

MARINE BIOLOGY

Sea Intelligence: The Dolphin

Scientists are now investigating an ancient sea creature who displays superior intelligence and also a gentle sense of humor, good nature and even compassion toward men.

By BARBARA TUFTY

See Front Cover

► WITHIN THE WARM SEAS swims one of the most intelligent animals in the world—the dolphin.

Quick to learn and remember things with his large complex brain, he also exhibits a friendly willingness to cooperate with other earth creatures—a rare attribute which another animal, *Homo sapiens*, has not yet learned to do with any consistency.

"To the dolphin alone, beyond all other, nature has granted what the best philosophers seek: friendship for no advantage," stated the Greek philosopher Plutarch, 19 centuries ago.

The dolphin has been making friendly gestures to man for ages. The Romans and Greeks painted him on walls, imprinted him on coins and vases. The early Christians considered him a symbol for goodness. However, only now are we beginning to understand his methods of communication and to find out what a remarkably pleasant and intelligent fellow he really is.

He seems happy to perform circus tricks like ringing bells, leaping as high as 16 feet into the air and jumping through flaming hoops for appreciative spectators in theater-like marinas.

High Intelligence

In the shallow waters of the laboratory tanks, he is cordially cooperative with researchers who put him through many tests to determine his responses to different situations, his memory, his ability to recognize signals and sounds, and his power of reasoning in solving problems and devising games.

With a sleek, graceful body and a constant, "built-in" smile on his broad face, the dolphin loves to play. One of his favorite sports in open water is frolicking and leaping around the bows of moving boats.

Covered with smooth and flexible skin that undulates in waves according to the turbulence or waviness of the water, the dolphin can easily reach speeds of 20 or more miles an hour, even up to 35 miles.

Dolphins are also jokesters, and love to tease their trainers, nudge a dozing turtle or pull a fish backward a few feet by its tail.

Just what sort of creature is this friendly beast so beloved by all who come in contact with him?

The dolphin is a member of the order Cetacea which is a group of sea animals including whales, porpoises and dolphins. These sea animals are warm-blooded, which means that they maintain a constant body

temperature instead of changing temperatures to follow changing heat and cold of the environment, as do fishes, snakes and other cold-blooded animals.

All of the cetacean members take in oxygen by breathing air, instead of circulating water through gills. They must continually come to the surface of the water to obtain air, or else they would drown.

These sea creatures are mammals, which means they give birth to their babies alive, not encased in eggshells or sacs, and the mothers nurse them with milk from their bodies—for as long as 18 months in the case of the dolphins.

Scientists say these animals once lived on land in the dim misty ages of the past, for all of them possess rudimentary pelvic bones embedded in the central body muscle in front of their powerful tail. The flippers of the dolphins have a five-finger or toe structure similar to that of a land animal's forepaw or man's hand.

Return to the Sea

In the long process of evolution on this planet, life began as microscopic organisms in the sea. These evolved into other creatures, some of which slowly changed to air-breathing forms that pushed themselves upon the land, while fish and other sea forms remained in the ocean. Now we are discovering the intelligence of those creatures that have returned again to live in the sea.

The names dolphin and porpoise are often confused. Some researchers call the same animal by different names, but Dr. John C. Lilly of the Communication Research Institute in Miami, Fla., states that they definitely are different. The dolphin is larger, heavier and more intelligent than a porpoise. His teeth are shaped like pointed cones instead of the flat-topped, spade-shaped teeth of the porpoise. His body is shaped differently, with a long snout or "beak," contrasted to the blunt snout of the porpoise. For ages, Europeans and Australians have been calling a dolphin a dolphin, but in the United States, it has taken on the name of porpoise.

Dolphins are found in salt and fresh waters throughout the world. There are many varieties, but the bottlenose dolphin, *Tursiops truncatus*, shown on this week's front cover, is among the most intelligent animals in the world. It is readily adaptable to living in captivity and associating with man, state researchers at Marineland, near St. Augustine, Fla., the first U.S. area set up for studying dolphins.

Dolphins measure about eight feet long and weigh around 300 or more pounds when fully grown. Scientists believe they can live for about 30 to 40 years, although no one has yet proved this. According to his species, a dolphin has from 60 to 100 teeth which he uses to catch and hold his fish dinner, but not to chew or bite with. He just swallows his fish whole.

Habitually a gentle fellow, the dolphin sometimes uses his strong beak to ram against enemies such as a shark, but has not been known to turn viciously against a human being.

Beak for Protection

There is a curious air hole on top of the dolphin's head. This is his blowhole, which is open when the dolphin breathes with his head out of water and is closed with special air pressure valves when he submerges. The dolphin normally breathes through this blowhole several times a minute, but he may swim submerged without breathing for as long as five to seven minutes at a time.

The variety of sounds he can make are marvelous—whistles, chirps, pops, clicks, raspberries, squeaks, groans, whines and many other expressive noises. Exactly how he makes these sounds is still unknown. Dolphins have special membranes analogous to our vocal cords. Some of the noises, emitted in frequency ranges from 3,000 to 36,000 cycles per second, are produced by two valves or noise makers on each side of his nose below the blowhole. When his head is above water, the dolphin can vibrate the valves by blowing through them, somewhat like a human can make sounds by blowing through and vibrating his vocal cords.

Natural Mimic

Some of these above-water communication sounds, states Dr. Lilly, resemble sounds of the human voice. Dr. Lilly believes that the perceptive dolphin can even mimic some human-created sounds such as laughter, whistles, Bronx cheers, and even word syllables in the high-frequency ranges.

The dolphin also makes sounds at much higher frequencies—possibly from a series of sound-producing slits in his larynx that leads into the blowhole. These high-frequency noises are used in his sonar system that enables him to locate and recognize objects for precise navigation in dark or murky waters—the envy of the U.S. Navy.

With especially sensitive hydrophones used under the water, Dr. Lilly has recorded frequencies of these sonar noises from 30,000 to 200,000 cycles per second, and possibly as high as 300,000. These series of high-frequency noises, which on a special receiver sound like a putting or creaking noise, are essentially like noises the dolphin emits at

lower frequencies, but tuned up to high frequencies, as he chooses.

Latest device for trying to unlock the dolphin language is the SCEPTRON pattern recognizer, developed by the Sperry Gyroscope Company, Great Neck, N. Y. This miniature computer is designed to "memorize" sounds of the dolphins, to record communication patterns between man and dolphin and to catalogue dolphin noises in order to translate them into something meaningful to human beings.

Can Dolphins 'Talk'?

A highly controversial subject among dolphin lovers and research scientists is the assumption that dolphins are trying to communicate with men. According to Dr. Lilly, the intelligent dolphin is eager to learn from man, and wanting to communicate with him and cooperate with him, despite such communication handicaps as having to live in an environment of water and having no manipulative parts such as fingers and hands.

Dolphins acquire and exhibit an uncanny knowledge about human beings, Dr. Lilly believes. For instance, he has found that the dolphin deliberately lowers his noise frequencies into the ranges audible to the human ear, somewhere below 10,000 cycles per second and emits them in air for man.

If human beings could learn to communicate with these intelligent creatures of the sea, Dr. Lilly believes, we could learn many things about man and the sea.

For instance, the dolphin could help man by passing on information about nose cones and satellites that fall into the sea, by directing fishermen to locate and catch fish, and by helping to measure the sea currents, temperatures and land formations of his native habitat, the oceans—to say nothing of the spiritual and moral value man would gain by communicating with such a pleasant and intelligent creature.

• Science News Letter, 86:138 August 29, 1964

ICHTHYOLOGY

Fish Eat Weeds to Aid Power Plant Operation

► SOME 15,000 grass-eating fish are helping to keep the lights burning in England.

The fish are young grass carp that thrive on the large crops of weeds growing in the Cavendish Dock, which supplies water to the cooling system of the electric power station at Barrow-in-Furness.

The fast-growing weeds had clogged the water inlets and often nearly stopped its flow.

The young fish, about two to two and a half inches long, were flown to England from Hong Kong in 60 water-filled plastic bags packed in an electrically heated box. Upon arrival in England, the fish were put into a 3,000-gallon tank of freshwater. The water was changed gradually until it became a mixture of fresh and salt-water similar to that in the dock.

The grass carp, which will weigh about 70 pounds full grown, are busily eating weeds in the dock to keep the water flowing freely.

The Central Electricity Generating Board



Marineland of Florida

DANCING DOLPHINS—Upright in the water, these dolphins seem to be performing for their dinner in Marineland of Florida, where scientists are studying their means of communication.

in England, which ordered the carp, decided to use these fish as a solution to the weed problem after an experiment. In the test 25 grass carp were taken from the London Zoo and put into the dock.

These fish made gluttons of themselves on the vast amount of food available, said Frank Dale, senior chemist to the board. It was then decided that at least 14 tons of grass carp would be needed to keep the weeds down.

The board still has one problem, however, it does not know whether these fish will breed in England. This may mean that the whole operation will have to be repeated in a few years.

U.S. Tests Grass Carp

Grass carp are being tested in the United States for their ability to eat aquatic weeds.

Nearly 100 of these fish were flown from Malaysia eight months ago to Stuttgart, Ark.

They are a possible solution to the aquatic weed problem in lakes, ponds, streams and fisheries, Paul Thompson, chief, division of fish research, U.S. Fish and Wildlife Service, told SCIENCE SERVICE.

Aquatic weeds interfere with fishing, boating and raising fish, particularly in many southern states.

• Science News Letter, 86:139 August 29, 1964

Nature Note

Japanese Puffer Fish

► The Japanese puffer fish, *Sphoerides rubripes*, contains poisons 50 times as deadly as strychnine and 1,000 times as lethal as cyanide.

Yet the fish is eaten throughout Japan

as a culinary delight, fugu. Only highly skilled and licensed Japanese cooks prepare fugu by removing the ovaries, roe, liver and skin to remove the source of the fish's poison. But despite the efforts of the Japanese Government to control fugu preparation, many Japanese and foreign visitors alike join their departed ancestors each year because fugu was "out of this world" for them.

The fish's poisons—tetrodotoxin and tarchatoxin—are among the most deadly known. They have even been used to drop Ian Flemming's James Bond in his tracks. It is estimated that a teaspoon of pure toxin from the puffer fish would kill seven million mice on the spot.

• Science News Letter, 86:139 August 29, 1964

OCEANOGRAPHY

355-Foot Seagoing Cigar Is Automatic Laboratory

► A CIGAR-SHAPED laboratory bigger than a football field floats on end in the water.

The strange-looking craft is called SPAR, for Seagoing Platform for Acoustical Research, and it is designed to make exact measurements of sound transmission under water. SPAR carries no crew; instead it automatically collects data from clusters of gyrocompasses, direction finders, hydrophones and radio transmitters. It sends its information by a floating cable to a nearby ship, and simultaneously makes a recording for later use.

Floating six-sevenths submerged, SPAR is very stable and can make accurate measurements as deep as 50 fathoms (300 feet).

Built by Aerojet-General Shipyard, Inc., Jacksonville, Fla., and officially launched July 17 for use by the U. S. Navy, SPAR will probably see service early in 1965.

• Science News Letter, 86:139 August 29, 1964