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.

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## 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.

for four or five weeks, spending time and care over them, to eventually find, when the "eye-spots" do not develop, that all our trouble was wasted and that no development at all took place.

It is true one may, with proper preparations and with the help of the pocket-lens or microscope, follow the development while there may be no external signs of the process evident. This method of making the test is, however, not adapted to the purposes of the practical fish-culturist, who will have better success by the following method:

If fertilized fish ova are placed in a 50 per cent. solution of wine vinegar [Any ordinary vinegar will probably be found to answer just as well—TR.] the embryo, even during the very first stages of development, will become apparent to the eye lying on the transparent yelk. The acetic acid contained in the mixture, one part water to one part wine vinegar, causes the material of the embryo proper to coagulate while the yelk remains clear.

A short time after the ova are laid in this mixture, and during the first week after impregnation, a white circle at one pole of the egg should become apparent, and in the course of the second week a cylindrical white streak running from the edge of the circle towards its center should be evident. If these features are not developed by the test, the eggs have not been fertilized, and are, therefore, worthless.

We will not complicate the application of the method by describing other details of the development, but would merely suggest that when a lot of ova are fertilized a small portion should be left unimpregnated. These could then be tested in comparison with the fertilized ova from day to day, using say three eggs at a time of each lot. The observant culturist could by this means construct for himself a scale of development covering the period embraced by his experiments. At a lower temperature the development is slower than at a higher one. The difference of appearance between fertilized and unfertilized ova treated by the method will demonstrate its utility. Whoever does not trust to the method for the evidence of death of the eggs until after five weeks subsequent to impregnation, must of course wait.

Director Tiefenthaler, of Kölzen, has had the kindness to test the method practically, and finds it useful to fish-culturists.

[A very little practice, it seems to the translator, would serve to enable any person of ordinary intelligence to apply this method or several others which might be suggested. Other substances which would answer the same purpose would be dilute solutions of picric or chromic acid, of not more than one to one-half per cent., or one part to two hundred of water. Vinegar or acetic acid of the shops may also be used; the last to be diluted in the proportions of about one part in ten of water. The acids cited will coagulate and cause the germ disk to turn white or yellow in a few hours. Chromic is better than picric acid, as it coagulates the yelk also, but turns the latter much darker than the embryo or embryonic disk.—TR.]