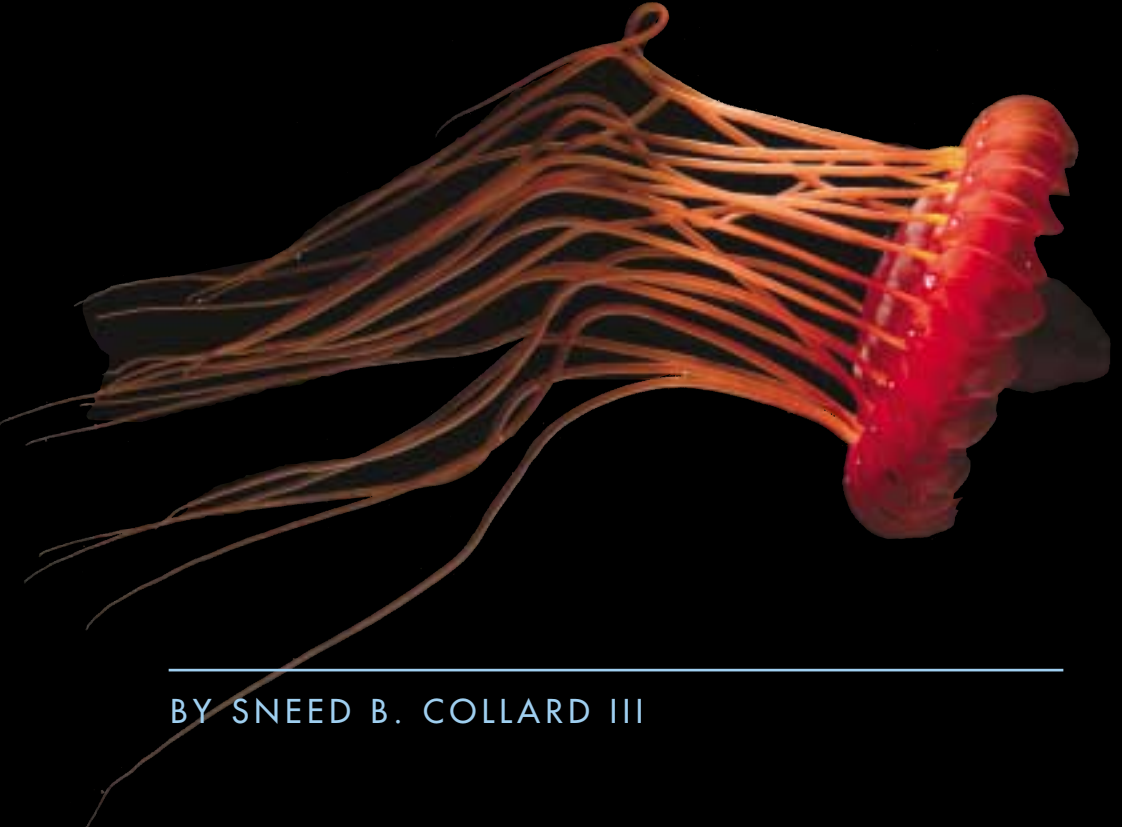


DEEP SEA


IN THE



BY SNEED B. COLLARD III



Suckers and Submarines

 IN 1997, DR. EDITH WIDDER was diving off the Gulf of Maine in a deep-sea submersible called the Johnson-Sea-Link. Dr. Widder was using the four-person submersible to study *bioluminescent* animals—those that can make their own light. In the submersible, she and the pilot searched for bioluminescent shrimp and jellylike animals that lived more than 2,000 feet below the ocean surface. As the pilot guided the Johnson-Sea-Link through the deep, dark waters, however, Dr. Widder suddenly spotted a beautiful football-sized red octopus called *Stauroteuthis syrtensis*.

Dr. Widder asked the pilot to try to capture the octopus using one of the Plexiglas “buckets” mounted on the front of the submersible—not an easy task! Catching animals with the sub, in fact, was a lot like trying to catch a butterfly using a net taped to the front of a pickup truck. The submersible’s pilot, though, expertly maneuvered the Sea-Link into the

OPPOSITE: The ghostlike *Stauroteuthis syrtensis* is one of several species of octopuses adapted for deep ocean life.



right position. With a last upward thrust of the sub, the octopus slid into one of the buckets, and with a flick of a switch, the pilot closed the lids.

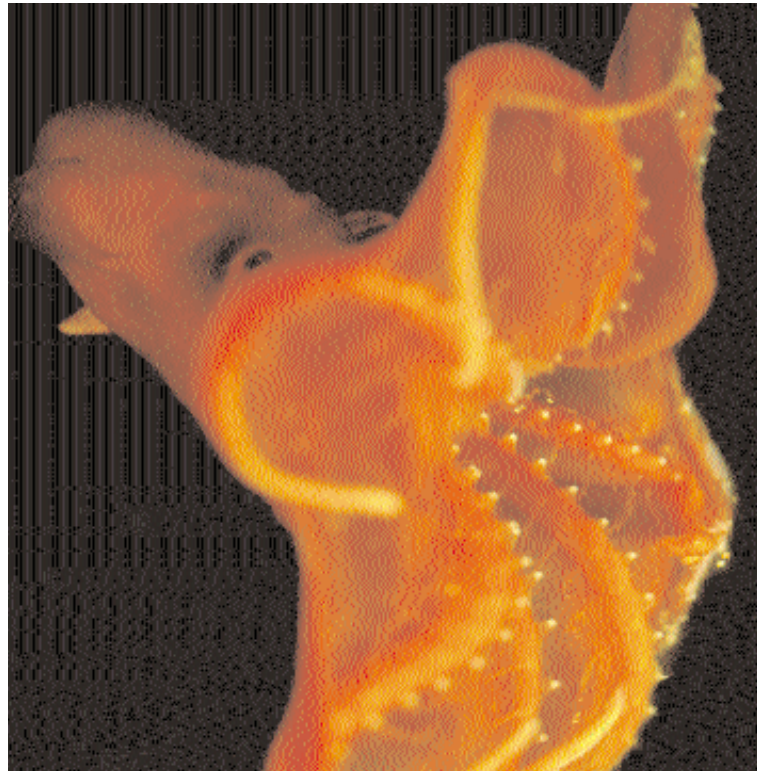
When they returned to the surface, a huge crane lifted the Johnson-Sea-Link out of the water and onto the deck of its 200-foot support ship. Once the deck crew bolted the submersible securely in place, Dr. Widder climbed out and carried the bucket containing the living octopus into the ship's lab. With one of her colleagues, Sönke Johnsen, looking over her shoulder, Dr. Widder began taking pictures of the remarkable animal. As Dr. Widder fired off one picture after another,

Sönke Johnsen said, "You know, those don't look like suckers on the octopus's arms."

Dr. Widder took a closer look at the animal's suckers and said, "You know, you're right."

Then, together, the two scientists exclaimed, "They look like light organs!"

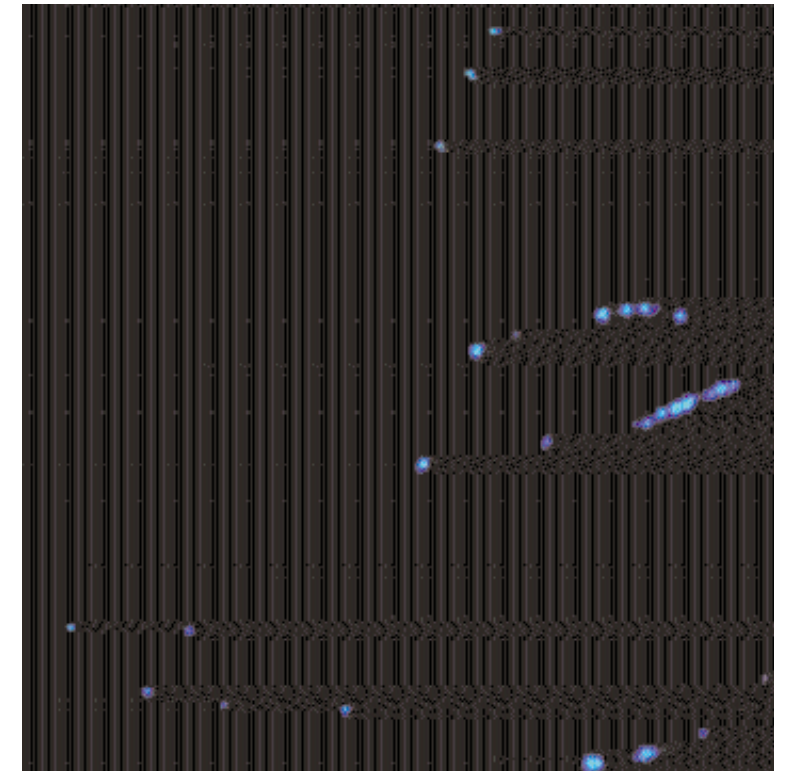
The two whisked the octopus into another room, and turned off the lights. As their eyes adjusted to the darkness, they looked at the octopus. To their amazement, the scientists saw that



The suckers of *Stauroteuthis* do not function like the suckers of most other octopuses. Amazingly, they have evolved into light organs. This is how *Stauroteuthis* appears with the lights on.

the animal's suckers glowed with a beautiful blue light.

When Dr. Widder and Sönke Johnsen reported their discovery in the scientific journal *Nature*, biologists all over the world got excited. Not only was *Stauroteuthis syrtensis* the first octopus ever discovered to have bioluminescent suckers, but those suckers provided important clues for how—and why—bioluminescence has evolved in ocean animals.



This is how *Stauroteuthis* appears with the lights off.

Got Light?

Dr. Widder is not the first person to be enthralled by bioluminescence. Few people who've watched a firefly flash on a summer's evening ever forget the enchantment of the insect's magical light. However, only a handful of people—including scientists—realize the extent to which bioluminescence influences life on our planet, especially in the ocean. On land, bioluminescence has evolved in several hundred species of fireflies and a few other animals, bacteria, and fungi. In the ocean, the number of bioluminescent species soars into the *thousands*. These species belong to almost every group of ocean creatures, from the



Nets tear apart fragile jellyfish, like this bioluminescent hydromedusa, but scuba gear and submersibles have allowed scientists to study these animals in their natural habitats

smallest worms and single-celled organisms to larger octopuses, fishes, and shrimps.

Why have so few people noticed? One problem is the way scientists have studied the ocean. For hundreds of years, the main way people have investigated the deep sea is by lowering nets down into it. The problem with nets is that they rip apart many fragile ocean animals and

are too slow to catch many others. As a result, scientists have been able to catch and examine only a fraction of deep-sea animals.

An even bigger problem is that for humans, the deep sea is a very hostile place. It's dark, cold, and under intense pressure that would crush most human beings. The deep sea also has no air to breathe. Even with scuba gear, humans can only dive a couple hundred feet at most. To go deeper just hasn't been possible.

Until recently.

Enter the Deep

People began experimenting with submarines for military use in the mid-nineteenth century and steadily perfected these machines after World War I. Most military submarines are large and bulky, however, and don't easily lend themselves to scientific research. Also, most military subs do not dive deeper than a couple thousand feet.

Starting in the 1960s, though, scientists began building smaller devices known as submersibles. These watercraft can go to great depths. They are powered by batteries, however, and so must rely on a "mother ship," from which they are launched and to which they return to have their batteries recharged. One of the first submersibles was *Alvin*, a three-person craft that could carry scientists down 6,000 feet. Since then, researchers from different countries have built a number of other submersibles—some capable of traveling several miles beneath the ocean surface. By visiting the deep sea directly in these craft, scientists have made remarkable discoveries about the ocean and marine life. Many also have witnessed the incredible variety of bioluminescent animals that inhabit the deep.

IN THE

WORLD



BY SNEED B. COLLARD III



Primate Professionals



ZOO ATLANTA'S FOCUS ON PRIMATES grew from several sources. One was Terry Maple's own scientific background. Terry earned his PhD at the University of California at Davis, studying the behavior of rhesus monkeys, baboons, and other primates. Afterward, he continued working on primates at the world-famous Yerkes National Primate Research Center at Emory University in Atlanta.

When he became director of Zoo Atlanta, Terry formed a partnership between the zoo and Yerkes. One of Terry's first goals was to build a giant, modern gorilla habitat at the zoo. This habitat became home to thirteen gorillas that had been living at Yerkes, as well as one male gorilla who had already been living at the zoo.

Terry also began building a scientific research team that included many primate experts. These experts began conducting studies on

OPPOSITE: A partnership between Zoo Atlanta and the Yerkes research center led to the creation of the zoo's world-class gorilla habitat.

primates within Zoo Atlanta. The zoo also became involved in a variety of projects to support conservation research in the field. One of these was the golden lion tamarin reintroduction project.

Tails of Woe

Golden lion tamarins are small, beautiful orange monkeys that inhabit the coastal Atlantic forests of Brazil. Their forest homes are not nearly as famous as Brazil's Amazonian rain forests, but they are much more endangered. Since Europeans began settling in Brazil almost five hundred years ago, more than 93 percent of these coastal



The golden lion tamarin reintroduction project was a natural fit for Zoo Atlanta's team of biologists.



Hikers cross a bridge in a forest along Brazil's coast. Nearly all of these Atlantic forests have been destroyed, leading to the decline of the golden lion tamarin and many other species.

forests have been cleared for farms, pastures, and other uses. This forest loss has been devastating for wildlife, including the golden lion tamarin.

By the early 1970s, only 100 to 200 golden lion tamarins survived in the wild. Another 30 lived in captivity in Brazil, and about 80 lived in zoos worldwide. Conservationists realized that to save the species, they needed to act fast. In 1973, the Brazilian government established a reserve to protect the tamarins' habitat. Zoos around the world also stepped up breeding programs to increase the number of tamarins in captivity.

birds. He also looks for signs of human activities. Since he often works in dense forests, he has learned to identify many animals by their calls or sounds. He records everything he finds, and his information is used by conservation agencies and African officials to identify and protect places that are especially important to wild species.

Tom's surveys typically last about a month, and they've led to some amazing discoveries. In the Itombwe Mountains near Lake Tanganyika, Tom rediscovered two species of birds that hadn't been seen for more than forty years. One was a nightjar and the other was an owl. He was the first person ever to record the call of the nightjar and photograph the owl.

Tom's most urgent findings, however, have to do with primates.



The western gorilla is one of four species of great apes that live in Africa.

Land of the Apes

Scientists consider Africa to be the cradle of primate evolution. Our human ancestors may have been evolving in Africa as long as seven million years ago. Today, Africa is home to four of Earth's six species of great apes: the robust chimpanzee

(also called the common chimpanzee), the gracile chimpanzee (also called the

pygmy chimpanzee or bonobo), the western gorilla, and the eastern gorilla. Only two species of great apes—two kinds of orangutans—make their home outside of Africa, in Southeast Asia.

Unfortunately, all of Earth's great apes are in big trouble. In the past two decades, Africa's human population has more than doubled. Many wildlands have been converted to farms and grazing areas. Africa is also the poorest continent on Earth. To survive, many African people hunt and eat wild animals of all kinds, from birds to primates. They also destroy forests for fuel wood and building materials.

To make matters worse, logging companies from Asia, Europe, and North America have been pushing into Africa's tropical forests, cutting down trees and building roads to places that used to be wild and inaccessible. These new roads have allowed in a flood of hunters, and the slaughter of wild animals—or "bushmeat"—has devastated Africa's mammals, birds, and reptiles.

Africa's four ape species have been especially hard-hit. Many ape populations have disappeared from places where forests have been



Only a fraction of Africa's gorilla populations survive today.