BIOLOGY

Magnetic butterflies and dolphins

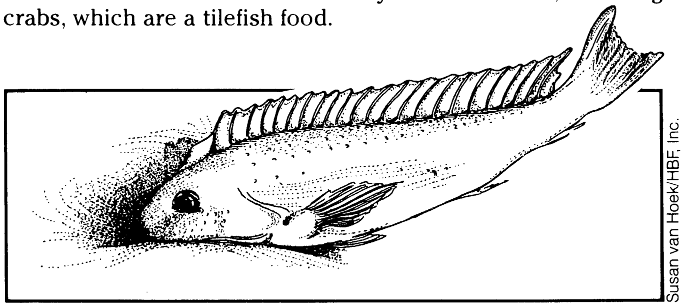
Butterflies are the newest members of the club of animals recognized to contain magnetic material. Like dolphins, bees, pigeons and some bacteria (SN: 6/14/80, p. 376; 5/24/80, p. 326; 4/28/79, p. 278), monarch butterflies have iron oxide grains, called magnetite, in their bodies. Bruce MacFadden and Douglas Jones detected the butterfly magnetism in experiments at the University of Florida. They speculate the magnetic material, acting like an internal compass, guides the monarch in its annual migration from eastern North America to central Mexico.

In a different corner of the animal kingdom, dolphins were the first mammals to be found to contain magnetic material (SN: 6/14/80, p. 376), and a whale is the next. Details of the dolphin discovery are published in the Aug. 21 SCIENCE. John Zoeger of Los Angeles Harbor College and Michael D. Fuller and J. Robert Dunn of the University of California at Santa Barbara found magnetite in the heads of four dead stranded dolphins. A surface of the largest magnetite particle was coated with fibers that appear to have come from nerves. The scientists say, "The fibers may be a nerve net and the large [magnetite] object could be part of a magnetic receptor." Fuller cautions, "The idea of some sort of magnetic navigational system is not absurd, but it remains to be properly demonstrated. Magnetite could be 'wired' into the nervous system, but that is merely a speculation at this point." The scientists have not yet demonstrated that dolphins detect magnetic fields, but they are examining that possibility in research with scientists at the University of Hawaii. In other work there they have demonstrated magnetite in a species of whale, Cuvier's beaked whale.

Peeping into tilefish burrows

Ten thousand photographs taken from a submersible on a 40-day mission will provide data for the management of a fish population that is becoming increasingly important for food. Last year East Coast fishermen caught more than eight million pounds of tilefish, a relative of perch, whiting and bluefish. Some tilefish populations appear to fluctuate dramatically, but little is known about the lifestyle of the catch.

Scientists from Rutgers University in New Brunswick, N.J., and the Harbor Branch Foundation, Inc. of Fort Pierce, Fla., scanned and mapped the ocean floor in two canyons off Woods Hole, Mass., and in another, called Hudson Canyon, off the New Jersey shore. Tilefish live on the ocean floor and in canyon walls at depths of 400 to 800 feet. They inhabit burrows consisting of an outer basin-like crater with one or more central shafts that penetrate the sediment into the underlying clay. The burrows can run horizontally in outcrops of clay along canyon walls, as well as vertically in other terrains. The scientists observed fish "sweeping their porches," brushing away loose sediment with their fins, and speculate that they construct their burrows with a similar behavior. When frightened, the fish plunged head-first into their burrows leaving behind a plume of stirred-up sediment. To coax fish out, the scientists injected a mild chemical irritant into the burrow entrance. Sometimes they found a tilefish sharing its burrow with fish of other species. Small holes in the outside crater are inhabited by other creatures, including crabs, which are a tilefish food.



Susan van Hoek/HBF, Inc.

Commercial fishermen have found that the tilefish population near Cape Cod fluctuates more dramatically than does that off the New Jersey coast. The recent observations confirm a previous suggestion that the more northeastern area has less well-developed burrow construction, and so the fish there may form less stable communities.

Quick-cleaning the calamari

The task of cleaning squid deters many a chef from the tasty, nutritious and abundant mollusk. The high cost of manual cleaning limits its distribution to small-scale special-order stores. Engineers at the University of California at Davis now report design of a completely automated squid cleaning machine. In 15 seconds it removes the squid's head, eyes, skin, viscera, ink sac and backbone, leaving the white flesh cone of the mantle and the tentacles ready for cooking.

The automatic system, designed by R. Paul Singh and Daniel E. Brown, orients and aligns a squid as it slides into the machine by taking advantage of the higher friction of tentacles compared to the mantle. The squid is cut into tentacle, head and mantle segments and each part falls down a different duct. The open-end of the mantle slides onto a peg and a fan-shaped high-pressure sheet of water removes the skin and fins. Water jets inside the peg do the rest of the cleaning and then others at the base propel the cleaned squid off the peg and out of the machine.

The yield of edible meat from the machine is comparable to hand-cleaned samples. The yield is greatest in squid longer than 6 inches, but the quality of the cleaning is higher in smaller squid. To increase the rate of processing, one squid could be aligned while another was being cleaned, and in an industrial machine the number of troughs and pegs could be multiplied to get the required output. The California catch of "market squid" now averages 10,000 tons annually, but Singh and Brown estimate that if demand increases this catch could go up to more than one-half million tons per year.

Poisons may lurk in the parsnips

Substances that occur in foods naturally may have adverse effects equal to or more serious than those of man-made chemicals. Scientists at the Department of Agriculture Veterinary Toxicology and Entomology Research Laboratory in College Station, Tex., now report that parsnip root, a vegetable available in most supermarkets, represents a stew of potential hazards. Both raw and cooked, peeled and unpeeled, parsnip contains three chemicals, called psoralens, that are acutely toxic to mammals at moderate doses and that can react with light to cause cancer in laboratory animals. (Psoralens in the presence of light cause the human skin to make pigment and so are used in certain medical treatments.) The Texas scientists find that carrot, in contrast, contains little if any of these chemicals, although they have been reported in celery and parsley. The only documented harm to humans by parsnip psoralens is incidents of photoinduced skin inflammation among vegetable handlers and processors. But the scientists suggest that careful epidemiological studies might turn up dietary effects. "On the basis of the amounts of psoralens found in the samples studied here, it is apparent that consumption of moderate quantities of this vegetable by man can result in the intake of appreciable amounts of psoralens. Consumption of 0.1 kilogram [4 ounces] of parsnip root could expose an individual to 4 to 5 milligrams of total psoralens, an amount that might be expected to cause some physiological effects under certain circumstances," G. Wayne Ivie, Douglas L. Holt and Marcellus C. Ivey say in the Aug. 21 SCIENCE.