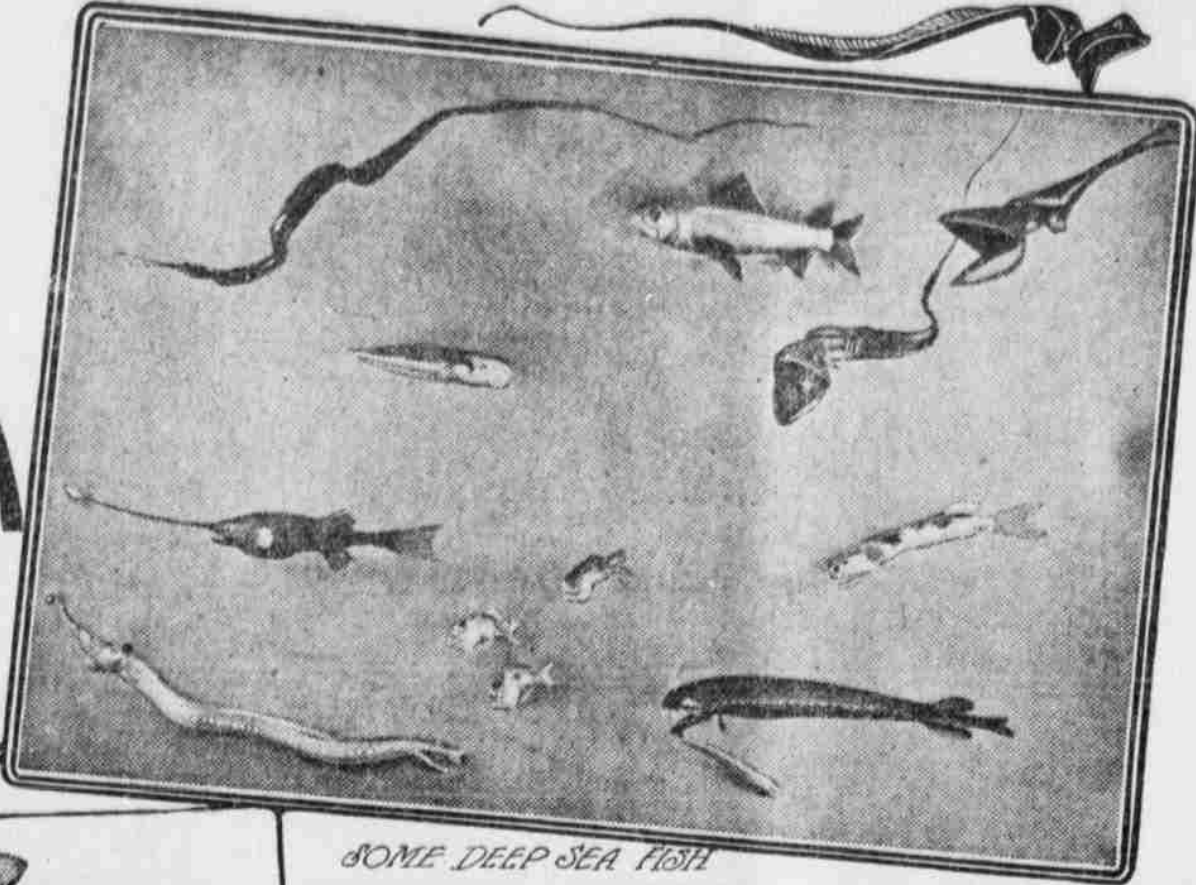


# FISHES of the DEEP SEA

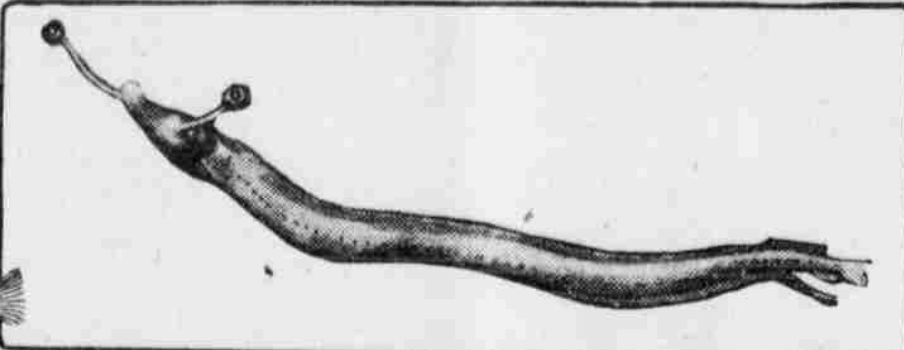
L. HUSSAKOF  
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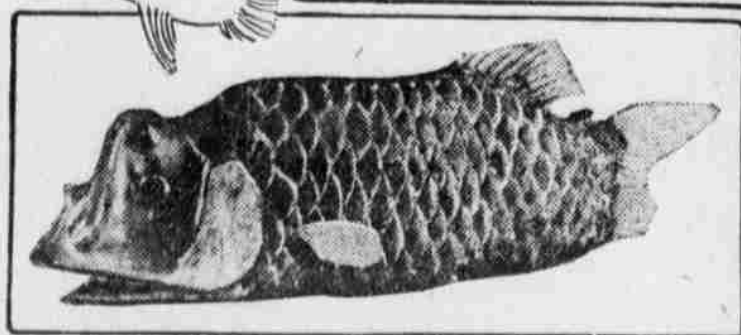
SOME DEEP SEA FISH



GIGANTURA CHUNI



STYLOPHTHALMUS PARADOXUS



OPISTHOPROCTUS SOLEATUS

UNTIL the time of the "Challenger" expedition, very little was known regarding the fish life of the abyssal depths of the sea. Only about 30 species were known. But the wonderful collections brought back by the "Challenger" from her four-year cruise (1873-1876) made known the vast diversity, the strangeness and even weirdness of this fish fauna. Several hundred kinds of deep-sea fishes had been collected—some of them dredged from a depth of more than a mile—and it required a huge quarto to describe and picture them. From this volume dates our real knowledge of the fishes of the abyssal deep. The "Challenger" expedition was, indeed, a "Columbus voyage" in ichthyology; it opened a new chapter in the history of the sciences.

Since that time many deep-sea exploring expeditions have been sent out by the various nations, and hosts of other fishes have been brought up from the oceans in all parts of the world. More than a thousand species are now known, and we can appreciate at its full value the richness and strangeness of this fauna. Moreover, not only do we know the fishes themselves, but, as a result of the scientific investigations carried on by the various expeditions, we now know a good deal of the physical conditions under which they live, so that we can, in a measure at least, explain the why and wherefore of their extraordinary characteristics.

When we think of life in the deep-sea, there comes to mind, first of all, the enormous pressure which these creatures must withstand. This pressure becomes the greater the deeper we go down, and in the profoundest depths it equals thousands of pounds to the square inch. The result of this pressure is that the tissues of these fishes are tender and loosely knitted together. When they are brought up out of the dark depths, and the great pressure under which they live is removed, the explosion of the gases within them bulges out the eyes, and often blows out the viscera through the mouth, while the muscles collapse, leaving them soft and flabby like moist rags. Most deep-sea fishes are very small also, usually only a few inches in length, and it is probable that this reduction in size has come about, to some extent at least, from the great pressure under which they live.

Another important condition is the dimness of light, or even darkness in the profound depths of the sea. If we imagine ourselves descending into the deep ocean, we see the light grow dimmer and dimmer as we go down, until finally a level is reached beyond which no light penetrates at all. The entire vast depth below it, is in eternal darkness. Now the fishes living in this dim light, or in total darkness, have been profoundly modified by it. In some forms the eyes have become very small, and in some cases have entirely disappeared. There are even fishes in which the skin and scales of the body have grown over the place where the eyes should be, so that these fishes are, as has been aptly said, "blind beyond redemption." Other forms, on the other hand, have been affected in an entirely different way. The eyes, instead of growing smaller, have grown larger, as if in an attempt to catch every fleeting ray of light. In some fishes this has been carried so far that the eyes have become like enormous goggles.

Most deep-sea fishes have luminous organs of one kind or another, so that they carry their own light about with them. In some the entire body glimmers, the coating of slime which exudes from the pores and lateral canals, emitting a soft silvery glow. In others rows of minute, luminous organs run along the sides of the body, or there are flashing light-spots on the head or face. What a wonderful sight would be to us a small black fish flitting through the silence and darkness of the deep with its headlights and row of pores gleaming through the darkness like some small ship passing through the night with its portholes all aglow! Some deep-sea fishes have a luminous organ at the end of a feeler on the head.

A pertinent question may be asked: How do we know these fishes glow and glimmer, since no human eye has ever beheld them in their abyssal home? We know this partly from analogy and partly from actual observation. When one is in a boat in the tropics, on one of those sultry nights when everything is a dead calm, and the black clouds hang so low that sky and sea form one continuous blackness, then one may see the glimmering fishes darting out of the path of the boat, their forms, silvery and ghost-like, outlined for one moment against the blackness of the sea. This effect is chiefly due to the oxidizing of the slimy secretion covering their bodies. Why shall we not believe, then, that in deep-sea fishes a similar phenomenon takes place, particularly as in many of them

the slime pores and canals are greatly developed and must exude large quantities of slime? Then too, on deep-sea expeditions, on favorable occasions, as for instance, a dark calm night, fishes that have been brought to the surface and placed in water were seen to flash light from the ends of the tentacles or the phosphorescent pores, precisely as we should have expected from a study of these organs. Major Alcock, in his interesting volume, "A Naturalist in Indian Seas," mentions a specimen brought up from a profound depth which "glimmered like a ghost as it lay dead at the bottom of the pail of turbid seawater." So that by inference, as well as by actual observation, we must believe that what we call luminous organs in deep-sea fishes, emit light into the darkness about them. In the case of fishes totally blind, the absence of light is compensated for by the development of enormous antennae-like feelers, modified from fin rays, so that these fishes can feel their way, as it were, through the darkness.

The absence of light, however, entails another important consequence. As is well known, no plant life can exist in darkness. There is therefore no vegetation of any kind in the profound depths of the sea. The deep-sea fishes are, in consequence, all carnivorous, the more powerful ones seizing and devouring the weaker ones. It is a cold black world where might reigns supreme. Many have enormous mouths, and formidable teeth to insure holding the prey. In some forms the teeth are so large that the mouth cannot be shut!

The temperature of the water in the profound depths of the sea, is always low and near the freezing point. This is true everywhere, even at the equator. Undoubtedly this has an effect upon the fishes, although it is not yet known what it is. The amount of oxygen dissolved in the water also, is much less than in water nearer the surface. The breathing apparatus of the deep-sea fishes is modified to suit their peculiar conditions. The gill filaments have become much reduced in size, and in a number of instances some of the gill arches bear no gill filaments at all. The fishes are apparently adapted to a much smaller oxygen supply than those living in rivers or in the shallow sea.

When we think of the vast diversity among these fishes, the question arises: Are they all representatives of a single family or group that has become specially adapted to life in the deep sea; or do they belong to different families or groups? One need hardly be an ichthyologist to answer this question. Even a cursory examination of the plates in a work on deep-sea fishes will show that different types are represented. In fact, a great many families are included in the deep-sea fauna. There are sharks and rays; salmonoids, herrings, perches, eels, and representatives of many other families. We can explain this heterogeneity among them in this way. We may imagine that fishes of many different kinds in their search, so to speak, for the unoccupied corners of the sea, found a haven in these deeper waters where they were free from pursuit by their enemies. In the course of time they migrated farther and farther into the deep, a change in habits taking place pari passu with the changes in structure. Having started out with different organizations, and possessing different degrees of variability, they became differentiated in diverse directions, so that while some developed enormous mouths, powerful teeth, or phosphorescent organs, others became bottom-living and partly or completely lost their eyes. Still others developed long feelers for groping their way through the darkness. Now and again, however, fishes of separate groups developed similar structures, so that there are many striking cases among deep-sea fishes of what the biologist calls "convergence," or parallelism.

The museum has recently prepared for exhibition a number of typical deep-sea fishes arranged in the form of a group. The preparation of this exhibit involved many technical difficulties, such as the modeling of the fishes in transparent or translucent media, to represent them as glimmering or shining with lit-up "portholes." Considerable experimenting was necessary to

accomplish this group, but all the difficulties were overcome, thanks to the ingenuity and perseverance of Mr. F. F. Horter of the museum's taxidermist staff. The group, as it is now installed, represents ten types of deep-sea fishes. It is not, of course, a group in the sense of the habitat groups displayed in the museum; it is not a section, so to speak, taken from nature and transplanted to the museum. In nature so many deep-sea fishes are not to be found in so small a space. What the group represents is a number of fishes which are in nature scattered over a vast area and through a great height of water, here brought together for museum purposes into a few square feet of space. Each fish is reproduced accurately with its phosphorescent pores and tentacles as these are known to exist. With one or two exceptions they are enlarged several times, as the fishes themselves are very small. And since it is known that the phosphorescent organs do not glow with a steady light, the illumination of the group has been arranged so as to have these luminous organs flash intermittently. Furthermore, the installation is arranged so that one may view the fishes for a few seconds in full light, as if in a synoptic exhibit, and then see them, when the light goes out, as they are supposed to appear in the darkness of the profound depths, lit up only by their own phosphorescent organs.

Near the top of the group is seen a fish which lives on the border line between the region of dimness and total darkness. Many of the fishes living in this region are not of a uniform somber hue, but are brilliantly colored. Neoscopelus is one of these. The body is "one dazzling sheen of purple and silver and burnished gold, amid which is a sparkling constellation of luminous organs" (Alcock). The glowing fish in the center is Barathronus diaphanus, a small fish known from a single specimen, which was dredged in the Indian ocean at a depth of a little over four-fifths of a mile. The model of it is one and one-half times the natural size. The phosphorescent fish with the curious long tail (at the right) is Gigantura chuni. It, also, is known by only a single specimen. This was brought up from a depth of four-fifths of a mile in the Gulf of Guinea, on the west coast of Africa. The model is twice the natural size.

The two dark fishes with enormous gaping mouths (near the top, at the right) are Gastrostomus bairdi. This species is commoner than some of the others, a number of specimens being in several museums. The models of it in the group are copied life-size from a specimen in the museum. The species occurs in the Atlantic ocean, near the American coast, in the path of ocean liners. Specimens have been dredged from a depth of nearly three miles.

Near the bottom of the group at the left-hand side, is seen an eel-like fish with a line of lit-up pores. This is an enlarged model of Stylophthalmus paradoxus, a small silvery fish widely distributed in all the oceans, whose young also are known. The generic name it bears was given it in allusion to the fact that the eyes are perched on long slender tentacles. The species ranges from a depth of a little less than a mile to two and one-half miles. Another form with tentacles is Gigantactis vanhoefeni, a species typical of many deep-sea fishes which have a tentacle, terminating in a luminous organ, attached to the head. This tentacle serves as a lure for attracting prey. The present species is known by only two specimens which were found in the Indian ocean at a mile and a half and a half from the surface. The creature is a very small fish, the model being enlarged six times.

#### HIS STATUS.

"As a motorist, is Jinks in the running?"  
"Is he? He ran up a bill for repairs, ran down a woman in the street, ran away from a running comment of the crowd and was run in by a policeman."

#### NATURALLY.

"The new idea of fresh-air games is working well in the insane asylum, isn't it?"  
"Yes, indeed. The inmates are just crazy about it."

#### JUST IT.

"That motorist was developing railroad speed when the cop got him."  
"I see. A case of arrested development."

# WHO'S WHO—and WHEREFORE

## INVENTOR OF SUBMARINE



If the war continues for two years England will have to use cargo-carrying submarines to import food from the United States, in the opinion of Simon Lake, submarine inventor and president of the Lake Torpedo company, Bridgeport, Conn.

Captain Lake, whose company is constructing undersea boats for our navy, is encouraged in this belief by the 5,500-mile trip, on an initial supply of fuel, made by the G-3 of the United States navy.

"The G-3 made that trip at a speed of 11 knots an hour," he said. "At reduced speed she can cover a greater distance."

"Between 18 and 24 months from now, should the war run that long, the ships of the Teutonic allies will close the seas to surface shipments of food, ammunition and other supplies from this country to England. You can readily see that some other method of shipment will have to be adopted."

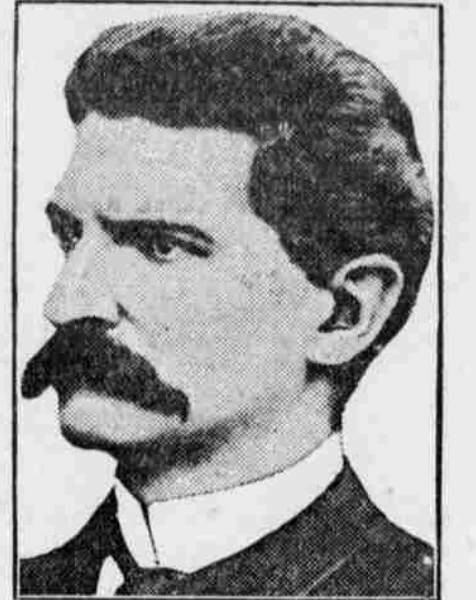
And why not the submarine? Secret stations will be established on the English coast, from which long lines of mines will extend out in parallel lines. Only the captains of the submarines and the officers at the landing stations will know the location of these mines. Airships will be sent from the shore to watch for hostile submarines and, even should hostile airships succeed in locating the submarine freight boats, they would be unable to destroy the submarines unless they rose to the surface."

## THE SPHINX OF ITALY

Signor Sidney Sonnino, Italy's minister for foreign affairs, is known in the Italian press as "the Sphinx." He has twice been premier and has three times declined the honor, he has been minister of finance, has served in the diplomatic corps at Paris, Vienna, Madrid, and has sat in parliament 34 years.

With this varied experience in governmental affairs, he was sought by the king to guide the cabinet in the crisis brought about by the outbreak of war. Sonnino declined, fearing, it is said, that he would not be able to command the necessary support in parliament. He has always declared he "belonged neither to the right, nor to the left," meaning that he adopted no policy of open support or opposition to the government. He is a liberal.

He is an exceedingly cultured man, a good classical scholar and a distinguished commentator of Dante. His knowledge of state affairs is complete, but he lacks parliamentary ability. His speeches are cold and uninspiring.



## HIGHLY HONORED WOMAN



For the first time in its history Columbia university conferred the honorary degree of LL. D. on a woman recently. She is Miss Louisa Lee Schuyler and she was born in New York in 1837. Miss Schuyler was prominent in the work of the sanitary commission in the Civil war. Since that time she has been prominent in hospital and poorhouse work and she founded the State Charities Aid association in 1872. She established the Bellevue Hospital Training school for nurses and she has done much other notable philanthropic work. Miss Schuyler is a great-granddaughter of Alexander Hamilton and of Gen. Philip Schuyler of the American revolution.

Although Miss Schuyler is no longer young, her days of activity are by no means over. It was only nine years ago that she organized the first committee in the United States for the care of the insane, and a year later she was appointed one of the original trustees of the Russell Sage foundation. In 1908 she organized the first committee in this country for prevention of blindness, and it was composed of both physicians and laymen.

In addition to the varied and ceaseless activities already sketched, Miss Schuyler has written voluminously upon the subjects in which she is recognized as a leading authority.

## GIVEN IMPORTANT POST

When Secretary of State Lansing selected Frank Lyon Polk for the highly important position of counselor of the state department, he picked an accomplished lawyer and a man of wide experience.

Mr. Polk is the son of Dr. William Mecklenburg Polk, dean of the Cornell Medical school, the grandson of the Confederate bishop-general, Leonidas Polk, and the grandnephew of President James K. Polk. He was born in 1871 and was graduated from Yale in 1894. He studied law at Columbia Law school and was graduated from there in 1897. In 1898 he went to the Spanish war with Troop A and became assistant quartermaster under General Ernst with the rank of captain. In 1908 he married Miss Elizabeth Potter, daughter of Mr. and Mrs. James Potter of Philadelphia. They have three children.

Mr. Polk was treasurer of the bureau of municipal research during Mayor McClellan's administration and a member of the Thomas Mott Osborne Democratic league in the early days of the Dix campaign. In January, 1914, he was appointed corporation counsel of New York by Mayor Mitchell, his close friend. He was riding with Mayor Mitchell last year when a grievance-crazed man shot at the mayor. The bullet missed its mark and struck Mr. Polk in the left cheek.

