expense for many years and has published a number of papers relating to it.

An invitation has been extended to medical men and others the world over to cooperate. This cooperation, while of the greatest importance, and indeed in default of any of the other support so much needed—of prime importance—can only be disconnected and very incomplete.

Residence in the tropics and in a leprosy center, together with the hearty cooperation of Dr. Howard, of Washington, Dr. Carter, of the University of Texas at Galveston, and others has made possible a good beginning by the writer. Indeed, an interesting result already to be noted is that one of the common rat fleas of the southern gulf ports is the same as the common species in Havana, and of the group of tropical rat fleas closely related to *Pulex irritans,* and thus very likely to bite human beings when opportunity offers. An utter lack of extensive collections from human beings at any of these places makes useful, well-founded deductions on this point impossible. We hope to get these collections in some way. The simplicity of the apparatus needed (tweezers, small homœopathic vials of alcohol and several rat traps) should make extensive collections possible to all who are interested in the subject. Some have complained of the quick movements of the living insects, and the rapidity with which they desert dead animals, as a serious hindrance to the collecting. A little strong pyrethrum powder will remedy these difficulties. Scattered through the fur of an animal, it immediately disables the fleas, and their expiring efforts serve to carry them out, to fall on white paper, where they may be readily and rapidly gathered. As large series as possible should be taken and full data as to locality, host, etc., should be inserted in every vial. A report will be returned for all specimens sent either to the writer or to Dr. Howard, Government Entomologist in Washington, D. C., U. S. A., and full published credit will later be given for every sending.

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SPECIAL ARTICLES.

NOTE ON THE HABITS OF AN OPHIDIID (CUSKEEL).

In 1871 Professor A. E. Verrill (*Am. Nat.,* 5, p. 399) published a note of half a dozen lines on the *Ophidium marginatum,* remarking that 'this species appears to be very rare and its habits little known.' He "dug two specimens out of the sand near low-water mark, where they burrowed to the depth of a foot or more. When placed upon moist sand, they burrowed into it *tail foremost* with surprising rapidity, disappearing in an instant." These are the only data known to me respecting the habits of any member of the ophidioid family. I was, therefore, much interested to receive confirmatory and additional information about the same species from Dr. E. W. Gudger, of Waynesville, N. C.

It is quite possible, if not probable, that the apparent rarity of the species results from the uncommon manner of life rather than from actual paucity in numbers. Persons generally do not look for fishes in the bare sand.

It is to be hoped that one of the investigators at the Beaufort Laboratory will obtain other specimens and study the habits and food of the species. It is probable that the period of activity is night. It would, therefore, be desirable to examine the stomach-contents as early in the morning as possible.

Theo. Gill.

A NOTE ON THE HABITS OF RISSOLA MARGINATA.

On July 13, 1904, while walking on a sand spit, exposed at low water and lying northwest of the island on which is situated the laboratory of the United States Bureau of Fisheries at Beaufort, N. C., I noticed, thrust out of the wet sand, a conically pointed head which instantly disappeared. Throwing myself down, I immediately began with my bare hands to dig the wet sand where I had seen the head. The animal went down tail first, and so rapidly that I began to despair of capturing it. Presently, however, when I had dug below water level, this little fish was brought out in a great double handful of sand. When taken into the laboratory and put into an aquarium of run-

ning salt water, after a few struggles it turned on its side and so remained, seemingly in considerable distress, being unable to maintain itself in the normal position by its delicate filament-like ventral fins which are intramandibular in position.

I then filled a tall glass jar some eight inches deep with fine sand, introduced into it the little fish and placed it under a salt water jet. At first the fish lay quiescent on the sand, but when I returned some hours later, it had burrowed into and was never again seen on top of the sand. Frequently, however, the little fish could be seen with its body half outlined against the glass side of the aquarium. There could then be seen slow undulations of the long dorsal and anal fins together with slight bendings of the body, both motions beginning at the head and progressing towards the tail. Evidently by this means a current of water was maintained through the gill-chambers. On the surface of the sand, small conical half-filled depressions could be found. These seemed to have been formed by the fish either in burrowing into the sand or in drawing water over the gills. However, I did not notice any distinct currents through these depressions and can not positively say that they were excurrent and incurrent openings. But I am sure that there were no distinct burrows, the wet sand not having sufficient consistence to remain in shape after the withdrawal of the fish.

Bits of oyster were put into the aquarium as food for the fish, but as these were never counted I could not be sure that any had been eaten and as it was impracticable to make later an examination of the contents of the stomach of the fish, nothing can be said as to its food.

Since this fish was of no value as a live museum specimen, and as I feared that it might die of starvation, it was killed and later identified as *Rissola marginata,* one of the cuskeels. It is a cause of considerable regret that press of other work prevented a more complete study of the habits of this interesting little fish. This specimen is now in the Museum of the laboratory of the United States Bureau of Fisheries, at Beaufort.

E. W. GUDGER.

INTERNAL INFECTION OF THE WHEAT GRAIN BY RUST—A NEW OBSERVATION.

THERE are many species of the rust parasites (Uredinales) found upon cereals. Almost every type of cultivated grain is attacked by its own particular type or form of rust. These rusts are minute, thread-like, filamentous affairs. The threads are very much more minute than the branching spawn met with in mushroom culture. The threads branch very generally and spread through the tissues of the host plant in various directions. They are able to penetrate all of the soft parts of the plants upon which they live. It has usually been supposed that the threads did not spread far from each point of new infection. The filaments usually gain admission to the tissues of the leaves and stems by eroding or boring through the skin layer from the outside. Later the branching filaments become massed at certain points under the skin layer of the host plant. They then produce countless numbers of small ovoid or rounded bodies called spores. These spores are cut off or rounded off from the ends of the filaments, pressing outward under the skin layer of the host. As the spores mature, the size enlarges, and thus the skin or epidermis of the host plant is broken and pushed outward. This allows the spores access to the air and they are then carried by the wind and other agencies from plant to plant and from field to field, perhaps hundreds of miles by wind storms. Countless numbers fall to the ground and do no harm; but countless numbers are produced and thus some of them are sure to reach other host plants. This is the usual method of accounting for the spread of wheat rust.

It has usually been assumed that rusts grow only in the leaves and stems (*vegetative parts*) of their hosts, but gradually it has been learned that amongst many perennials, certain weeds and shrubs these parasites send their filaments (*hypha*) into other more permanent structures, as, for example, roots and woody stems, thus becoming perennial with the host. Observations and experiments at this experiment station have gradually convinced us of the probability that rust of wheat may sometimes thus persist. Our field experi-