

A SHOCKER

By CAPTAIN A. L. MENDES

It was a dark night in 1941 when an intruder stole up to an aquarium in Diego Martin. He put his hand inside and picked up an eel lying on the bottom.

The next moment he let out a yell, dropped the eel on the floor, and fled.

There it was found next morning—dead.

So ended an interesting experiment with an electric eel (*Electrophus electricus*, Linn.) I had shipped from Carapito in Venezuela to Trinidad.

No wonder the intruder dropped him. This particular electric eel had registered 23 volts on a crude apparatus during experiments!

Where does it get this electricity?

One-fifth of the electric eel's body—that is, the portion from snout to vent—contains the main organs of the body. The other four-fifths is mainly made up of the "batteries" which store the electric energy until it is needed.

These electric organs are in three pairs, the largest running to the tip of the tail. Other features of the eel's organs are the very small eyes—only 5 mm. in diameter. This particular eel appeared to be nearly blind and relied on its sense of smell to find food. It is possible that its own electric discharge may have impaired its vision.

When the eel (a male) arrived in Trinidad from Caripito in 1931 in a watertight container it measured 68.5 cm., or about 2-ft. 3-ins. in length. It was netted in one of the deep pools of the Rio Caripe, a tributary of the Rio San Juan, flowing into the Gulf of Paria. On arrival it was transferred to an aquarium tank at Four Roads, measuring 4-ft. 2-ins. in length, 22-ins. wide and 18-ins. deep, with plate glass sides and covered with a wire grid. Six years later it had grown a foot to 99 cm. or 3-ft. 3-ins. with a maximum girth of 44 cm. ten inches from the snout. The only fishy part of its make up was a pair of small pectoral fins, 25 mm., kept close to its body and barely recognisable when the eel was at rest.

The electric eel is truly a freshwater fish and belongs to the Order Ostariophysi, which includes the catfish family. It is carnivorous and in captivity its favourite food is raw meat, shrimps,

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and a small species of crayfish found in the Diego Martin River. It has been known to fast for five days and, when hungry, becomes restless and discharges its most powerful shocks.

When I heard in 1937 that Dr. Richard Cox was leading an expedition from New York to Brazil to investigate the electrical discharge of the electric eel, I decided to do some research and obtained the co-operation of two electrical engineers, Messrs. Reid and Batty. After several unsuccessful attempts with our experimental apparatus we managed to get a voltmeter reading of 23 volts from the eel's electrical discharge, with the eel barely submerged in its aquarium.

CATHODE-RAY OSCILLOGRAPH VOLTAGE MEASUREMENT

In April that year Dr. Cox and his party arrived in Trinidad from Brazil and I was able to obtain the data on his experiments. He showed we could not hope to get a correct reading with our apparatus and showed us the improved equipment his expedition was using. In a memo to me he said they used a cathode-ray oscillograph for voltage measurement, the essential part of which was a vacuum in which a beam of electrons passed through an arrangement of plates to strike a fluorescent screen on which it produced a luminant spot. In most of their observations the eel was removed from the water and laid on a board crossed with wires with which the skin of the eel made electrical contact. As a result of their experiments it was found that the eel gives three types of discharge—major, minor and intermediate.

CAN DEVELOP 300 VOLTS!

The major discharge is apparently developed in the large electric organs, the minor in "Sach's" organs and the intermediate probably in "Hunter's" organs, but this is not certain. The major discharge of a mature eel develops 300 volts when no appreciable current is drawn. Several higher voltages were observed. The duration of discharge is about .002 second and a number of major discharges are given in rapid succession by an excited eel, but may diminish with fatigue or injury. In water the current is reduced by one half and Dr. Cox said this must be one reason for our smaller voltage reading, but mainly because our voltmeter needle could not follow the extremely rapid changes in voltage during discharge. In 1940 I received from the New York Aquarium some special light bulbs which, when properly attached, would flash when the eel was hungry or excited.