creation of those distinct human races, the history of which is better known to us than that of any of the inferior animals?

So long as Geology had not lifted up a part of the veil which formerly concealed from the naturalist the history of the changes which the animate creation had undergone in times immediately antecedent to the Recent period, it was easy to treat these questions as too transcendental, or as lying too far beyond the domain of positive science to require serious discussion. But it is no longer possible to restrain curiosity from attempting to pry into the relations which connect the present state of the animal and vegetable worlds, as well as of the various races of mankind, with the state of the fauna and flora which immediately preceded.

In the very outset of the enquiry, we are met with the difficulty of defining what we mean by the terms "species" and "race"; and the surprise of the unlearned is usually great, when they discover how wide is the difference of opinion now prevailing as to the significance of words in such familiar use. But, in truth, we can come to no agreement as to such definitions, unless we have previously made up our minds on some of the most momentous of all the enigmas with which the human intellect ever attempted to grapple.

It is now thirty years since I gave an analysis in the first edition of my "Principles of Geology" of the views which had been put forth by Lamarck in the beginning of the century, on this subject. In that interval the progress made in zoology and botany, both in augmenting the number of known animals and plants, and in studying their physiology and geographical distribution, and, above all, in examining and describing fossil species, is so vast, that the additions made to our knowledge probably exceed all that was previously known; and what Lamarck then foretold has come to pass; the more new forms have been multiplied, the less are we able to decide what we mean by a variety, and what by a species. In fact, zoologists and botanists are not only more at a loss than ever how to define a species, but even to determine whether it has any real existence in nature, or is a mere abstraction of the human intellect, some contending that it is constant within certain narrow and impassable limits of variability, others that it is capable of indefinite and endless modification.

Science News Letter, June 17, 1933

ICHTHYOLOGY

Not All Fish Are Voiceless; Some Can Call Their Mates

FISH ARE commonly reputed to be voiceless, yet some species can make sounds that apparently serve as calls to their mates. So stated Dr. Shinkishi Hatai, marine biologist of the Tohuku Imperial University, Japan, before the Fifth Pacific Science Congress. Several species of fish produce distinct sounds, he said, either by friction of the fins, grinding their teeth, emitting air through a narrow passage or through specially developed sound-producing organs. These sounds may serve as warnings as well as for mate-calls.

Dr. Hatai developed this point during a discussion of the sensitiveness of fish and other marine organisms to vibrations in general. A very little movement of a boat's oars, he related, served to attract to his boat numerous specimens of the handsome red Japanese fish called "tai" at a distance of forty yards.

This sensitiveness of fish to changes in their environment, imperceptible to human organs or man-made instruments, may have considerable importance, both scientific and economic, in connection with the almost incessant earthquakes with which Japan is visited. Before two recent rather severe earthquakes the uneasiness of the sea fish in certain regions was noted. On both occasions they consistently refused baited hooks.

The consequences of an earthquake that changes the level of the sea bottom may be revolutionary to the animal societies living on it or in the water above it Dr. Hatai continued. Most bottom communities are adjusted to a given depth of water, as it affects quality and intensity of light, oxygen concentration, and other factors. In turn, these anchored animals and plants are related to the swimming animal population in the roles of food, shelter, enemies, etc. An earthquake that revolutionizes the life balance on a given stretch of sea bottom may very well ruin a whole fishing community though it does not wreck a house or a boat, simply through the changes it brings to pass in the animal communities that constitute the support of the people.

Science News Letter, June 17, 1933

GEOLOGY

Atlantic Coast Damage Worst in Years

ACCUMULATING reports reveal that the past winter brought the worst damage in years to the Atlantic coast. Numerous buildings and shore structures were battered into a state of wreckage by stormy waves. Abnormal amounts of soil were stolen from the shore line by the sea.

The damage is laid to a succession of extreme storm tides such as occur every 25 to 30 years. In intervening years it is the usual thing for damage to the coast to total millions of dollars, but in years of storm tides the losses pyramid.

In editorial comment on this serious property loss, the *Engineering News-Record* calls upon coast states to take defensive action. Local protective measures against storms and tides are of little effect, it is pointed out, because resistance of any one section of the shore line is interwoven with the resistance of adjoining sections.

Declaring that few states have taken cognizance of the situation, the editor urges that protecting the coast against the sea should be one of the major fields of public improvement construction.

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