

circumarea. To express the submerged zonation on the sea coast, the English word *shelf* can be used. This is authorized by everyday speech, for we refer to a shelf of rock, a continental shelf, or a shelving beach. To speak of the marine shelves, *i. e.*, the *Fucus* shelf, the *Laminaria* shelf, would be to use the word with exactness. For the zonation of a beach, strand, river shore or prairie edge, the writer suggests the word *strip*. We should then speak of the shrubby strip, the grassy strip, the forest strip, etc. The idea of zonation on a river island, where the vegetation of a particular band runs completely around the island, and not continued lengthwise, as the word strip implies, the term *girdle* could be used. For forest zonation, where it is vertical, the term *layer* (stratum), or story ought to be accepted.

These terms are proposed because it seems to the writer that as the time approaches for the convocation of the Botanical Congress at Vienna in June, a full ventilation of nomenclatorial views should be made, not only for discussion, but also as suggestions to those who will take part in the deliberations of the congress.

JOHN W. HARSHBERGER.

UNIVERSITY OF PENNSYLVANIA.

SPECIAL ARTICLES.

ON THE HABITS OF THE GREAT WHALE SHARK (RHINEODON TYPUS).

ONE of the most interesting of fishes and by far the largest of all is the *Rhineodon typus* (better known by the later name *Rhinodon typicus*). This has received the quasi-ver-nacular name whale shark, although, under the native Indian name (Mhor) it has been the object of a regular fishery for a long time along the northwestern coast of India (Sind). One might naturally suppose that the animal was so rare that nothing was known of its range or habits if the most recent works, popular as well as scientific, were consulted, but really, scattered through various volumes, many data may be found. A gentleman desirous of learning the history of the fish was unable to find data I informed him about,

even after I had told him in what periodicals they were published. I, therefore, found them for him, and the difficulty that had been experienced by him, and may be by others, leads me to summarize the information that may be gleaned.

The species was first named *Rhineodon* typus* by Dr. Andrew Smith in 1829, in the *Zoological Journal*, and the genus was adopted by Bonaparte in 1832 in the *Giornale arcadico di Scienze*, etc. (vol. 52). The numerous subsequent modifications of the name and notices of the species do not demand consideration in this place.

In 1850 an article, 'On Shark Fishing at Kurrachee' was communicated by George Buist to the *Proceedings of the Zoological Society* (pp. 100-102) and in it is an unmistakable reference to the whale shark, but which has been overlooked and not identified by Indian or other zoologists. From this and other recent sources the following account is compiled.

* * * * *

The greatest—the most gigantic—of the sharks is one not uncommon in the Indian Ocean, but which, on account of its huge size, is represented by remains in very few museums and is little known. It is the *Rhineodon typus*, the type not only of the genus *Rhineodon*, but of an independent family—Rhineodontids; the not inappropriate name whale shark has been coined for it.

The whale shark is a huge animal occasionally, it is said, attaining to a length of sixty feet, although the average size is much less; it may be considered a pelagic species, not willingly often approaching land. It is a slow, apathetic animal, mostly living near the surface of the ocean and often resting, idly floating along and supposed to be 'sleeping.'

Its gigantic size is in inverse ratio to its food. Unlike the giant *Carcharodon* or man-eater, it has extremely small teeth and its food consists of very minute animals. Its teeth, indeed, are quite similar (in a general way)

* The generic name was misprinted *Rhincodon*—evidently a typographical error.

to those of a skate (*Raia*), almost immovable, in many transverse rows, and with acute backward-directed points and bulging heel-like bases. It has a straining apparatus, somewhat like that of the basking shark (*Cetorhinus maximus*) and its food is analogous to that of its northern relative. It consists of the minute copepod and other crustaceans as well as mollusks which live about the surface of the ocean. These flourish in such abundance as to compensate by their number for their small size. In fact, like those other giants of the sea, some of the whale-bone whales, it finds enough for growth and the enjoyment of life among the smallest of animals.

Nothing is known of its reproductive habits but it has been assumed that, like its nearest relatives, it is ovoviviparous.

According to E. Perceval Wright, 'it is quite a harmless fish, with a mouth of immense width, furnished with small teeth,' really very minute. "It now and then rubs itself against a large pirogue, as a consequence upsetting it, but under these circumstances, it never attacks or molests the men, and while it reigns as a monster among the sharks, is not, despite its size, as formidable as the common dog-fish"—save in the line of upsetting!

Dr. Buist, as early as 1850, referred to it as the 'mhor or great basking shark' and stated that it was frequently captured at Kur-rachee (not far from the mouth of the Indus). "It is found floating or asleep near the surface of the water; it is then struck with a harpoon." The stricken fish is "allowed to run till tired; it is then pulled in, and beaten with clubs till stunned. A large hook is now hooked into its eyes or nostrils, or wherever it can be got most easily attached, and by this the shark is towed on shore; several boats are requisite for towing. The mhor is often forty, sometimes sixty, feet in length; the mouth is occasionally four feet wide."

The later literature respecting the species has been already summarized in SCIENCE (1902, N. S., XV., 824-826).

THEO. GILL.

A FAUNAL SURVEY OF THE FOREST RESERVES IN
THE SANDHILL REGION OF NEBRASKA AND OF
THE LAKES IN THAT REGION.

NEBRASKA is, from a faunal standpoint, one of the most interesting states in the Union. Owing to its geographical location, to a range in altitude of from 810 to 5,300 feet, to variations in soil, climate and vegetation, the state contains a fauna rich in species and in great variety. Along the Missouri River, which forms the eastern boundary of the state, and following westward out the tributary streams into the prairie region, is a growth of purely deciduous timber representing species of trees derived from the south and east and including oaks, hickories, walnut, butternut, honey locust, Kentucky coffee-tree, wild cherry, etc.; while spreading into the state from the north and west and following down the Niobrara River nearly to its mouth is a growth of pine, together with quaking aspen, balsam poplar, mountain maple and black birch.

Midway across the state and at an average altitude of 3,000 feet lies a region of extreme interest, one of sandhills, varying in height up to 250 feet, so thickly scattered as to make a surface as rough as can well be imagined. The region is sharply defined. Streams flow out of it toward the east and south which have carried away sand to deposit it as sandbars lower down their courses, making in that way valleys running back into the hills and up which extend fringes of low trees and shrubbery, the advance guard of the tree growth from the southeast. To the north and west of this region are plains cut into by pine-clad canyons. In the sandhill region proper, however, no native trees of any kind are found, although there are here and there patches of stunted bushes—sand cherry, plum, rose, *Ceanothus* and June berry. Throughout this area, which in extent equals one fifth the total area of the state, or about 11,000 square miles, forest conditions are quite absent and forest animals absolutely lacking.

In this region the government has recently set aside two tracts of land as forest reserves. One, known as the Dismal River Reserve, in Thomas County, has an area of 86,000 acres, the other, the Niobrara Reserve, in northern