

A Commentary on Electric Organs in Fishes

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DESCRIPTION

Among several families of fishes, electric organs are well developed and they can produce electricity. These organs can produce electricity. These organs can generate electric field outside the body. Electric fishes have been isolated into two sorts: emphatically electric and feebly electric, contingent upon the strength of the flow. The electric organs are used for capturing prey, as organs of defence and they are also used as direction finders. The electric eel (*Electrophorus electricus*) is the best known example of the fishes that can produce electricity. These fishes attain a length of eight feet and are eel like in appearance. They live in the shallow muddy waters of Amazon, Orinoco and other rivers of South America. This fish can discharge about 500 volts of electricity on land but in water there is considerable reduction in the strength on the current. Nonetheless, the release voltage is sufficient to make inconvenience man and different creatures. *Torpedo*, *Malapterurus* and *Mormyrus* are known as the electric fishes from the ancient time.

Important Fishes with Electric Organs Some important fishes which can generate electricity are the following:

1. Skates and ordinary rays
2. Electric rays and Torpedos
3. Mormynts
4. Gymnarchus
5. Gymnotus
6. Electric catfish
7. Star gazer

In addition to the above mentioned fishes some other members belonging to the families *Rhamphichthyidae*, *Stemarchidae* and *Stemopygidae* have also been reported to possess the electric organs.

Description of electric organs

The electric organs differ in their shape and position in different species but their basic microscopic structure is almost the same. The organ is made up of disc-like cells known as electroplaxs or electroplates facing the same direction in the members of the particular species. The electroplates are implanted in a jam like substance and they are bound together by connective tissue into a stretched cylinder or compartment. The electroplates are quite large cells of low resistance and they can be studied by microelectrode techniques. One face of each electroplate is supplied by nerves and blood capillaries. Each electroplate is a multinucleate cell having transparent cytoplasm. It looks different from the muscles. The electric organ actually looks like clear gelatinous mas.

The electroplate shows characteristic folding and convolutions of one or both surfaces. On the non-nervous face of the electroplate, large papillae can be seen but the surface supplied with nerves is smooth. In some fishes (*Torpedo*) there is repeated branching of the nerves and the whole surface of the electroplate is covered by the nervous net-work.

In *Electrophorus* the nerves end on a number of short papillae. In *Mormyrus*, the points of contact are much more reduced. The contact is at one point only in case of *Malapterurus*. The Electroplates are well innervated in all the electric fishes. The electric organs are located at different parts of the body. Shocks can be transmitted when the fish is molested. Shocks are also transmitted when the fish comes within the range of its preys which are knocked senseless and then swallowed whole.

In Mediterranean *Uranoscopus* and the American *Astroscopus* also the muscle tissues are modified into electric organs. These are innervated by the oculomotor nerves and, are confined to the region of the eyes. The African Mormyrids can produce weak shocks with the help of modified caudal muscles. The *Malapterurus electricus* is the only siluroid fish known to be electric.

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Details of electric organs of some important fishes

Torpedo: There are two huge and two little organs on each side of the head. The kidney-shaped mass on either side of the middle line is supplied by a prominent nerve originating from a special lobe of the brain. The organ comprises about 45 vertical hexagonal columns each possessing nearly 400 electroplates. The innervated side of the electroplate is electrically negative. The current in *Torpedo* passes from the dorsal side, which is positive, to the ventral side, which is electrically negative. The discharge is between 30 to 50 volts normally.

Electrophorus electricus: In *Electrophorus electricus* (electric eel), the electric organs are present on each side of the fish and one is larger than the other. The organ extends along the whole length of the body and consists of about 6000 electroplates. The nerve supply to this organ comes from the spinal cord. It is sufficient to give a severe shock to man and some other creatures.