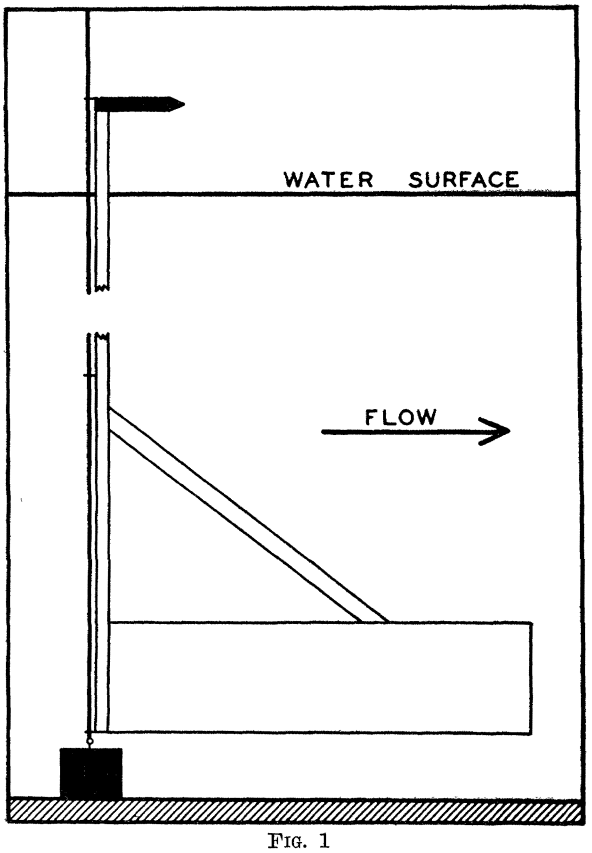

FIG. 1

the movable sounding machine. This carried observation out to depths of about 22 feet.

Choosing two days when there was a strong on-shore wind and fairly large waves numerous tests were made. The directions were easily observed and seemed to leave no doubt as to conditions existing at these times. In all cases the current was essentially the same at the surface as at the bottom. For the most part the current was moving to the south along the shore.

In some places near shore within the range of the breakers outward moving currents were observed, but these were always shown both at the surface and on the bottom. They can be considered as a type of rip current.

Observations with a current meter at the end of the pier in about 25 feet of water showed also that the current had a longshore trend in the same direction as the current at the surface. On the other hand, a bottom current, observed by R. Revelle and R. H. Fleming on another occasion when there was no wind, flowed contemporaneously with the outward movement of a rip current. On this occasion the bottom current was longshore, indicating that the rip current had passed over the bottom water without disturbing it. This of course represents a case that is the opposite of undertow.

These observations suggest that dangerous undertow is not an accompaniment of strong on-shore winds and large waves. However, they are of too limited scope to prove the absence of this danger to bathers. It is to be hoped that Professor Evans and others interested will extend these experiments to lakes and other parts of the ocean. Meantime the bather is still in danger from the rip currents which may carry him out beyond his depth, even if they do not carry him below the surface. The rip currents incidentally are observed under all sorts of conditions of waves, currents and winds.

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SURVIVAL OF THE TROPICAL RAT FLEA IN UNITED STATES

SINCE July, 1934, when Roudabush and Becker[1] reported the tropical rat flea (*Xenopsylla cheopis*) from the interior of the United States, several other reports have established its presence from the East, Mid-west and Far West. The evidence given in these papers leaves one with the impression that the flea is well established, but as yet no one has proved that the flea does not migrate into the interior every year.

Realizing that such a question must some time be answered, Dr. E. R. Becker and the author continued to collect the fleas at Ames, Iowa, every year from 1934 to 1938. In order to check its presence thoroughly, they were collected every fall until snow covered the ground and every spring as soon as possible after the first thaw. These collections prove that the flea is not a periodic visitor but is actually a resident in the interior.

In August, 1938, several specimens of the tropical rat flea were sent to Ward's Natural Science Establishment for identification. These came from Youngstown, Ohio, and since Ewing and Fox[2] have already reported that infestation no further details are necessary.

Several workers, cleaning out an infestation of insects in a Rochester, N. Y., church, brought into Ward's some of the insects for identification. Among other things three female specimens of the flea under consideration were found in a chandelier of the inverted dome type. Exactly how or why the fleas happened to be there is not understood, but there is some evidence that at least one of them underwent some development while in the chandelier, since a deserted pupal case was found in the debris.

Ewing and Fox[2] state that "there is a possibility that a more resistant race of this flea has been devel-

[1] R. L. Roudabush and E. R. Becker, SCIENCE, 80: 97, 1934.

[2] E. W. Ewing and Irving Fox, SCIENCE, 88: 427, 1938.

oped in some of our northern ports, such as New York and Boston and from there has spread to the Central states." Such a hypothesis is unnecessary. Freed, Jordan and Eckhoff[3] in reporting a case of endemic typhus fever in Des Moines, Iowa, sent the arthropods collected from rats in that locality to the author for identification. This material revealed the presence of *Xenopsylla cheopis, Liponyssus bacoti* and a species of *Hoplopleura* among other things. Dr. G. F. Ferris[4] identified the *Hoplopleura* as *H. oenomydis,* a species which has never been recorded in North America. The report by Freed, Jordan and Eckhoff established the fact that rats with their parasites might have been imported from the southern states, but since *H. oenomydis* has not even been found there it is just as logical to assume that the rats were imported directly to Des Moines.

Thus it is felt that the spread of the flea could have been more easily accomplished by shipping on the Mississippi than by the cross-country travel from New York and Boston. This, accompanied by the fact that in most cases years and years of gradual exposure are necessary to create a race more resistant to cold, would appear to leave the hypothesis of Ewing and Fox without a basis.

Further, a brief thought on the subject should account for the survival of the flea in the colder temperatures of the temperate zone. It matters not how low the temperature falls as long as the flea, its larvae and eggs remain in the warm confines of the rat's tunnel. The same warmth which allows the rat to live can also keep the flea alive. In other words, a flea in a test-tube exposed to freezing temperatures is not any more at home than man deprived of his home, his clothing and his food, but we have long since ceased to marvel because man can survive freezing temperatures in his artificial environment.

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REDISCOVERY OF THE RHIZOCEPHALAN PELTOGASTER PAGURI ON THE NORTH AMERICAN COAST

FOR more than a century, the Rhizocephala, a group of degenerate parasitic Cirripedes, has engaged the attention of many European zoologists, but, with the exception of a few Sacculinidae described from the West Indies, there have been no studies made of these remarkable Crustacea from the Atlantic coast of North America. During July, 1938, at the University of Maine Marine Laboratory on Frenchmans Bay, Maine, I had the good fortune to discover a representative of the order Rhizocephala, *Peltogaster paguri* Rathke, parasitic on the abdomen of the hermit crab *Pagurus pubescens* Kröyer.

The geographical distribution of this parasite is considerable. It occurs along the entire European coast from Norway to the Mediterranean but is strictly a boreal species, more rare toward the southern edge of its range. Its chief host in Europe is *Eupagurus bernhardus* (Linneus), but it has also been found on *Eupagurus cuanensis* (Thompson), *Pagurus chiracanthus* Lilljeborg, and *Pagurus pubescens* Kröyer.

Peltogaster paguri was first recorded for North America by A. S. Packard, Jr.[1] (1866), who found a single specimen at Eastport, Maine. Another specimen was taken by the W. A. Stearns expedition at Henley Harbor on the coast of Labrador and recorded by S. I. Smith[2] (1884). In both cases the host was likewise *Pagurus pubescens.* No further American records are known.

Of a total of 341 *Pagurus pubescens,* consisting of 128 males and 213 females, which I examined from Frenchmans Bay this summer, 86 individuals (25 per cent.) bore the parasite *Peltogaster.* These were distributed as follows:

33 males, each carrying one Peltogaster
4 males, each carrying two Peltogaster
45 females, each carrying one Peltogaster
3 females, each carrying two Peltogaster
1 female, carrying three Peltogaster

The largest parasite obtained measured 21 × 12 mm, the average size being about 13 × 5 mm.

In many instances the Rhizocephalan was itself parasitized by another crustacean, one of the Epicaridea, *Liriopsis pygmaea* (Rathke). This isopod hyperparasite is new to American waters, but has been known as occurring on the same host along the coast of Northern Europe.

There are only two species of hermit crabs commonly found in Frenchmans Bay, the *P. pubescens* already mentioned and *P. acadianus* Benedict. Both occur on hard bottoms from near low water to 90 feet, with the former more common toward the outer bay and on the open coast, the latter more prevalent in the inner bay. It is significant that none of the 26 males and 46 females of *P. acadianus* which were examined, a goodly number from the same collecting grounds that yielded parasitized *P. pubescens,* showed any evidence of *Peltogaster.*

Abundant material to elucidate the embryonic development and larval stages of *Peltogaster,* the anatomy and life history of the imperfectly known *Liriopsis* and the effect of these parasites on their

[3] H. Freed, C. F. Jordan and D. Eckhoff, *Jour. Ia. State Med. Soc.,* 27: 425–426, 1937.
[4] G. F. Ferris, personal communication, 1937.

[1] A. S. Packard, *Mem. Bost. Soc. Nat. Hist.,* v. I, p. 295, 1866.
[2] S. I. Smith, *Proc. U. S. Nat. Mus.,* v. 6, p. 222, 1884.