## 159.—NOTES ON A DISEASE AFFECTING CRAWFISH IN GERMANY.*

By C. RAVERET-WATTEL.

The disease affecting crawfish, which is now doing so much damage in France, rages with perhaps even more severity in some parts of Germany and Austria, where this epidemic is the object of the research of many investigators whose labors have often been mentioned in the *Bulletin* of our society. One of the last numbers of the periodical of the German Association of Fish-culture† contains some information on this subject which has seemed to me worthy of recapitulation, because it states some new facts which it may be useful to record.

Max von dem Borne, founder of the important fish-cultural establishment at Berneuchen, has observed the progress of this disease in the Mietzel River,‡ a stream 60 kilometers [about 33 miles] in length, which flows from the Lake of Soldin and empties into the Oder River near Clewitz. The Mietzel, which is unfortunately obstructed by eight dams which hinder the passage of fish, is a stream abounding in fish, and moreover greatly esteemed until recently for the abundance and size of its crawfish.

"At Berneuchen," says Max von dem Borne, "where the river belongs to me for about 10 kilometers [about 6 miles] we have also this year (1883) taken many crawfish, which have been made use of at the time of reproduction." During the first fortnight of September they began to see these crustaceans leave the water and scatter along the banks for several yards. On the 10th of that month they could still make a good catch. But soon a sort of migration took place; the crawfish seemed to flee, to abandon the Mietzel. Numbers of them, large and small, dead or dying, could be found daily on a horizontal metallic lattice placed at the mouth of the brook for trout. Most of them were mutilated, having lost one or more members. On September 14, sixty of these crustaceans, kept in a well-boat in the middle of the river, died in a mass, and on proceeding to fish the river on the 16th and 17th, it was learned that there was not a single living crawfish left.

It was in 1880, and from the Oder, that the disease began to invade the lower course of the Mietzel. The following year it ascended as far as the dam of the metallurgical works at Kutzdorf. In 1882 it appeared further up. Finally, in 1883, one could see it gain ground and hasten its advance from month to month, for, during the month of October alone, it passed over two dams. The waters of the Mietzel are not pol-

* *La maladie des Écrevisses en Allemagne.* From the *Bulletin Mensuel de la Société Nationale d'Acclimatation de France.* February, 1884, p. 200. Translated from the French by H. P. JERRELL.

† *Circulare des Deutschen Fischerei-Verein,* 1883, No. 5.

‡ Max von dem Borne, *Die Krebspest in der Mietzel.*

luted by waste matters from any manufacturing establishment; the appearance of this epidemic, therefore, cannot be attributed to this cause. Moreover, symptoms of disease have never been noticed among the fish inhabiting this river.

Max von dem Borne proceeded to experiments, which seem to show that the cause of the disease is found, if not in the water, at least in the mud of the river. He said:

"I caused to be sent me by a leading fisherman of Soldin (a locality further up the river than Berneuchen, and not yet contaminated) some perfectly healthy crawfish, which I placed in a cemented trough at my establishment. This trough was traversed by a strong current of water coming from the Mietzel, and the bottom was covered with a layer of mud taken from the same river, but no diseased or dead crawfish was put in this trough. Nevertheless, at the end of nine days all the healthy crawfish which I had placed there began to show signs of disease, and in a day or two afterwards all were dead. I always noticed the following symptoms: The crawfish contracts on one side; it continually rubs its head and eyes with its walking claws; the whitish color of the lower part of the abdomen becomes red; and the animal lies on its back and dies. It is worth saying, however, that the crawfish which I placed under observation on the 18th and 26th of last November have remained perfectly healthy up to the present, and they are even occupied in spawning."

At the request of Max von dem Borne, von Linstow*, physician of the staff-office at Hameln, has given special attention to this disease among crawfish, and the examination of a great number of these crustaceans which he has made leads him to admit that he is certainly in the presence of a parasitic disease. Dr. von Linstow has also stated that the disease propagates itself in ascending watercourses. As soon as they feel the disease the crawfish become restless. Generally they leave the water, wander around on the banks, and on the way usually lose some claws and often their pinchers, and finally they lie on their backs and die.

Like Max von dem Borne, Dr. von Linstow believes that the water contains the cause of the mischief, and that it serves as a vehicle for it. He has seen, in fact, that if healthy crawfish coming from localities as yet uncontaminated are placed in streams where the epidemic rages, these crustaceans are quickly attacked by the disease and destroyed in a little while.

Dr. von Linstow says: "The researches made with a view of discovering the cause of the evil have given rise to different opinions. According to Professor Harz, of Munich, the disease might be caused by the trematode, now for a long time known under the name of *Distoma cirrigerum*, which might invade the muscles of crawfish in great numbers. My attention was then immediately directed to this parasite, but

* *Mittheilungen des Herrn Dr. von Linstow in Hameln über die sogenannte Krebspest.*

I have not found a single member of this species in the many diseased or dead crawfish which I have examined. In consequence, it is perfectly clear to me that it is not this parasite which does the mischief. I will mention some leeches, some *Branchiobdella astaci*, Odier, and *B. parasita*, Henle, as well as some psorospermic corpuscles 0.15 millimeter [.0059 inch] in length, a few of which were found in the thorax of certain crawfish. By analogy with what takes place in various contagious diseases, some persons have been led to think that a cryptogamic growth could be the cause of the mischief. But the results reached in following out this hypothesis have been entirely in the negative. On the contrary, it is certain that nearly all the organs of the diseased crawfish—the tissues of the heart, the cavity of the stomach and also of the intestines, the nerve ganglia, most of the muscles, the adipose tissue, the gills, &c.—are full of a multitude of little ovoid, cellular substances, which sometimes accumulate in such quantity at certain points that the organs are torn asunder. This accounts for the frequent loss of claws. These ovoid corpuscles measure 0.02 millimeter [nearly .0008 inch] in their longest diameter and 0.013 millimeter [about .0005 inch] in their shortest diameter. They can easily be colored red by picrocarminic acid."

How do these corpuscles get into the organs of the crawfish? This is difficult to explain. We do not find that they make any kind of motion, even when we get them from crawfish which have scarcely ceased to live. It is supposed that these cellules spread progressively in the water during the decomposition of the dead crawfish, and that in this new condition they continue a certain development. "I have no doubt," says Dr. von Linstow, "that they belong to the animal kingdom and to the sub-kingdom of Protozoa, and it is probable that in its perfect state the parasite should be classed among the Gregarinidæ or the Amœbea."

The question of learning whence these corpuscles come, and how we can protect the crawfish from them, remains as yet entirely unanswered; but a step is taken towards its solution when we discover the enemy to be opposed. Henceforth the problem to settle, as Dr. von Linstow continues, would be, so Dr. Leukart thinks, that of the cultivation of this parasite outside of the organs of the crawfish; and if its development can be attained under these conditions we shall doubtless arrive at the determination of the question by what means and in what manner the parasite finds its way into the tissues of the crawfish.

When we consider the difficulty there is to distinguish, without the aid of the microscope, the diseased crawfish from those which are healthy, we can ask whether the consumer has not some risk to run from the putting up for sale of crawfish which were already somewhat affected. The reply, Dr. von Linstow affirms, is that the crawfish, even though diseased, can be consumed without any fear, because the protozoan which causes

the disease is not among the number of the parasites of man, and also because it is inevitably killed by cooking the crawfish.

In conclusion, I would add that according to Mr. Oscar Micha, who carries on both at Berlin and at Cologne a considerable trade in crawfish, a few very young crawfish are beginning to reappear in many of the streams where extermination was complete and where no attempt at restocking has yet been made. Now, as in these streams no adult crawfish was able to escape destruction—when, on the one hand, the immigration of individuals coming from uncontaminated localities seems improbable, and when, besides, we meet no specimen of an age capable of reproduction—we are led to think that the young crawfish which appear were born before the invasion of the epidemic, which they alone have been able to resist. In this case the immunity which they would have enjoyed should be attributed to the fact that the very young crawfish have the habit of burrowing and passing the first part of their existence at a great depth in the beds of the rivers. In their holes, where they often are more than a meter [yard] from the water, no doubt they can escape the action of certain noxious influences and of certain principles of disease carried by the water. Thus it could be explained how the epidemic, which could have brought about the disappearance of all the crawfish of a river, has nevertheless spared those crustaceans which were out of its reach under the protection of a thick layer of earth. New observations will doubtless permit it soon to be settled in this respect.

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### 160.—FLOATS FOR THE SO-CALLED FATTENING OF OYSTERS.

**By JOHN A. RYDER.**

[From a letter to Prof. S. F. Baird.]

You have sent me some letters regarding Weems's floats for fattening oysters. What their structures are like I do not know, but doubtless some one has a patent on them.

The simplest and most practical structures of the kind which I have seen are the storage and fattening floats used by Mr. Conger, of Franklin City, Md., and now in use by all the shippers and planters in the vicinity of Chincoteague Bay. I have already described them briefly in my paper on the result of the work at Stockton, although I have been informed that similar structures, or rather structures serving similar purposes, are in use on the oyster-beds along the shore of Staten Island, New York.

It is probably a fact that in all of these contrivances they take advantage of the effect produced by fresher water upon oysters which have been taken from slightly salter water. The planters of Chincoteague call this "plumping the oysters for market." It does not mean