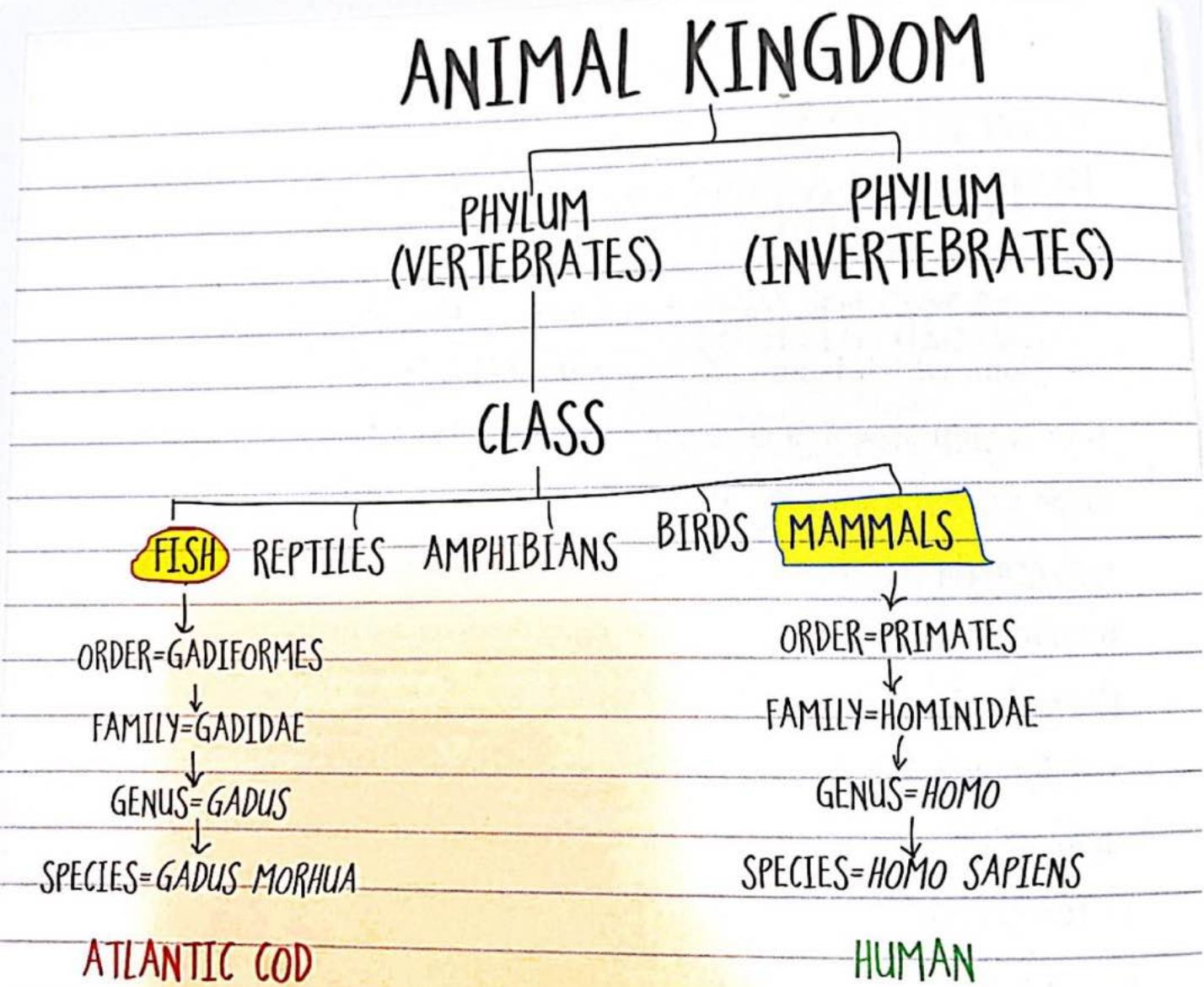
of nature as a system in which all the many various plant and animal species struggle for survival. He did not see nature as particularly nice or kind, but as a cruel system in which species attempted to kill and dominate other species in order to secure the survival of their own kind. He wrote, "We do not see, or we forget, that the birds which are idly singing round us, mostly live on insects or seeds, and are thus constantly destroying life."

Plants and animals are organized into groups with seven major levels or categories: KINGDOM, PHYLUM, CLASS, ORDER, FAMILY, GENUS (PLURAL: GENERA), SPECIES.

A good way to remember the seven major categories of animal and plant classification is with this sentence: "Kangaroos play cellos, orangutans fiddle, gorillas sing."

A codfish and a human belong to the same kingdom, which is animals. They also belong to the same phylum, which is vertebrates (animals with spines). But after that, they break off into completely different classes—cod are fish and humans are mammals. More specifically, humans are vertebrates of the class known as mammals in the order known as primates, which we share with monkeys and lemurs. We belong to the family Hominidae, which we share with apes and chimpanzees. Within that family, we are of the genus *Homo*, which are Hominidae that walk standing up on two feet. (Several other *Homo* genera have all died off

and we are the only surviving species of this family: *Homo sapiens*.) Cod, on the other hand, are fish—specifically fish with jaws—that belong to a family called Gadidae. This fish family is fairly evolved, has elaborate fins, and lives in the bottom part of the ocean. They hunt voraciously the species living directly over and beneath them, and have white flesh greatly favored by *Homo sapiens*.



Darwin wrote of how all species struggle for the survival of their own group. So it is not surprising that we humans have the greatest affection for organisms that are biologically close to us. Killing our own species is the worst thing we can do. Killing close relatives to our species, like monkeys, though it occurs, is revolting to most of us. We tend to care more about our own class—mammals, such as whales and seals and polar bears—than we do about fish. Is that because they are in a different class? Is that why people tend to have less sympathy for animals that are not in our phylum, like insects? Ultimately, a vegetarian is a human who rejects killing living things from his own kingdom—animals—but accepts killing from the other kingdom—plants.

DARWIN'S GREAT CONTRIBUTION WAS TO understand that in the struggle for survival, nature puts out variations: the species that successfully adapt through the use of variations survive, and the others become extinct. Our family, Hominidae, was a very successful family because it developed numerous variations that went on to be successful genera and developed various species. The genus *Homo* produced one highly successful species that dominated while the other *Homo* genera became extinct.

Darwin's ideas were extremely controversial in 1859. Some people were upset that he did not see nature as kind. Others thought his vision of how humans evolved conflicted with what was written in the Bible. They did not like the idea that he accorded no special mystery to the creation of man, that it was just another animal created by chance experimentation in nature. Nor did they want to accept the idea that natural experimentation led to the development of the species and that they did not each appear in a separate act of creation. There are people who are still angry about Darwin because they believe his theories conflict with the Bible. But most people, whether they believe in the Bible or not, think that Darwin's explanation of natural order makes sense. For a century and a half now, scientists have been observing natural occurrences and have found that they follow the theories of Darwin.

As the millions of other species of plants and animals struggled for survival, circumstances were constantly changing. Species moved into and out of areas, there were changes in weather, some species were eliminated and others became extremely abundant. Each shift, sometimes as minuscule as a shift in the wind, day by day—even hour by hour—changed the order of nature. These shifts continue to happen, so slightly that we don't even notice. But things are changing and, over time, these changes can be enormous.

As circumstances change, there are variations in species—sometimes a change in color, or a tendency to hunt in a certain way. These changes can be thought of as experiments. Some fail and disappear and some succeed and become a completely different species. It is out of this process, known as evolution, that monkeys eventually developed into human beings.

In understanding what is happening in the oceans today, it is essential to understand the Darwinian order of

life. Though Darwin wrote only a little about the sea, marine life is linked in the same system as all life on Earth.

ALL LIFE ON EARTH IS INTERCONNECTED, AND ALTERED CIRCUMSTANCES WILL CHANGE THE ORDER OF LIFE AT SEA, WHICH WILL ALSO CHANGE LIFE ON LAND. AND ALL OF THIS CAN AND WILL HAVE AN ENORMOUS IMPACT ON OUR LIVES.

It is important to understand that there are *not* two worlds: the world of humans and a separate world of plants and animals. There isn't a "natural world" and a "man-made world." We all live on the same planet and live in the same natural order. What plants and animals do alters human life, and what humans do alters plant and animal life. Even the smallest changes can have unforseen results that are extremely difficult to change back.

DARWIN NOTED THAT FOR A SPECIES to survive it must have large numbers because it has enemies that kill its kind. What that means is that not every individual member of the species must die in order for the entire species to die off. It only has to lose a large enough percentage of its kind to have little chance of survival. In fishing, a distinction is made between a fish species that is biologically extinct and one that is commercially extinct. Only very rarely do we find the biological extinction of a fish, where a fish species has not one single living specimen. But commercial extinction, which is when there are so few of a particular kind of fish that it is no longer profitable to fish for them is increasingly common. For instance, the North American Atlantic salmon is commercially extinct because it has only hundreds rather than hundreds of thousands of surviving fish. It is unknown whether the few survivors will ever be able to reproduce enough to once again be the flourishing stock that they used to be. If that is the case, if the number is so low that the species is no longer plentiful enough for survival, it may become biologically extinct and completely disappear from the ocean.

NORTH ATLANTIC SALMON
(*Salmo salar*)
This species, unlike the Alaska Wild Salmon, is on the brink of commercial extinction.

IN SCIENCE, IT IS KNOWN THAT LIFE depends on a large variety. This is known as biodiversity. The fewer species—the less biodiversity—the harder it will be for the remaining species to survive. And that includes us, human beings. Remember, we are the only surviving species of our genus, *Homo*.

Though the term *biodiversity* was first coined by biologists in 1986—and came into common usage at a meeting of biologists in 1988—the concept was written about by Darwin in *On the Origin of Species*. He stated it simply: "The greatest amount of life can be supported by great diversification."

We have named a million species in the world. We know of another 800,000 that we have not yet given names. Scientists guess that there are at least ten million species in the world, though there may be even more. This means that

MOST SPECIES HAVE YET TO BE DISCOVERED. SOME MAY DIE, VANISH FROM THE WORLD WITHOUT OUR EVER KNOWING THEY HAD EXISTED.

One place where we are losing species at an enormous rate is in the oceans. Throughout the world, coral reefs, complex ecosystems that house a wide variety of plants and animals, are losing species that haven't even been discovered or identified. Coral reefs are made up of coral polyps, tiny, soft-bodied translucent animals related to sea anemones and jellyfish. Their hard skeletons are made of limestone, which attract certain other aquatic species that give the coral polyps their wide variety of rich colors. When the polyps attach themselves to rocks on the seafloor, they reproduce by dividing and growing, connecting to one another to create a colony that acts as a single organism. As colonies grow over hundreds and thousands of years, they join with other colonies and become reefs. Some of today's reefs started fifty million years ago.

AND THESE REEFS ARE DYING DUE TO THE THREE MAIN CULPRITS IN THE DEVASTATION OF THE WORLD'S OCEANS: OVERFISHING, POLLUTION, AND CLIMATE CHANGE.

THERE ARE ABOUT 20,000 KNOWN species of fish, though there may be many more we don't know about. Occasionally, a new fish is discovered. There may also be fish that are disappearing without our ever knowing that they existed.

Nothing is certain in the ocean. Fish that were said to be plentiful have suddenly disappeared. Fish that were said to be extinct have been discovered alive, most dramatically in 1938 when a coelacanth, a fish thought to have died out with the dinosaurs, turned up on the deck of a South African trawler. The list of 20,000 fish species that came out of the 1988 conference of biologists in which the term "biodiversity" was first coined is constantly being revised. Fish disappear and new ones are discovered.

COELACANTH
(*Latimeria chalumnae*)
Humorist Ogden Nash called the coelacanth "our only living fossil." Although it may seem like 20,000 known species of fish is a lot, it's actually not that big a number when considering that there are 550,000 known mollusk species and 751,000 known species of insects.

But there is one certainty. Something huge, a massive shifting in the natural order of the planet, is occurring in the oceans—and it will come with tremendous biological and social changes. This shift, the disappearance of species, is also happening on land. We are losing large numbers of species that inhabit tropical rain forests, for instance, because these are being cleared for people

to live in or chopped down for lumber at unprecedented rates.

Mammals and reptiles all over the world seem to be vanishing. Some scientists have predicted that by the year 2100 up to 14 percent of all bird species may be extinct. And other scientists have concluded that one-fourth of all mammals, a third of amphibians, and 42 percent of all turtles and tortoise species also face extinction.

MEGAMOUTH
(*Megachasma pelagios*)
In 1976, the megamouth, a hitherto unknown species of shark, was discovered when the fourteen-foot-long 1,600-pound giant tried to eat the stabilizing anchor on a United States navy vessel near Hawaii.

A RECENT REPORT BY SCIENTISTS SAID THAT IF COMMERCIAL FISH SPECIES—THE FISH CAUGHT FOR FOOD—CONTINUE TO DECLINE AT THE CURRENT RATE, BY THE YEAR 2048 MOST COMMERCIAL FISH SPECIES WILL BE IN DANGER OF NEVER RECOVERING BECAUSE OF A LACK OF DIVERSITY IN THE OCEAN.

The United States government said in a 2002 study that one-third of the 274 most eaten types of fish are threatened by too much fishing. The United Nations Food and Agriculture Organization says this is true of almost two out of every three types of fish they have studied in the world. The oceans are in serious trouble.

THE STORY OF KRAM AND AILAT : PART 1