



SEPTIC TANK FOR 20,000 PEOPLE INSTALLED AT SCONE, N.B.

## MARINE FISHES.

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Of the animals composing the fauna of any given area it is perhaps safe to say that the birds are known first and known best. They are conspicuous, their haunts are more or less accessible, and they are readily procured. A knowledge of the mammals and reptiles is obtained later, but in a comparatively short time nearly all are known. These animals, for the most part, live on the land, breathe the same air as we do, and are thus brought into close contact with ourselves.

In regard to fishes matters are very different: we can only to a limited degree become personally acquainted with them. They are, without exception, inhabitants of water and a knowledge of the marine forms is acquired very slowly. Naturally the Littoral, or shore, fishes, those which live on the threshold of the land, are the earliest discovered, and, indeed, beyond these a knowledge of the fishes is scarcely extended by the community as a whole. In addition to the shore fishes two other divisions are usually recognised, namely, the Pelagic, or surface, forms, and the Bassalian, or deep sea, fishes.

The Shore, or stay-at-home, fishes exhibit the greatest peculiarity of form, colour and habit, and afford the best examples of geographical environment. This is what one would naturally expect, and it is paralleled in ourselves. People who do not travel develop peculiarities of speech and manner, and are recognisable as from certain districts and such evidences, once developed, are never wholly obliterated in the individual. One can, therefore, in a similar manner identify many shore fishes as coming from certain localities; they have adapted themselves during the course of many generations to their environment, and such specialisation has unfitted them for life under different conditions.

Not only may shore fishes be confined to certain geographical districts, but they may be extremely restricted even within those limits.

The Pelagic fishes are the ocean wanderers, whose geographical range is determined mainly by differences of temperature. If we find a species on, say, the western side of a land area only, it does not follow that the conditions on the eastern side are unsuited for it, but, rather, that the land extends, north and south, beyond the limits in which the species can exist.

Many degrees of tolerance of temperature, however, exist, so that whereas a certain genus, or even species, may occur in the open sea between certain land barriers either north or south of the equator, others are cosmopolitan.

As these Pelagic fishes do not encounter diverse conditions, the open ocean being similar, temperature apart, the world over, we find them formed on much the same type and without those extreme modifications so numerous in shore fishes; they are the typical forms and, generally speaking, approximate to the mackerel in shape.

There are, however, many notable exceptions. The sucker fish has assumed a lazy life, and has

therefore lost the faculty of prolonged rapid motion. Instead of using its own fins it attaches itself to other fishes, notably sharks, and is carried about by them. Some small fishes shelter themselves beneath the bells of jelly fishes, and with these animals are wafted about by wind and wave.

The Bassalian, or deep sea, fishes are, like the Pelagic ones, of wide distribution. The term Bassalian is applied to those forms which live below the depths to which light can penetrate. They therefore dwell in absolute darkness and, not needing eyes, many of them have lost the faculty of sight. Others are provided with luminous organs, or lanterns, and in order to catch the faintest ray of light, have gone to the opposite extreme and developed eyes of great size.

The range of deep sea fishes is to be measured by vertical depth rather than geographical area. The pressure of the water increases so rapidly as the depths are attained that the particular zone to which a certain type may have accommodated itself is very limited vertically. Fishes hauled to the surface from the depths expand so greatly, owing to the withdrawal of outside pressure, that they are usually forced out of natural shape, their eyes, when present, generally protrude from their sockets, while their stomachs are driven out of the mouth.

While the Littoral and Pelagic fishes may be more or less generally known, the Bassalian fishes are obtained chiefly as the result of scientific research; and it is only in comparatively recent years that the presence of fish life at the greatest depths has been demonstrated.

Some day the deep waters off New Zealand will receive attention equal to that now bestowed upon the Mediterranean and the deep seas of Europe and America, and though one cannot hope to have such research undertaken in the near future, there is no reason why a small beginning should not be made at once, when investigations might be carried on to, say, the 200-fathom line. The results to be obtained would, without doubt, be great, and nothing tends to bring a country to the fore so much as active evidence of scientific enquiry and diligent research.

## Heaviest Passenger Engine.

What is said to be the heaviest passenger engine ever built has been delivered to the Lake Shore and Michigan Southern Railroad. It weighs 244,700 lbs., of which 170,000 lbs. are on the driving wheels. The engine and tender weigh 403,700 lbs., and the capacity for water is 7,800 gals., while that for coal is 15 tons. This powerful locomotive was designed as a step in the development of large passenger locomotives on the Lake Shore Road, which began about seven years ago, as a result of which this road has a series of successful designs. The Walschaerts gear has been generally adopted because of favourable experience in both freight and passenger service. The new locomotive is entirely free from untried devices or principles.

Think naught a trifle, though it small appear,  
Small sands the mountain moments make the year,  
And trifles, life.—Edward Young.

## Tying Down the Desert.

Over 150,000 acres of sand dunes in France, once blown about by the wind until they overwhelmed great stretches of fertile ground and even threatened to bury whole towns, are now covered with forests of pine, which produce turpentine, lumber, and charcoal.

A new apparatus for the determination of the mechanical equivalent of heat was recently described by Herr H. Rubens in a German paper. A brass tube, 60 centimetres long and  $4\frac{1}{2}$  centimetres in diameter, closed at the end by insulating caps, through which project inwards the bulbs of two thermometers, is firmly fixed coaxially within a slightly larger highly polished and nickel-plated brass cylinder with closed ends, which can be turned into a vertical plane about a horizontal axis through its middle point. The inner tube contains a cylindrical mass lead, weighing over 4 kilos., of but slightly less diameter, and of nearly half its volume; the remainder of the tube being filled with machine oil. Observation windows are provided so that the behaviour of the lead weight can be noted. The tube is quickly turned from its vertical position to another, halt is made for the short period needed for the weight to fall to the bottom of the tube, and the procedure is repeated, the rate of about ten turns a minute being possible. With this instrument the author has found  $J = 424.8$  as a mean of ten observations with an average variation of 1 per cent. from the mean.

## Progress for January.

The January issue of PROGRESS will contain the following specially contributed articles:—

### ASTRONOMY OF TO-DAY

By SIR ROBERT STOUT, K.C.M.G.

### WIRELESS TELEGRAPHY

By CAPT. LOUIS E. WALKER, Representative of the Marconi Company.

### THE CAUSES OF SPONTANEOUS COMBUSTION

By PROFESSOR EASTERFIELD, Victoria College, Wellington.

### DEVELOPMENT OF THE MARINE STEAM TURBINE

By the HON. C. A. PARSONS and R. J. WALKER.

### THE TRANSMUTATION OF METALS

By PROFESSOR ROBT. A. MILLIKAN, Ph.D.

### THE FINGER-PRINT SYSTEM

For the Identification of Criminals.

By WM G FITZGERALD, Author of *Travel and Exploration in Central Australia*.