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A Gastric Battery for Fish

We previously described, in Transactions of the American Fisheries Society (1965), vol. 94, p. 193–194, "A device for holding objects in the stomachs of fish," consisting of a 1/16-inch plastic rod formed to loop around the isthmus and extend down the gullet into the stomach. This harness was developed to secure an experimental gastric battery, not reported at that time. The battery was intended to power an ultrasonic tracking transmitter.

After 20-day trials of seven combinations of metals in an electrolytic solution of 0.5 percent hydrochloric acid, we chose gold and cadmium for the battery plates on the basis of their longevity, primarily, and secondarily on the strength of their power output. The gold-cadmium batteries were constructed by wrapping cadmium and gold foil, separated by a spiralled polyethylene spacer, around the portion of the harness rod that extended into the stomach. The 0.3-millimeter-thick foil plates were about 1 by 3 centimeters; the 0.15- by 1.5-millimeter spacer strip was spiralled with a 5-millimeter space between each wrap. Enameled No. 30 copper wires soldered to the plates served as battery terminals.

The output of such a battery in the stomach of a northern pike was intermittantly measured during a 13-day period. In average water temperatures of 14°, 19°, and 22°C. the output averaged 0.20, 0.37, and 0.50 milliwatts respectively. Voltage ranged from 0.26 to 0.64 volts, apparently varying with temperature. Short circuit current varied from 0.04 to more than 1 milliampere, possibly affected by the composition of available gastric juices.

Other northern pike were fitted with the gold-cadmium batteries having a 680-ohm resistor connected across the plates to simulate the current drain of a transmitter. Held in an aquarium for 51 days, they appeared to feed normally and four were released to a 0.1-acre pond. Three of the four fish were recovered, 87, 164, and 226 days after insertion of the battery units. One fish was in poor condition, probably because of a poorly fitted harness, but the batteries showed no plate erosion and were still capable of essentially their original power output.

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