

found in birds, in some reptiles, and amphibians. But de Kay makes a distinction between the Spring Mackerel and the Fall Mackerel. He does not notice a nictitating membrane on the so-called Fall Mackerel, which is now known to be of the same species as the so-called Spring Mackerel. In seas which are not ice-encumbered, the winter torpidity may be of very short duration; in ice-encumbered seas it may extend over several months.

In this particular the Mackerel resembles the Sturgeon of the Caspian Sea, whose torpidity during winter is well-known, and this winter sleep is not confined to these fish but is probably much more general than is commonly supposed. Some fishermen assert that the Mackerel caught late in the Fall, and even early in the Spring, are covered with slime, but this requires confirmation. The skin which forms over the eye is probably designed to protect that organ from the attacks of the numerous parasitical crustaceans and leaches which infest the external portions of the bodies of fish and are also found internally, as in the gills of Codfish. According to Carpenter the *Lernæa* is not unfrequently found upon the eyes as well as in the gills of fish.

The Sturgeon of Rainy River and of the Lake of the Woods is covered in the early Spring with a thick mucus or slime, which appears to serve as a protective covering against too rapid respiration and consumption of the substance of its own body, during a long period of torpidity. The Tautog on the coasts of the United States is stated not only to be extremely sensitive to cold, but at the approach of the time of hibernation the vent becomes sealed and the fish is thus prepared for a minimum consumption of its own fat during its winter sleep.

The subjoined notice of the torpidity of the Tautog and the Scup, by Capt. Atwood, will be found on page 212 of the U. S. Commissioner of Fish and Fisheries Report for 1871-72. (1.)

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the mud at the bottom of the small clear hollows, encrusted with ice round those coasts, entirely bristled over by the tails of mackerel imbedded in it nearly three parts of their length.

(1) In the American Angler's Guide, page 178, in the article on Tautog or Black Fish, it is remarked: "The Black Fish abounds in the vicinity of Long Island, and is a stationary inhabitant of the salt water."

"He may be kept for a long time in ponds or pens, and even fattened there. When the cold of winter benumbs him, he refuses to eat any more, and a membrane is observed to form over the vent and close it."

"He begins to regain appetite with the return of warmth in the spring." (179.)

Now we know that Tautog hibernate among rocks near the coast and in our rivers, and it has been stated by Mr. L. Tallman or Mr. Daniel Church that some years ago, after a very cold snap, not only many Tautog were washed ashore frozen stiff, but afterward quantities were also found dead among rocks off the coast.

If, during the winter, they don't feed as stated above, and this membrane closes them up, the conclusion must be that they remain in a state of torpor or sleep during cold weather.

Now it happens that the Scup, when first taken by traps, are in a state of torpor: they neither eat nor have any passage. It is probably sealed up like the Tautog, and nothing in the shape of food is to be found within them. Some say they are blind, and they seem hardly able or willing to move."

The inference, then, is, that the Scup have also been hibernating within a short distance from the coast, in the same state as the Tautog. This would account for the stray Scup mentioned by Mr. Southwick as having been occasionally found in March. A warm day wakes him up, and he visits the shore for a day or so, and then returns. To my mind, this is a more reasonable way of accounting for his presence than to assume that he has been left behind. If these facts are as stated, it is to be presumed that Scup are a local fish, and do not leave their localities any more than Tautog, about the propriety of the classification of which as a local fish there is no question."

(2) The following brief description of the winter sleep of the Sturgeon by Alexander Schultz, in his account of the Fisheries and Seal-hunting in the White Sea, the Arctic Ocean and the Caspian, is both instructive and suggestive:—

"A very peculiar phenomenon in the Ural is the winter sleep of fish, espe-