

which joins the adductor muscle on its ventral side. In my report I will give a detailed description of the organ of Bojanus of the oyster.

If there is still the slightest doubt as to the hermaphroditism of the oyster, my researches have shown that, at the time when an oyster is sexually mature, it always functionates as a male as well as a female; it is, therefore, physiologically diœcious. And when the eggs of one oyster are fecundated by the spermatozoa of another, we need not be surprised if the contact of the eggs and spermatozoa takes place in the interior of the animal. Likewise the fact observed by M. Lacaze-Duthiers and by other authors, that the egg of the oyster is nearly always fecundated at the time of laying, is not surprising. The large number of males also, that is to say, individuals functionating as males, as stated by M. Davaine and M. Lacaze-Duthiers, explains itself. In the case of the oyster, as with most other lamellibranchs, the spermatozoa move and encounter the egg; "the water carrying the sperm in the currents produced by the ciliary movements of the internal surface of the mantle reaches the eggs;" that is, it gets into the genital duct.

I think this view of the question is the only one which gives a rational explanation of the facts.

NOTE ON THE ORGAN OF BOJANUS IN OSTREA VIRGINICA, GMELIN.

By JOHN A. RYDER.

In March, 1882, I first noticed what I supposed might probably be the organ of Bojanus of the American oyster, but I could not then investigate the matter, so that it was allowed to rest for the time being until a more favorable opportunity should occur to carry out more detailed researches. In November, 1882, I first began to make preparations to study the subject by means of sections, the only method by which it was believed possible to arrive at any valuable conclusions. Although I have not yet traced the structure in question in its relation to the pericardiac cavity and the openings of the generative organs, my sections show essentially much the same details of structure as have been described by M. Hoek. As that author observes, the literature of the subject is silent in regard to this structure in the oyster, and of the few allusions to the matter, one is by Huxley,* who says: "In *Ostrea* and *Teredo* the renal organ seems to be present in only a very rudimentary form." He then alludes to the researches of M. Lacaze-Duthiers. That it is present in a rudimentary form is the fact, as an examination of the structure in question has proved. In *Bronn's Klassen u. Ordnungen des Thierreichs, III, Malacozoa*, by Keferstein, on page 388, it is remarked, in effect, that the organ of Bojanus in *Ostrea* is present as a mere appendage of the ventricle. In "Forest and Stream," under date of No-

* Anat. Invertebrates, p. 411, New York, 1878.

ember 30, 1882, I described this organ in the following terms: "Besides, no anatomist, to my knowledge, has very definitely located the organs of Bojanus or quasi-renal apparatus of the animal, or indicated the apparently close relation of this paired organ to the openings of the generative ducts. It is true these structures are very rudimentary, but seem to be present in a slightly developed condition, in somewhat the same relation to the great adductor as in *Pecten*, only that they lie close against the mantle at either insertion of the muscle and on its ventral side. Their extent is sometimes marked by brownish tissue in their walls."

In order to see these structures at all it is necessary to open the animal with the greatest possible care, in order that the mantle and the underlying delicate tissue of the organs of Bojanus which lie close against the lower side of the muscular insertion be not lacerated beyond recognition. The body-mass, which is prolonged backwards below the adductor and containing the first bend of the intestine, lies just below the organ, and in fact a suspensor membrane connects the two. This suspensor has the same structure as the mantle. The form of the organ of Bojanus in the oyster, taken as a whole and viewed from the side, is somewhat sickle-shaped, and clasps the opposite ends of the adductor next the mantle on either side for an extent of about three-quarters of an inch, and rarely extends a very little way forward upon the floor of the pericardiac chamber. In section through its most enlarged part it is somewhat triangular or trihedral, and its inner non-canalculated portion involves more or less completely at this point the parietosplanchnic ganglia, as is shown by my sections. It is a paired organ, and the portions of opposite sides are about equally developed. Their dimensions, as compared with the same organs in *Unio*, are very meager indeed.

When examined under the microscope, sections from the mid-region of the organ show several large canals, six or seven, the walls of which are clothed with an epithelium provided with very long cilia, which hang freely into their cavities. These larger canals are placed near the center of the trihedral body of the organ. Around the larger canals numerous smaller canals and induplicatures of membrane are aggregated, which are clothed with a less conspicuously ciliated internal epithelium. These smaller canals evidently communicate with the larger ones, and are probably the secretory portions of the organ, but no crystalloidal bodies in the form of urates were detected, such as may be seen in the renal organ of *Arca pexata*, for example. The smaller ducts and canals of the organ encroach upon the connective tissue of the adjacent portion of the mantle to some extent. The color of the tissue of the organ in life is frequently dark-brown, so that its extent may be clearly made out in an oyster which has been very carefully opened. Oftener, however, the organ can scarcely be distinguished from the neighboring structures, except by its richer yellowish color. Its greatest develop-

ment is attained at the lower side of the adductor muscle, just where the posterior sickle-shaped column of white fibers comes into contact with the larger grayish oval anterior column. Just in the angle formed by these parallel muscular columns the organ is most massive, and just here too lies the parieto-splanchnic ganglionic masses of nervous matter, which are more or less enveloped by the external and perhaps indifferent portions of the organ.

As before stated, I have not taken the pains to demonstrate the opening of the organ into the pericardiac cavity and the generative canals, but as already hinted in my article in "Forest and Stream," which was written before I had seen M. Hoek's paper, I believe such a connection altogether probable from what is known of the relations of the homologous organs in other lamellibranchs. Just below the vicinity of the thickest portion of the organ are situated the external openings of the generative ducts, which, as observed by M. Hoek, are not marked by papillar elevations.

M. Hoek's observations on the generative ducts of *Ostrea edulis* agree with my own on *O. virginica*. From the openings of the ducts forward over the sides and dorsal and ventral surfaces of the animal, beneath the mantle-layer, they branch over the greater portion of the body-mass, receiving the generative products from the underlying follicles, which have a generally vertical direction, and stand at right angles to the courses of the ducts and their ramifications.

The sexual characteristics of *O. edulis*, *O. angulata*, and *O. virginica* have already been discussed by me in another essay which has preceded this, so that there is no need of a further elaboration of that matter here. More recently two notices by M. Bouchon-Brandely have been placed in my hands by Professor Baird, which discuss this matter from still another point of view than my own, viz, the microscopical and histological aspect of the subject.

WASHINGTON, D. C., December 25, 1882.

A SIMPLE TEST TO LEARN IF FISH OVA ARE IMPREGNATED.*

By PROFESSOR NUSSBAUM.

The development of the eggs of game fishes [salmonoids], as is well known, is relatively far advanced before the fish-culturist is positively assured that embryos are developing normally in the egg. A method, therefore, which would enable us to shorten this period of probation would not only be desirable, but also of value under certain circumstances, since it is certainly annoying, after having had them in water

* Ein einfaches Verfahren zur Erkennung der gelungenen Befruchtung von Fischeiern, von Professor Nussbaum in Bonn. Deutsche Fischerei-Zeitung, VI, No. 5, Jan. 30, 1883. Translated by JOHN A. RYDER.