The new society now numbers some two hundred members, each of whom pays the small annual assessment of two francs. All persons are invited to join, and thus to assist this most worthy object, the expenses of which, especially in the way of publication, must be very considerable.

THE DEEP-SEA CRUSTACEA DREDGED BY THE TALISMAN.[1]

CRUSTACEA are distributed from the surface of the water to very great depths; and, at the exhibition of the Talisman collection, one may see Neptunus Sayi and Nautilograpsus minutus of the Sargasso, whose color they have assumed, side by side with other forms, as Ethusa alba, which is only found between four and five thousand metres below the surface. The swimming crustaceans, forming the group of Brachyura, are extremely rare at great depths. Certain forms of these crabs, taken on the Talisman, are remarkable for their geographical distribution, such as Bathynectes, found at four hundred and fifty and nine hundred and fifty metres, on the coasts of Morocco, and at the Cape Verde Islands, and which much resemble the Portunus of our coasts. On the other hand, they are very like species of the same genus, obtained at the Antilles, in the German ocean, and in the Mediterranean. The Oxyrhynchi, other triangular crustaceans of the group of Brachyura, are found lower than the last. Lispognatus Thompsoni was found between six hundred and fifteen hundred metres, on the Morocco coasts; and Scyramathia Carpenteri, in the same region, at twelve hundred metres. The former species had before been observed only in the German ocean; and the latter, north of Scotland and in the Mediterranean.

Crustaceans, intermediate in form between the brachyurans and macrurans, are found in abundance in deep water. They seem to belong to genera between the two; and, in studying Crustacea, it is surprising to see types, which, taken separately, appear absolutely distinct, brought into contact by these intermediate forms. Thus the genera Ethusa, Dorippe, Homola, and Dromia, are linked together by many forms, with blended characteristics, rendering them difficult to classify. Several of the crustaceans are remarkable for their geographical distribution. Thus, on the coasts of Morocco, there was found a species of Dicranomia, noticed by Edwards in the Caribbean; and Homola of Cuvier, considered

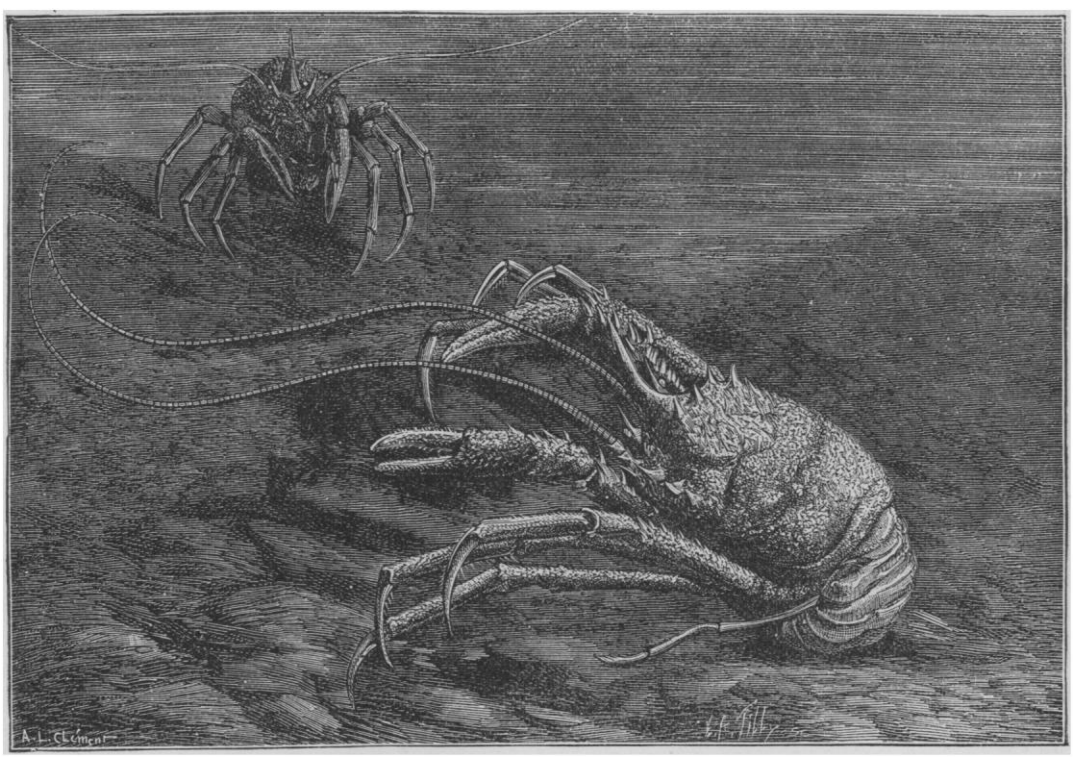

FIG. 1.—GALATHODES ANTONII, A BLIND CRUSTACEAN FROM A DEPTH OF 4,100 METRES. (NATURAL SIZE.)

[1] Translated from the French of H. FILHOL, in *La Nature*.

before as peculiar to the Mediterranean, was found extending from the coasts of Morocco to the Azores and the Canaries. But the most noticeable example of great geographical distribution is presented by Lithodes. These animals have hitherto been noticed only at the surface, in the waters of the poles. We found them at the tropics. But here, to meet the changed conditions of their surroundings, they have deserted their former depth for one of a thousand metres. This fact is important as bearing on the animal distribution of the oceans. It shows, first, that certain animal forms extend from northern seas to the tropics; and, next, that animals from the poles have only to seek deeper water in proportion as they approach the warmer regions, to reach a zone suited to their organization.

The Paguri, commonly called hermit-crabs, have been found at five thousand metres. The bodies of these animals are protected only at the head and thorax; and, to shield their abdomens, they lodge in shells whose size corresponds to their own. But, as the shells of deep water are always very small, the abyssal Paguri obtain only very imperfect protection. One of these species, obtained on the Morocco coast and in the Sargasso, presents a very singular habitat. It lodges, not in a shell, but in a regular animal colony formed by beautiful Epizoanthi. These Zoanthi originally developed in a shell which has been gradually re-absorbed; and it is the cavity corresponding to this which this peculiar species of hermit-crab now occupies.

Galatheans have been found abundant at all zones; and the color of the body, generally reddish, becomes white with those living at great depths. Certain species establish themselves as lodgers in the interior of those beautiful sponges, the Aphrocallistes, whose tissue resembles lace. Galathodes Antonii, a new species, a specimen of which was taken below four thousand metres, is here figured (fig. 1). Ptychogaster formosus (fig. 2) is interesting on account of the position of its abdomen, folded twice upon itself.

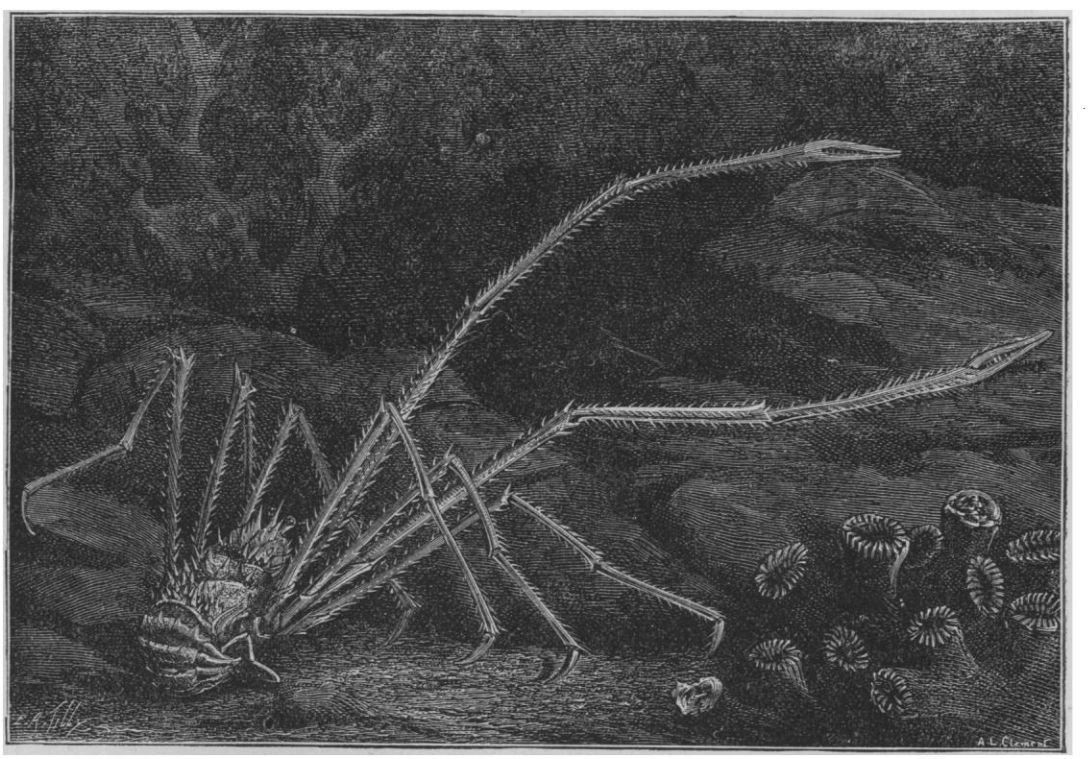

FIG. 2.—PTYCHOGASTER FORMOSUS, DREDGED FROM A DEPTH OF 950 METRES. (NATURAL SIZE.)

The group of the Eryonides is represented by a number of species and genera. Polycheles and Willemoesia, whose tissues are so transparent that the stomach is visible through them, were taken at four and five thousand metres. The species of Pentacheles, common between one and two thousand metres, present forms very similar to those described in the fossil state, under the name of Eryon. At the exhibition of the Talisman collection, there is placed beside Pentacheles crucifer a calcareous plate coming from the Jurassic deposits of Solenhofen in

Bavaria, on which is the impression of an Eryon; and a comparison of these specimens impresses one with their great resemblance.

The macrurans, a group to which the crayfish belong, are abundant at all depths. At the Cape Verde Islands, at five hundred metres, a thousand individuals of a new species of Pendale were obtained. Among the most remarkable forms, I will mention a beautiful red Aristes, whose antennae are five or six times as long as the body; Nematocarcinus (fig. 3), whose claws are disproportionately long; Oplophorus; Notostomus, of a vivid red; Acantephyra; Pasiphae, sometimes brown, sometimes rose-colored, often covered with red spots; and Glyphus, one species of which, Glyphus marsupialis, has a very strange arrangement, the lateral plates of the first abdominal segment being developed in the female to form a pouch for the eggs. I will call

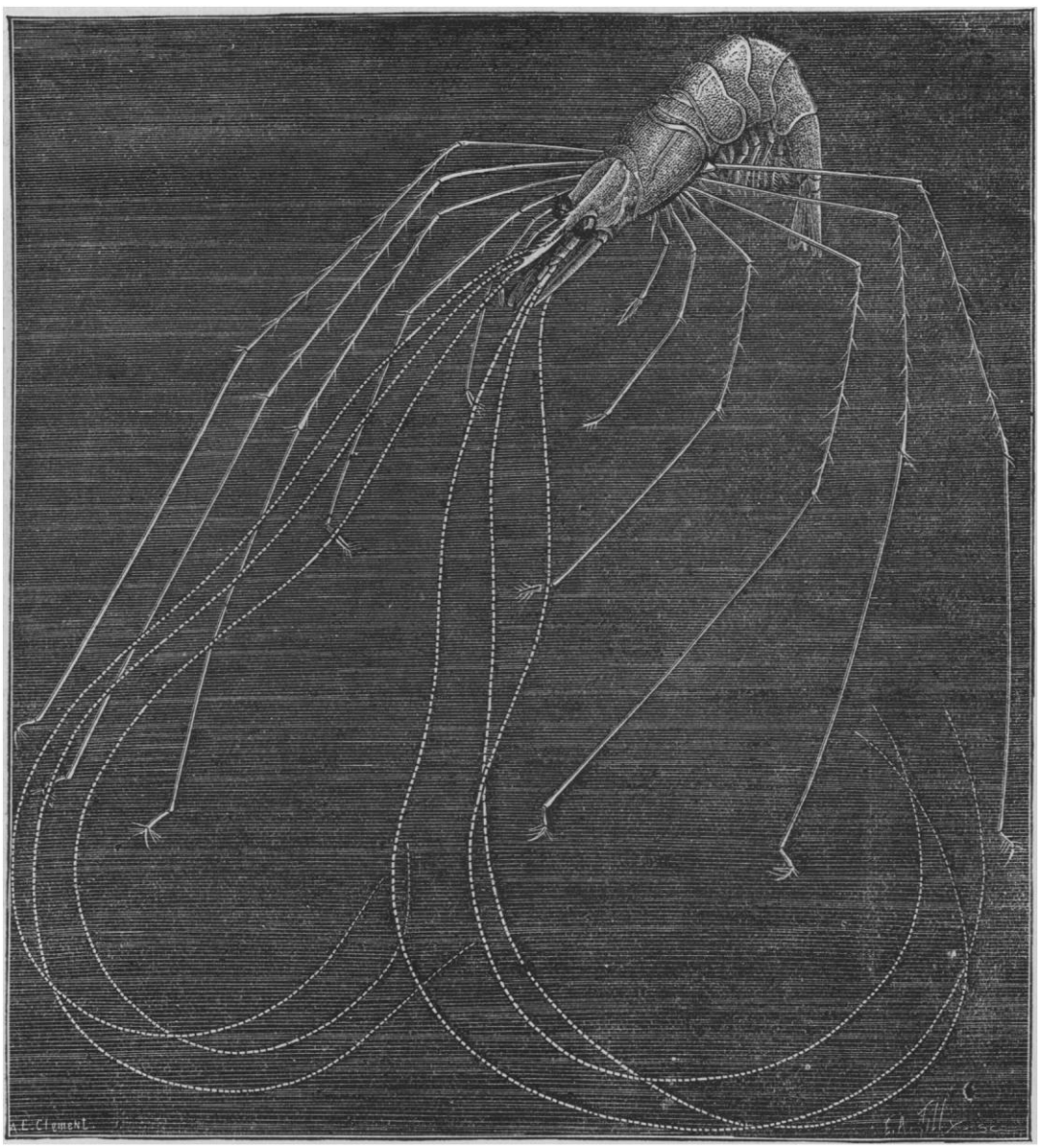

FIG. 3.— NEMATOCARCINUS GRACILIPES, TAKEN IN THE TRAWL AT A DEPTH OF 850 METRES. (NATURAL SIZE.)

attention, finally, among the schizopods, to Gnatauphausia, of large size, and of a scarlet color. The lower crustaceans, Amphipoda and Isopoda, were found in large numbers; but a study of them is much less interesting than that of the forms of which we have just spoken. The species of Nymphon is abundant at great depths; and a giant form, whose stomach extends to the end of its claws, Colossendeis titan, was taken at four thousand metres.

With crustaceans, as with fishes, it is very interesting to inquire whether the circumstances surrounding them cause modifications and adaptations in their organisms. The changes in the tissues are often noticeable in the structure of the carapace and muscles. I have already called attention to Pentacheles, Polycheles, and Willemoesia, whose tissues are so transparent as to allow the viscera to be seen; and the flesh is tender, and lacking flavor. The exterior colors are either a bright red, a rose-white, or a pure white. The macruran Crustacea are specially noticeable for their brilliant colors: and one cannot restrain a feeling of admiration for Aristes, of a carmine color; Notostomus, of a pure, deep red; and Pasiphae, spotted red and white. At very great depths, rose-white or pure white are the only tints observed.

With the fishes, as we have seen, the visual organs are always well developed, at whatever depth these animals are taken. It is not so with the Crustacea, several species of quite different groups having experienced atrophy, and sometimes a complete disappearance of the eyes. It is, however, a very singular fact, that some species in the same genus are blind, and others are not. Thus Ethusa granulata, living in the German ocean, between two hundred and thirteen hundred metres, is blind; while Ethusa alba, taken in the Atlantic, at five thousand metres, is not blind. The disappearance of the eyes seems to be gradual, and to be related to the depth at which the animal lives. The cornea first disappears, the ocular stalk remaining, and being movable. Then these parts become fixed, and, losing their characters, are changed into spines. Thus, says Norman, "Ethusa granulata, dredged between one hundred and ten and three hundred and seventy fathoms, has two remarkable ocular stalks, smooth and rounded at the extremity, where ordinarily the eyes are placed. With the specimens from the north, living at a depth of from five hundred and forty-two to seven hundred and five fathoms, the ocular stalks are no longer movable: they become fixed in the sockets, and their function is changed. Their dimensions are much enlarged; they approach their foundation; and, instead of being rounded, they end in a very firm rostrum. No longer serving as eyes, they serve as rostra." We have on exhibition one blind species, Galathodes Antonii (fig. 1), taken on the Talisman; and near this strange form, whose eyes are replaced by sharp spines, may be seen Pentacheles, Polycheles, Willemoesia, and Cymonomus, whose eyes are more or less changed.

Crustaceans of great depths emit phosphorescence. The light is shed, sometimes by the whole surface of the body, and sometimes, as with Aristes, in a special manner, by the eyes themselves. With some of them it seems as if there were, in certain parts of the body, organs arranged for the production of this light, — a fact which recalls what was said about fishes. Thus in Acantephyra pellucida, a new species, the claws are furnished with phosphorescent bands. The organs of touch are considerably developed, the most remarkable example of which is found in the long antennae of Aristes. With certain crustaceans, as in Benthesisymnus, the last pair of claws assume the character of antennae, and have the same function, probably, as these organs.

THE WOBURN ROTATION EXPERIMENTS.

FOR the past six years some very interesting field-experiments have been in progress at Woburn, Eng., under the conduct of Dr. Voelcker, chemist of the Royal agricultural society. A portion of these experiments are upon the continuous growth of wheat and barley on the same land, and closely resemble the celebrated Rothamsted experiments, differing from them in being made upon light land. Other of the experiments are rotation experiments, and are designed to test the comparative agricultural value of artificial fertilizers, and of barnyard-manure made from different feeding-stuffs. These experiments are to be continued for a series of years; but a brief description of their plan, and a statement of the results obtained up to the present time, may not be without interest.

The rotation is an ordinary four-course rotation; viz., roots, barley, grass, and wheat. Sixteen acres are under experiment; so that, in any given year, four acres are covered by each crop, while, in the course of four years, each plot of four acres bears successively the crops above enumerated. The following table shows at one view the crops thus far carried by each plot: —

Date.	Plot 1.	Plot 2.	Plot 3.	Plot 4.
1877	Grass	Roots	-	-
1878	Wheat	Barley	Grass	Roots
1879	Roots	Grass	Wheat	Barley
1880	Barley	Wheat	Roots	Grass
1881	Grass	Roots	Barley	Wheat
1882	Wheat	Barley	Grass	Roots
1883	Roots	Grass	Wheat	Barley

Each plot of four acres is subdivided into four one-acre sections, and these are fertilized in different ways. As each of the four plots is treated exactly alike in successive years, it will suffice to follow one plot through the four years, in order to understand how each section of it is fertilized. Plot No. 1 was in grass in 1877, the grass being a mixture of clover and rye-grass. Sheep were pastured on each of the four sections of this plot sufficient to consume the grass. To the sheep on the first section were given 728 pounds of decorticated cottonseed-meal, and to