

fish, which were killed in sailing through strips of this poisoned water. It is said to be of a reddish color, and distinguishable for some distance from the surrounding water. Capt. Samuel Morgan, a patient in the hospital, informs me that in some of the freshwater creeks fish are caught by placing bags of the bruised bark of the swamp dogwood (*Cornus sericea*) in still water, and that the fish will revive if allowed to remain in it for a short time only. There would appear to be some connection in this, as the mortality seems to appear after considerable rainfall in the swamps and freshwater outlets, and is not due, as has been stated, to submarine volcanic action. I have mentioned the fact to Dr. Joseph Y. Porter, U. S. A., and requested him to take advantage of his proposed visit to Tampa, Fla., this week, to collect samples of the water, should the vessel pass through any of these reddish-colored strips.

KEY WEST, FLA., October 28, 1885.

#### 5.—THE MORTALITY OF FISH IN THE GULF OF MEXICO.

By JOHN G. WEBB.

The answer to the question "What kills the fish?" is, in my opinion, that they are killed by noxious and poisonous gases which permeate portions of the Gulf and its bays, and which are derived from underground streams of water that flow into the sea.

First, as to the existence of underground streams of water. Everybody at all familiar with Florida is aware of the existence of enormous springs. Crystal River, in Hernando County, is an illustration. Good-sized coasters, say of 8 or 10 tons, can, I am informed, sail clear up to the spring, which issues from the ground—a river at the start. So with Silver Spring. It is described, for I have not seen it, as an immense volume of water rising in a bowl, deep and clear, and forming the Oklawaha, a river at once. So with a lake near Gainesville. My friend, Mr. F. B. Hogan, of Pine Level, in this county, tells me that, when a boy, his father resided near what is now the lake. He raised corn on the very flats which are now the bottom of this lake. There was then a small stream winding along through this flat and finally emptying into a hole in the ground, where it disappeared. In process of time somebody set up a saw-mill near this hole, propelling his machinery, if I am not mistaken, by power derived from the stream. He allowed the *débris* of his saw-mill to fall into the hole, which became stopped up. Now there is a lake there 18 miles long, and a large town gets its supply of fish from it. If the hole should again become open the lake would undoubtedly be drained.

Some years ago one of the Myaka lakes became nearly dry. It was then discovered that near the center of the lake was a deep hole, and it was furthermore discovered that the tide rose and fell in this hole.

A year or two afterward a party, of which my son was one, sounded this hole and procured some water from its bottom. The hole is 137 feet deep and the water brackish and nauseous to the taste. I live 10 miles from that place and on the Gulf of Mexico, and that hole, 10 miles inland, is more than twice as deep as the Gulf is 10 miles from the shore. You would have to go 25 miles to sea to find a place as far from the surface of the earth as the bottom of the hole in the middle of Myaka Lake.

A gentleman (Mr. T. J. Edmondson, of Tarpon Springs) informs me that he once accidentally discovered a deep hole in Sarasoto Bay, in which the water was dark and cold and fresh. He did not ascertain its depth.

Now, all these facts go to show that there are underground streams in this State, and that some of them are very large and very deep below the surface of the earth. How large we do not know, but the presumption is that there are very large ones. For the water which is discharged from our surface rivers does not, in my judgment, account for the water that falls upon the land. There is very little fall to our rivers, and all of them are stopped at their mouths by tides. The Saint John's is a large river, but it is the only one on the east coast above the Everglades. On the west coast there are a great many small streams discharging themselves into the Gulf, but every one, except the Suwanee, I think, is a tide-water creek.

Now, where these underground streams empty no one knows. The stream which the Myaka Lake is connected with may empty 25 miles at sea, for it is about on a level with the bottom of the Gulf at that distance. The surface of the lake is probably 10 feet above the surface of the Gulf, and as it certainly communicates with the tide-water, the only reason why the lake can exist with this hole in its bottom must be that the underground stream completely fills the orifice out of which it flows. Crystal River and Silver Spring are underground streams before they appear, and the Gainesville Creek was an underground stream after it disappeared; and it is not at all probable that they are the only ones or the largest ones in Florida.

Now, how should water carried into the Gulf by an underground stream poison the fish? The answer is that the rock through which the water flows contains pyrites. Pyrites is a compound of iron and sulphur, often contaminated with arsenic. Exposed to water this substance is decomposed, and the sulphur and arsenic, if that is present, unite with one of the constituents of water, hydrogen, to form one of the most poisonous gases known. It is very soluble in water, and a little water charged with it would poison a great deal of the air which the fish absorb in their gills as the water is forced through them.

As to the presence of iron pyrites in the substratum of Florida there is no doubt at all. Nothing in Manatee County is more common than iron in the well-water. Some wells furnish water so thoroughly impregnated with iron that it is unfit for the laundry. - And the shores of all

the bays are more or less lined with bog iron ore which has been deposited from springs. I have seen it at Cedar Key, at Tampa, and I think it is found all over the peninsula. Sulphur almost always is found combined with all iron ores, and arsenic and phosphorus often, which latter is as poisonous combined with hydrogen as either of the substances named.

Now, during the dry season, when there is not much or any surface water, the chemical reactions I have described would be going on, and lakes of underground water (or pools, if you please) existing along the watercourses, would become saturated with these poisonous gases. When the rains come and force out into the sea this accumulated poison the fish are killed. They are killed at every flood and they are not killed except at a flood. Smack fishermen say that they sometimes observe at sea a brownish spot or area of water, and sailing into it the fish in their wells begin to die at once. In these last two mentioned facts lies the objection to the volcanic theory, for it is difficult to see what connection a flood can have with a submarine volcano, which, being submarine, should be abundantly supplied with water.

OSPREY, MANATEE CO., FLA., *December 3, 1885.*

## 6.—HATCHING LOBSTERS AND COD IN NORWAY.

By G. M. DANNEVIG.

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

I am now engaged in hatching lobster eggs, and seem to be succeeding. During the past two days about 200 young lobsters have been hatched, and they are very lively—rather too much so, as they eat the other young ones as soon as these last come from the shell. I intend to find out what else they will eat, as their present food is rather inconvenient to furnish. The so-called artificial hatching of lobsters has often been tried before this; but in such cases simply lobsters with spawn were put into a live-box and kept there till the young hatched out; while in my experiments I take the spawn from the parent lobsters and hatch it out in a specially-constructed apparatus. If this latter method of hatching can be carried out on a large scale, of which I have no doubt, many millions of lobsters could be hatched every summer. If we could succeed in raising them for a while before planting them, so much the better. I would like to know if anything in this line has been attempted by the U. S. Fish Commission, and with what success.

Some time ago I read an account of your trying to send lobsters by rail from the Atlantic to the Pacific coast. Instead of sending the lobsters, why do you not try sending well-developed spawn? This could

\* For previous letters in regard to hatching lobsters, see F. C. Bulletin, 1885, pp. 280, 446.