

Along the banks there should be pits for hidingplaces, and for the same purpose there should be near the banks roots of trees, stones, &c. The steeper the banks of the ponds the less chance will there be for the eels to escape. All channels, either of influx or outflow, should be stopped up, so that the eels cannot escape. Care should be taken that the ponds are never exposed to the danger of inundation.

In this kind of pond eels measuring $2\frac{1}{2}$ to 3 inches in length may be placed, or better yet, eels measuring 8 to 15 inches. These latter are better able to seek their own food, to resist the changes of the weather, and to escape from their enemies. When eels are placed in these ponds in April or May, from 200 to 300 of the smaller size should be counted to an acre of pond area. If the eels are 6 inches long, 50 to 100 should be put into the pond, and of the largest size 25 to 50 per acre.

Many of the young eels placed in a pond are of course lost; some escape, others die, and some are devoured by other fish, frogs, and other aquatic animals; so that one may count on 25 to 30 per cent of the smallest eels (from $2\frac{1}{2}$ to 3 inches) reaching a marketable size; 40 to 50 per cent of the larger (6 inches); and 70 to 80 per cent of the largest. Two thousand young eels weigh about one pound.

In these ponds there should be placed the year after the large eels have been put in, or two years after small eels, a number of shell-fish, say 10 to 15 to every 100 eels. When these begin to propagate, the eggs and the young are an excellent food for the eels.

In spring the eels begin to get hungry, and it will be found an advantage to put into the ponds artificial food, such as manure, or a carcass in a basket, so that larvæ and worms may develop. There may also be a ditch or pit at the bottom of the pond, at one end of which there is placed a wooden box (6 to 10 feet long, $1\frac{1}{2}$ to 2 feet broad and deep) in which the food may be placed. If there is enough food in the ponds, the eels will increase in weight 2 pounds apiece in one year. If eels are placed in good growing ponds for carp, the yield of these ponds may be increased very considerably.

31.—ON THE INTRA-OVARIAN GESTATION OF THE REDFISH (*SEBASTES MARINUS*).

By JOHN A. RYDER.

It has been known for a long time that certain species of *Sebastes* were viviparous. During July last female specimens of *S. marinus* taken by the steamer Albatross off the Banks were found with the ovaries in a gravid condition, but with the embryos in an advanced state of development. These were so far developed as to show all of the features of the end of the lophocercal stage when the median fin folds already contain actinotrichia. Estimating the number roughly, fully one thousand embryos were contained in each ovarian sack.

The individual embryos were slender, about six millimeters long, with a pigmented stripe on the posterior dorsal part of the yelk-sack and along the upper margin of the hinder half of the tail. A large yellowish oil-drop occupies an anterior position in the yelk substance. The caudal part of the tail fold is already widened, as in the embryos of clupeoids, and the end of the straight chorda, as in the latter, divides the tail into very nearly equal dorsal and ventral moieties. The eyes were fully pigmented and black, and what pigment cells were present on other parts of the body were stellate, with several rays running out from a nearly colorless center, in which the nucleus lies embedded.

The only paired fins developed are the pectorals; no traces of the ventrals are yet visible. The proportions of the embryos are nearly those of the clupeoids, the head being but slightly more robust. The majority were found to be coiled up, or with the tail thrown around to one side over the yelk-bag and head, as they lie in the ovary. Each embryo as coiled up formed a flattened oval body nearly one and a half millimeters long and one millimeter wide. Some of these coiled ones seemed also to be covered by an exceedingly thin membrane, which is supposed to represent a zona radiata or egg-membrane. Fragments of this membrane enveloping the embryos when examined under a high power, however, failed to show the presence of fine perforations or pore-canal. These membranes were, moreover, in many instances, adherent to the vascular processes depending from the roof of the ovary, and it is inferred, therefore, that the membranes mentioned are actually the vestiges of a very thin egg-capsule.

The ovary itself was found to have very thin inferior and lateral walls, which were somewhat colored by dark pigment. These thin walls are not concerned in the development of the ova at all; the latter in fact are developed in the thickened dorsal or mesometric side of the ovary, which is highly vascular. When the ovary is opened and the embryos shaken out, it is found that there is an abundant covering of flat, fleshy processes which arise from the roof of the ovarian cavity. The basal part of these processes is thickened, traversed by vessels, and consists largely of ovarian stroma, in which immature eggs are found embedded in various stages of growth. The distal part of the processes which depend into the ovary are subdivided into slender digitations, which dip down amongst the great mass of embryos. These terminal digitations, upon cutting sections of them, are found to be highly vascular; small vessels in fact comprise the greater part of their substance. The vessels which traverse the digitations evidently form long recurrent loops and serve to bring the oxygenated blood of the parent female fish into close relation with the embryos or *fœtuses*, since these digitations pass down between and amongst the embryos lying in the ovarian bag, in such a way that few of them can escape coming into direct contact with some of the vascular loops in the digitations. The latter also

afford more or less obvious attachment or support to the adjacent embryos by means of the thin structureless membranes already spoken of.

While I have had practically but a single stage of development to study, it is obvious that we have in this instance a very remarkable condition of affairs in the ovary. It is clear, I think, that the method of viviparous development as seen in *Sebastes* is quite different from that observed in other types of viviparous fishes, so that this type adds another to the several forms of development noticed in a paper which I have recently published.*

WASHINGTON, D. C., *March 27, 1886.*

32.—NEW ENGLAND FISHERIES IN MARCH, 1886.

By W. A. WILCOX.

The month came in with the longest and most severe of the many gales during the past winter. The storm began February 25 and continued until March 3. During much of this time the thermometer indicated zero or below, and the wind blew from 50 to 75 miles an hour. One hundred and forty-three sail from Gloucester were absent at this time on cod and halibut trips to George's Bank; and as several days passed with no arrivals or news from them, much anxiety was felt. All at last arrived, mostly more or less damaged. Ten men were lost by being swept overboard, two vessels losing two men each and six vessels one man each. It is doubtful whether any previous record will show as many lost during a single storm by being washed overboard. Much suffering was experienced from the excessive cold weather.

Among the arrivals, schooner Fitz J. Babson reports that on February 27, on George's Bank, the decks were swept and three dories stove by a heavy sea, and that as soon as the deck was cleared a small-sized live mackerel was found to have been washed aboard. This may be recorded as the first mackerel caught this season. During the month the fishermen have several times reported finding mackerel in the stomachs of codfish caught on George's Bank.

The frozen-herring fleet from the United States to Fortune Bay, Newfoundland, numbered twenty sail, all belonging to Gloucester. One has previously been reported wrecked† while on the way home; the others all brought full fares, the last to arrive being the schooner Herman Babson, arriving March 8.

Codfish have been abundant, and when the weather permitted fishing a good catch has been made on George's Bank and in Ipswich Bay. The fleet in Ipswich Bay numbered forty-three sail that used trawls and seventeen sail that fished with gill-nets. Before the gale, which destroyed many nets, those using them were doing well. The schooner Sarah

* On the Development of Viviparous Osseous Fishes. Proc. U. S. Nat. Mus., 1885; pp. 123-155, pls. VI-XI.

† See F. C. Bulletin, 1886, p. 79.