Natural Sciences

Decomposition of spawn

Young birds possess egg teeth that enable them to file their eggs open; young butterfly larvae eat through their sheath when hatching, but how do fish embryos emerge from spawn?

Zoologist Hans E. Hagenmaier of Aachen Technical University in Germany investigated the matter. The German Research Service reports that the firm membrane that surrounds the spawn, which consists of a protein not yet chemically defined, is decomposed by an enzyme that has not been detected in vertebrates so far, and which has a low weight of about 10,000. The secretion that contains the enzyme is released by tiny glands situated on the head of, for example, trout embryos and attains maximum production at the time of hatching. The factors influencing the triggering of the enzyme into the fluid between the embryo and the spawn are not fully known yet, but oxygen metabolism of the spawn and some hormonal actions may be involved.

Rainfall and crab harvest

The dungeness crab harvest has been low this year. Oceanographer R. Gregory Lough of Oregon State University, who has been studying the early, larval stages of crab development off the Oregon coast for three years, blames low crab yield on heavy rains that occurred in February four years ago.

Lough discovered that during the earliest stage of crab development, which occurs in February, the sea animals are particularly vulnerable to low salt content in seawater. When heavy rains fall, the salt content becomes diluted and many larvae die. Since it takes four years for the surviving crabs to mature, heavy rains lead to low crab harvest four years later. According to Lough, other environmental factors such as sea-surface temperatures and ocean currents also affect the survival of the crab larvae, but not nearly as much as the salt content. He found that about 60 to 70 percent of the variations in crab harvest during the past 21 years can be explained by rainfall levels.

Working with data from selected ports south to Fort Briggs, Calif. and north to Grays Harbor, Wash., Lough predicts that crab harvest will be average to good along most of the Oregon coast for the next four years.

More happy birds

Thirteen national wildlife refuges have been authorized to acquire more than 17,000 acres of prime waterfowl nesting and feeding habitat by the Migratory Bird Conservation Commission. All refuge acquisitions are lands within the boundaries of existing refuges.

"These decisions promise a brighter future for America's marvelous migratory bird flocks," says Nathaniel P. Reed, assistant secretary of the Interior for Fish and Wildlife and Parks. "The commission's action will preserve valuable wetlands acreage along the east coast of Maine, New Jersey, Delaware and Florida which will provide stopover-resting spots and wintering areas for ducks, geese, swans and other migratory birds." The Atlanta flyway will benefit the most from the acquisitions, according to Reed, because it suffers more than any other migratory bird flyway in the nation from the rapidly diminishing open spaces.

The acquisitions will complete Prime Hook Refuge, Del.; Brigantine Refuge, N.J.; Lacassine Refuge, La.; and two divisions of the Rachel Carson Refuge, Maine.

Technology

New plastics boom ahead?

Familiar as they have become in everyday life, plastics have so far been unable to replace conventional materials in many seemingly obvious applications—they scratch and corrode too easily for window panes, they don't have the wear resistance and electrical conductivity to replace die-cast metals, and either they aren't elastic enough or heat-resistant enough for use in many under-the-hood automobile parts. New progress in each of these areas, reviewed for the European Conference on Plastics and Rubber in Paris by R. M. Kossoff, and reported in the June 24 CHEMICAL AND ENGINEERING NEWS, promises a major boom for industry.

Increasing vandalism has made administrators of many schools and public buildings wish they could replace glass windows with tough acrylic or polycarbonate sheets, and newly developed, scratch-proof coatings may now make this feasible. Using a closely guarded technique for orienting molecules of a polyester plastic before molding, Phillips Petroleum has been able to make food-grade plastic bottles stronger and thinner than ever before, so that Kossoff foresees the eventual replacement of glass bottles for beer and soft drinks. By reinforcing plastics with carbon fibers, a new generation of organic materials with great mechanical strength, good wear resistance and improved thermal stability and electrical conductivity are being produced, which may eventually be able to replace die-cast metals in some applications. The rubberlike, heat sensitive plastics known as thermoplastic elastomers are being made heat resistant so that they may soon find application in automobile bumpers, tubing and belting. Potentially the greatest single market impact could come from advances in reaction injection molding, from which automobile manufacturers hope to someday be able to cast large structural body parts in one operation.

Tracing a bullet's flight path

Forensic scientists have long used neutron activation analysis to detect metallic residues of gunfire on a person's hands. The technique involves collecting the microscopic portions of spent gunpowder and other materials, irradiating them in a nuclear reactor and then analyzing the characteristic gamma rays given off after such activation. Now scientists from Pennsylvania State University have found that the same basic technique can be used to detect residues scattered along a bullet's trajectory, and thus to estimate the length of its path, the direction it was fired, and whether the bullet was of the rim or center-firing type. Moist paper is used to pick up residues from the floor beneath a flight path and the materials are analyzed for four key components: barium from the bullet's primer, antimony from the lead and primer, and copper and gold from the casing. The new technique was announced at a meeting of the American Nuclear Society in Philadelphia. Some police departments have expressed interest, but are cautious.

Proteins from microorganisms

Microorganisms such as algae and yeast can be grown so easily and prolifically that many nutritionists have suggested using them as a cheap source of protein. Alas, they have tough cell walls that are hard to digest and, by themselves, taste awful. Now a research team at the Royal Institute of Technology in Stockholm reports developing a process to extract usable protein to enrich existing food products. A rotating cylinder containing minute glass beads fractures the cell walls and releases the proteins.