

exist in tens of thousands to the acre, and whose activities in loosening and fertilizing the soil may improve its crop potentialities greatly. Among the arthropods, the insects on the land and various crustaceans in the sea are obviously abundant. You only have to think of the swarms of mosquitoes that rise as you walk through a swamp, the fireflies that rise from a field of ripening wheat on a summer evening, the lacewings feebly fluttering above an alfalfa field like a shimmering mist at sunset, the swarms of flying ants, or of the grasshoppers (or locusts) that devastate crops in eastern Asia or in our American west.

In California in winter, two people can collect 50 to 100 pounds of massed hibernating ladybird beetles in a day—a collection that would probably contain 1 to 2½ million ladybirds. A hive of bees in summer may contain 60,000 bees. It may be necessary to unwind 25,000 cocoons to get one pound of silk thread.

NUMBERLESS CRUSTACEANS

On some tropical mud beaches, and in mangrove swamps the crabs may be the conspicuous and common animals in sight. But the crustaceans of the plankton in the open ocean are in more enormous numbers. The copepods, that feed on microscopic floating plants and are themselves only a small fraction of an inch long, are so abundant that the whalebone whale (which may reach a length of 100 feet) feeds on them, straining them out of the water with its baleen-fringed mouth. It is said that two tons of tiny copepods were found in the stomach of a large blue whale.

Mollusks may lie side by side on a shallow sea bottom or buried in the bottom. On some Florida west coast beaches, if you make a scratch in the sand where the waves are breaking, the little coquina clams will simply pour out into the retreating wave. On the bottom of the North Sea there are miles of banks where 1,000 to 8,000 bivalve mollusks per square yard are estimated. On oyster beds as many as 400 to 500 million oysters have been harvested annually from a bay with an area of about 60 square miles. In the stomach of a fish about 35,000 small snails have been found.

The echinoderms are of moderate size, so one wouldn't expect the great numbers you find in smaller animals. But crinoids (sea-lilies) are common enough that a dredge has brought up, in one haul, 10,000 of them, and the brittle stars are sometimes as abundant as 18 to the square foot in some places on the ocean bottoms.

The fishes are probably the most numerous vertebrates. Standing on a Lake Michigan pier I've seen the emerald shiner pass in what seemed endless schools. Perhaps no fishes in the sea are caught in such numbers as the herring. One fishing boat may catch a million in a day. In northern and western

Europe an estimated 7½ billion herring have been taken in a year.

Mammals are sometimes extremely conspicuous parts of the scenery as were the big game animals of the east African savannas. In America the herds of bison were once impressive. Now, especially in our western parks, herds of elk and in a few places bison can still be seen. But it is the smaller mammals that are actually more common. Red-backed mice of the spruce and pine forests have been estimated at 16,000 per square mile; and meadow mice at 70,000 per square mile.

SEVEN BILLION BIRDS IN U.S.

There are places in North America where water fowl congregate, and it is possible to see a million birds at once on the California wintering grounds, or the great Bear Lake marshes. But over much of our country the breeding bird population is only about two pair of birds per acre or perhaps 7 billion birds in the United States. By contrast there are only between two and three dozen whooping cranes left alive, and probably between 1,000 and 2,000 trumpeter swans.

I've tried to refrain from hyperbole, from adjectives which would lose their force by repetition in writing of animal numbers. When we discuss the actual numbers of microscopic and very small animals they are so great that their numbers actually surpass those of the leaves of the trees, of the blades of grass, and perhaps of the grains of sand.

As a general rule we can say that small animals tend to be more abundant than large ones. Space and food that can support one cow will support six sheep, many more rabbits, still more meadow mice, and still more grasshoppers along with still smaller things such as angleworms, roundworms, and protozoans in the soil. Predators must be less common than their prey species and are usually larger, as robins are larger than angleworms, or foxes than mice. Internal parasites are obviously smaller than their hosts, and often very much smaller as well as very much more numerous.

When we go into the countryside near Chicago, the plants, the grasses, and the trees are the obviously abundant living things, no matter how common swarming black birds, grasshoppers or mosquitoes may be. How different it is on a coral reef. In these beautiful sea gardens the corals form the substratum, with sponges, crustaceans, and fishes everywhere. Nowhere on the globe is animal life more obviously abundant.

In closing, let us remember that an acre of meadow may have a total population of animals, of various kinds and mostly very small, much more numerous than the human population of Chicago.

If your Museum visit coincides with lunchtime, don't forget there is a cafeteria, open from 11 A.M. to 2 P.M.

RADAR MAY BECOME BIRD-STUDY TOOL

The "spurious echoes" now called "angels" that began to plague the operators of radar sets as they became more powerful are now regarded as caused by birds. This was first demonstrated in 1941 in Britain, but most physicists continued to believe that "clouds of ions" were responsible. Security considerations restricted the exchange of information for some years. The facts have been rediscovered independently several times during the past few years, in Britain and Switzerland, and the evidence seems incontrovertible.

The use of radar equipment as a new tool for studying bird migration opens wonderful new vistas. Where knowledge of actual volume, height, direction, and speed of night migration has been limited to observations through telescopes trained on the moon or to deductions from deaths at radio towers, we may now get data from ornithologists watching migration on radar tubes.

Ibis, 1958

STAFF NOTES

An honorary degree of doctor of laws was conferred on **Dr. Clifford C. Gregg**, Director, on June 6 by the University of Cincinnati (of which he is a graduate). . . . **Dr. Sharat K. Roy**, Chief Curator of Geology, who since last September has been conducting a research project on meteorite collections in foreign museums, under the joint auspices of the National Science Foundation and the Museum, has completed his work in London, Paris, and Calcutta. He will next proceed to Vienna, Frankfurt, and Helsinki, and possibly to Moscow and Leningrad. . . . **Henry S. Dybas**, Associate Curator of Insects, is engaged in field work in southern Illinois. . . . **Dr. Alan Solem**, Assistant Curator of Lower Invertebrates, has begun a survey of collections in mid-western museums. . . . **Dr. Robert H. Denison**, Curator of Fossil Fishes, recently lectured at a seminar on evolution at the University of Illinois and also at a seminar on paleoecology at the University of Chicago. . . . **William D. Turnbull**, Assistant Curator of Fossil Mammals, recently lectured at the University of Illinois. . . . **D. Dwight Davis**, Curator of Vertebrate Anatomy, **Philip Hershkovitz**, Curator of Mammals, and **Miss Sophie Andris**, Osteologist, attended the annual meeting of the American Society of Mammalogists in Tucson, Arizona. . . . **J. Francis Macbride**, Curator of Peruvian Botany, was made an Honorary Professor of the University of San Marcos during the recent South American Botanical Congress in Lima, Peru. . . . **D. S. Rabor**, Field Associate in Zoology, has been named Associate in the Division of Birds.



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