

Omissions, Clarifications, and Errata

The following alphabetical list of definitions were graciously provided by William R. Elliott, Ph.D. of the Natural History Division of the Missouri Department of Conservation. The list of definitions were obtained directly from the *Biospeleology* web site:

www.utexas.edu/depts/tnhc/.www/biospeleology

which is based on *The Life of the Cave* by Charles E. Mohr and Thomas L. Poulson (1966, McGraw-Hill) with additions from Dr. Elliott. The original lexicon as published by EPA was severely deficient from an ecological standpoint. These additional definitions should greatly enhance the value of the lexicon published by EPA.

While it is recommended that users of this lexicon check this list for additional definitions, users should definitely note the corrected definitions for **troglophile**, **trogloxene**, and **tritium** as suggested by Dr. Elliott. Many thanks to Dr. Elliott for his suggested improvements.

Definitions

Adaptation. An inherited structural, functional, or behavioral characteristic that improves an organism's chances for survival in a particular habitat. See also *mutation*.

Antenna (plural antennae). A feeler; an appendage, sensory in function, that occurs in pairs on the heads of crustaceans, insects, and certain other animals.

Appendage. An arm or other limb that branches from an animal's body.

Aquatic. Living in water. Aquatic cave animals include amphipods, isopods, crayfish, planarians, fish, and blind salamanders. See also *terrestrial*; *marine*.

Arthropods. Animals with jointed legs and hard external skeletons (exoskeletons). The group includes insects, crustaceans, spiders, millipedes, and several other types

of animals commonly found in caves.

Bacteria. Simple, colorless one-cell plants, most of which are unable to manufacture their own food using sunlight. Bacteria are possibly important in caves as synthesizers of food materials from minerals. They are also important as decomposers.

Barbels. Fleshy threadlike sensory structures hanging like whiskers near the mouths of certain fish, such as catfish.

Bathybenthic. Of the bottom of the truly deep areas of the sea, where the "rain" of organic material produces a deposit of food.

Bathypelagic. Of the deep sea. Refers to the depths between roughly 3000 feet below the surface and the bottom of the sea. No food accumulates in these waters.

Biological clock. An inherited time-measuring process within a living thing, which governs its responses to certain external events.

Biomass. The total weight of living matter, whether in an entire community, at a particular trophic level, or of a particular kind of organism in the community. Thus we may refer to the biomass of a pond community, of herbivores in the pond, or of copepods in the pond.

Biospeleology. The scientific study of cave animal life, or the biology of caves, karst, and groundwater. A biologist who specializes in this study is called a biospeleologist.

Carnivore. An animal that lives by eating the flesh of other animals. See also *herbivore*; *insectivore*; *omnivore*.

Chlorophyll. A group of pigments producing the green color of plants; essential to photosynthesis.

Climate. The average weather conditions of an area, including temperature, rainfall, humidity, wind, and hours of sunlight, based on records kept for many years.

Community. All the plants and animals that live in a particular habitat and are bound together by food chains and other interrelations.

Competition. The struggle between individuals or groups of living things for common necessities, such as food or living space.

Conservation. The use of natural resources in a way that assures their

continuing availability to future generations; the wise use of natural resources.

Constant-temperature zone. The area of a cave where air temperature is unchanging throughout the year and approximates the average annual temperature aboveground. See also *zonation*.

Consumer. Any living thing that is unable to manufacture food from nonliving substances, but depends instead on the energy stored in other living things. See also *carnivore*; *decomposers*; *food chain*; *herbivore*; *omnivore*; *producers*.

Crustaceans. The large class of animals that includes lobsters, crayfish, amphipods, isopods, and many similar forms. Crustaceans typically live in water and have many jointed appendages, segmented bodies, and hard exoskeletons.

Cupula (plural *cupulae*). A jellylike rod projecting into the water from a neuromast, part of a fish's or amphibian's lateral line system. Vibrations in the water cause the cupula to move, thus setting off nervous impulses that enable the animal to detect nearby movements in the water. [Not to be confused with *cupola*.]

Decomposers. Living things, chiefly bacteria and fungi, that live by extracting energy from the decaying tissues of dead plants and animals. In the process, they also release simple chemical compounds stored in the dead bodies and make them available once again for use by green plants.

Ecology. The scientific study of the relationships of living things to one another and to their environment. A scientist who studies these relationships is an ecologist.

Embryo. A developing individual before its birth or hatching.

Environment. All the external conditions surrounding a living thing.

Epigeum. The surface environment.

Evolution. The process of natural consecutive modification in the inherited makeup of living things; the process by which modern plants and animals have arisen from forms that lived in the past. See also *mutation*.

Exoskeleton. An external skeleton. The hard body covering or shell of most invertebrate animals, including insects, crayfish, and millipedes.

Food chain. A series of plants and animals linked by their food relationships; the passage of energy and materials from producer through a succession of consumers. Green plants, plant-eating insects, and an insect-eating bat would form a simple food chain. See also *food web*.

Food pyramid. The normally diminishing number of individuals and amount of organic material produced at each successive level along a food chain. The declining productivity at each level results from the constant loss of energy in metabolism as the energy passes along the chain. See also *trophic level*.

Food web. An interlocking system of food

chains. Since few animals rely on a single food source and since no food source is consumed exclusively by a single species of animal, the separate food chains in any natural community interlock and form a web.

Fossil. Any remains or traces of animals or plants that lived in the prehistoric past, whether bone, cast, track, imprint, pollen, or any other evidence of their existence.

Geological map. A map that shows the kinds of rock lying beneath the soil or reaching the surface in a given area. A topographic map shows the contour or elevation lines, and surface features such as watercourses.

Geology. The scientific study of the earth and the rocks that form it. A scientist who specializes in this study is a geologist.

Habitat. The immediate surroundings (living place) of a plant or animal; everything necessary to life in a particular location except the organism itself.

Herbivore. An animal that eats plants, thus making the energy stored in plants available to carnivores. See also *carnivore*; *insectivore*; *omnivore*.

Hibernation. A prolonged dormancy or sleeplike state in which animal body processes such as heartbeat and breathing slow down drastically and the animal neither eats nor drinks. Nearly all cold-blooded animals and a few warm-blooded animals hibernate during the winter in cold

climates. Extremely large aggregations of bats, crickets, and spiders hibernate in some caves.

Histo, Histoplasmosis. The disease caused by the fungus *Histoplasma capsulatum*, found in bird and bat guano, especially in the southern USA and the tropics. An occupational disease of cavers, aviary and poultry workers, guano miners, and maintenance workers. Infection is usually caused by breathing the microscopic spores, which infect the lungs, or sometimes the eye. Flu-like symptoms accompanied by low-grade fever, breathing difficulties and pain, and miasma may start about 14 days after exposure and continue for weeks, months, or rarely until death, usually from complications. Treatable with various anti-fungals, such as itraconazole. Often misdiagnosed, as the standard tests may give a false negative.

Humidity, relative. The ratio, expressed as a percentage, of the amount of water vapor actually present in air of a given temperature, as compared with the greatest possible amount of water vapor that could be present in air at that temperature. Calculation of relative humidity can be done from tables, special slide rules or calculators, graphs, or complex equations. See also *hygrometer*; *psychrometer*.

Hygrometer. An instrument that reads the humidity in the air directly; some are based on a hair's ability to shrink or expand with humidity, or on certain electronic chips. Generally, a psychrometer is more

accurate at higher humidities (above 95%). See also *psychrometer*.

Hypogeum. The subterranean environment.

Infrared light. Light not visible to the human eye, with wavelengths longer than those of visible red light and shorter than those of radio waves.

Insectivore. An animal that feeds on insects. Almost all species of North American bats are insectivores. See also *carnivore*; *herbivore*; *omnivore*.

Invertebrate. An animal, such as a planarian, snail, or crayfish, without a backbone. See also *vertebrate*.

Larva (plural larvae). An active immature stage in an animal's life history when its form usually differs from the adult form, such as the grub stage in the development of a beetle or the tadpole stage in the life history of a frog. See also *metamorphosis*; *pupa*.

Lateral line system. A series of sensory organs, usually appearing in a line or series of lines on the sides and heads of fishes and larval amphibians. The system enables the animal to sense vibrations in the water. See also *cupula*; *neuromast*.

Mammals. The class of animals that includes bats, mice, man, and many others. They typically have a body covering of hair and give birth to living young, which are nursed on milk from the mother's breast.

Marine relict. An animal whose presently extinct ancestors lived in salt water but became adapted to life in fresh water when an area formerly covered by the sea became dry land.

Metabolic rate. The rate at which a living thing transforms food into energy and body tissue. The higher its metabolic rate, the more food it must consume. Most cave animals live at a reduced metabolic rate.

Metabolism. The sum of the chemical activities taking place in the cells of a living thing; the sum of the processes by which a living thing transforms food into energy and living tissue.

Metamorphosis. A change in the form of a living thing as it matures, especially the drastic transformation from a larva to an adult. See also *pupa*.

Microclimate. "Little climate." The environmental conditions, such as temperature; humidity, and air movement, in a very restricted area, such as a sheltered nook in a cave wall.

Microhabitat. A miniature habitat within a larger one; a restricted area where environmental conditions differ from those in the surrounding area. A sheltered nook in a cave wall is an example of a microhabitat within the cave.

Mold. A microscopic form of fungus responsible for much food spoilage and, in caves, for conspicuous tufts quickly covering scats, dead insects and bats, and even wooden

structures such as ladders.

Mutation. A sudden change in the genetic material of an organism's germ cells, resulting in offspring that possess characteristics markedly different from those of either parent. Mutations generally are harmful, but occasionally may improve an organism's chances for survival. See also *adaptation*; *evolution*.

Neoteny. The condition of retaining larval form and behavior even as a mature individual. Certain salamanders in particular are neotenic.

Neuromast. One of the individual sense organs that make up the lateral line systems of fishes and amphibians. See also *cupula*.

Omnivore. An animal that habitually eats both plants and animals. See also *carnivore*; *herbivore*; *insectivore*.

Organic. Pertaining to anything that is or ever was alive or produced by a living plant or animal. Organic material brought into the cave from outside is virtually the only source of food for cave dwellers.

Paleontologist. A scientist who studies the life of the past by interpreting fossil remains of plants and animals.

Parietal fauna. Pertaining to the inhabitants on the walls of the entrance and twilight zones of a cave.

Photosynthesis. The process by which green plants convert carbon dioxide and water into simple sugar. Chlorophyll and sunlight are

essential to the series of complex chemical reactions involved in the process.

Phreatobite. An inhabitant of groundwater, often exhibiting troglomorphy, but not limited to karst systems. Many examples of amphipods and other crustaceans abound.

Pigment. A chemical substance that imparts color to an object by reflecting or transmitting only certain light rays and absorbing all others. For example, a substance that absorbs all but green rays appears green. An object that contains no pigment, on the other hand, appears white because it reflects all light rays and absorbs none. Many troglobites have lost all their pigment

Planarian. A flatworm. A relatively simple wormlike animal with a flattened ribbonlike body, a distinct head end, and a mouth located more or less centrally on the underside of the body.

Pleistocene. Of or pertaining to the most recent period in the earth's history, roughly the past one million years. The period includes at least four major retreats and advances of continental glaciers.

Preadapted. Possessing adaptations that would contribute to survival in a habitat other than the immediate one because of similarities in living conditions in the two habitats. Insects that live in leaf litter on the forest floor, for example, may be pre-adapted to cave life.

Predator. An animal that lives by capturing other animals for food. See also *prey*.

Prey. A living animal that is captured for food by another animal. See also *predator*.

Producers. Green plants, the basic link in any food chain; by means of photosynthesis, green plants manufacture the food on which all other living things ultimately depend. They are available in the cave community only in the twilight zone, or as debris that falls or washes in. A few types of bacteria also manufacture food from nonliving substances and therefore serve as producers in some cave communities. See also *consumer*.

Psychrometer. An instrument used for measuring relative humidity. The simplest sling psychrometers consist of two thermometers mounted on a rotating frame. One thermometer's bulb is kept moist, the other dry. By comparing the "wet bulb" and "dry bulb" readings of the two thermometers after they have been whirled in the air, one can determine the relative humidity. An electric fan is used to ventilate the wet bulb in many psychrometers. See also *hygrometer*.

Pupa (plural pupae). The inactive stage in the life history of certain insects during which the larva undergoes a gradual reorganization of its tissues in the process of becoming an adult. See also *metamorphosis*.

Rabies. An infectious disease of the central nervous system in mammals,

caused by a lyssavirus. Usually transferred by the bite of an infected animal, such as dogs, skunks, racoons, or rarely bats. Characterized by choking, convulsions, inability to swallow, etc. Different genetic strains are now recognized and can be identified by tests. Transfer of rabies from bats via aerosols to caged animals in a cave has been demonstrated, but has not been proven in humans.

Relapsing Fever. One type of *Borreliosis*, caused by various species of *Borrelia* spirochaetes carried by several species of tick. Related to Lyme disease, but less chronic and milder. An occupational disease of some cavers in Texas who come in contact with the soft tick *Ornithodoros turicatae*, which carries *Borrelia turicatae* and may live in cave entrances.

Scats. Animal droppings, an important source of food in caves.

Scavenger. An animal that eats the dead remains and wastes of other animals and plants. See also *predator*.

Sonar. A system for detecting obstacles by emitting sound and intercepting and interpreting echoes that bounce back. It is used by bats and also by oilbirds and some swiftlets when they fly in the darkness of caves.

Species (singular or plural). A group of plants or animals whose members breed naturally only with each other and resemble each other more closely than they resemble members of any similar group.

Stygobite. An aquatic troglobite.

Stygophile. An aquatic troglophile.

Stygoxene. An aquatic troglaxene.

Terrestrial. Living on land. Not to be confused with "epigean." Terrestrial cave animals include blind beetles, millipedes, spiders, and crickets. See also *aquatic*.

Tritium. A short-lived isotope of hydrogen ($\lambda = 12.43$ y) that is directly incorporated into the water molecule as $^1\text{H}^3\text{HO}$ or $^1\text{HTO}^*$.

Troglomorphy. The physical characteristics of a troglobite or stygobite; e.g., reduced eyes and pigment, elongated appendages, well-developed tactile and olfactory organs, etc.

Troglophile. "Cave lover." An animal that can complete its life cycle in caves, but may also do so in suitable habitats outside caves.

Troglaxene. "Cave visitor." An animal that habitually enters caves, but must return periodically to the surface for certain of its living requirements, usually food.

Trophic levels. Feeding levels in a food chain, such as producers, herbivores, and so on. Most food chains include a maximum of four or five trophic levels.

Twilight zone. The area of a cave where light penetrating through the entrance is sufficient to permit human vision. See also *zonation*.

Variable-temperature zone. The area of

a cave where air temperature fluctuates with the seasons. See also *zonation*.

Vertebrate. An animal with a backbone. The group includes fishes, amphibians, reptiles, birds, and mammals. Some amphibians and fishes live permanently in caves. See also *invertebrate*.

Zonation. The organization of a habitat into a more or less orderly series of distinctive plant and animal associations as a result of variations in environmental conditions. Zones in a cave are the twilight zone, the variable-temperature zone, and the constant-temperature zone.

*Clark, I. and P. Fritz. 1997. Environmental Isotopes in Hydrology. Lewis Publishers, Boca Raton, Fla. p. 174.