ON THE SEXUALITY OF THE COMMON OYSTER (O. edulis) AND THAT OF THE PORTUGUESE OYSTER (O. angulata). ARTIFICIAL FECUNDATION OF THE PORTUGUESE OYSTER.*

By M. BOUCHON-BRANDELY.

Twenty or twenty-five years ago the Portuguese oyster, indigenous to the Tagus, did not exist on the coasts of France. It was acclimated in our waters altogether accidentally. A vessel from Portugal discharged its cargo so as to repair some damages it had sustained. The oysters which it carried were thrown into the Gironde, on the old Banc de Richard; here having met with the conditions favorable to their propagation, they have multiplied in such numbers that, from the Point de Grave to Richard, for a distance of 25 to 30 kilometers, they form a vast bed, the extent of which will soon be limited only by the banks of the river.

The sexuality of this oyster differs essentially from that of the other kinds common in our waters, the most widely diffused of which is *O. edulis*. The latter is hermaphrodite as established by Lacaze-Duthiers, Coste, Davaine, Möbius, Eyton, Hart, and others. Is it a self-sufficing hermaphrodite? With respect to this nothing has yet been demonstrated. It is highly probable that they are not self-fecundating, if we take into account the fact that the genital gland rarely presents the two sexes at the same degree of maturity.

The Portuguese oyster, on the contrary, is unisexual. This fact is incontestable. We have opened a great number, taken at all phases of the reproductive period, and all were exclusively male or exclusively female.

On the other hand, and contrary to that which occurs in the common oyster, where fecundation is accomplished in the interior of the valves, in the Portuguese oyster the eggs are expelled from the shell into the water outside, where they meet with the fertilizing element. Never, in fact, did we find either ova or embryos in the mantle of *O. angulata*. A fact which also goes far to prove this is the following: The eggs and embryos of the Portuguese oyster develop in pure sea-water, while those of the common oyster, at least during the whole of the period of gestation of the egg to the moment when the embryo abandons its maternal shelter, cannot live outside of the liquid contained in the shell, a liquid which, according to an analysis made in the laboratory of M. Berthe-

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lot, *contains albumen* in a notable proportion. It was in vain that we attempted to preserve the embryos of *O. edulis* in renewed and aerated sea-water until their complete development, even though they had attained the state of white or that of gray fry. The white embryos died after two or three days, the gray embryos after twelve or fifteen days, although they were in the presence of collectors to which they could attach themselves.

These facts show the essential differences between the two species of oysters, and exclude all idea of interbreeding and make us reject the preconceived theory of hybridization entertained by some ostraculturists. We have, moreover, made direct experiments in hybridization which gave only negative results. In this manner, in several attempts last season and this, we have brought together the eggs of the Portuguese oyster and the zoosperms of the common oyster, and reciprocally; never, under the conditions where we have experimented, the sexual elements not being brought together naturally and instinctively, was there a sign of fecundation or of development.

The sexual elements of *O. angulata* being, as one might say of them, clearly separated, we have conceived the possibility of achieving their artificial fecundation. The example of Brooks, of the [Johns Hopkins] University of Baltimore, who had made successful attempts in the artificial fecundation of *Ostrea virginiana*, was, to say the least, encouraging.

Here is, after numerous experiments, the mode of fecundation which we have adopted. It is easy, after some experience, to distinguish the sexes of the adults with the naked eye. We detached the eggs from the ovary by means of a camel's hair pencil, and they were then placed in a vessel filled with sea-water—a vial, for example. To separate them and free them from the foreign matters with which they are surrounded, we shook the vial for a few moments, when the liquid was allowed to stand. The eggs which are fit for fecundation then fall to the bottom of the vessel; that which remains in suspension is to be thrown away. Decanting the latter we renew the water in the vessel, and it is sufficient to add a small portion of seminal liquor, upon which the eggs are immediately surrounded and rolled by the mobile zoosperms; the first phases of fecundation commence soon afterward.

The ova and spermatozoa retain their vital properties for several hours, without being in contact, in water. Our most successful experiments were made with elements which were not brought into contact until two or three hours after their extraction from the genital glands.

We will not describe the first phases of development of the eggs, but we think there deserves to be mentioned a fact which has not hitherto been observed, viz, that the embryos of *O. angulata* commence to swim, according to temperature, at from seven to twelve hours after fecundation. At Verdon we have had them to do so in seven hours, the water having a temperature of 22° [C. 71° F.] Their movements of translation

are of a rotatory, gyratory character; at times they turn about a point as upon a pivot; at other times they change place rapidly and traverse the field view in which they are observed.

The shell is formed about the sixth or seventh day after impregnation.

Artificial fecundation presents no difficulties, and results four times out of five in the formation of mobile embryos, if good spawn is used. Oviposition proceeds gradually in the Portuguese oyster, and sometimes for several weeks. When the genital gland becomes transparent at one point it shows that the sexual products are ripe, and that they may be used to advantage.

Because of what has just been said, and in view of the exceptional fecundity of the oyster of the Tagus* [*O. angulata*], we have attempted to make some practical applications. With this object, we have arranged at Verdon a claire of 100 square meters in area, into which we have poured the animated products of diverse artificial fecundations.

The difficulty to be overcome was to prevent the escape of the embryos and assure the renewal of the water. We have attained these ends by making the water pass in and flow out through a bed of fine sand.

After a month of repeated experiments our efforts were crowned with success. We have had the satisfaction to find some spat fixed upon each of the tiles placed in our experimental claire. This is all the more remarkable, since, up to this time, the past week, there has been no spat attached to the innumerable collectors immersed upon the oyster banks of the Gironde—that is to say, in the very center of the reproductive area.

A HYBRID PLAICE—PLATESSA VULGARIS WITH RHOMBUS MAXIMUS.†

By K. E. H. KRAUSE.

On the 21st day of August, of this year, a remarkable-looking plaice was shown to me, and the question arose whether it was not a turbot. It had been sold by the fishwoman Hävernick of Warnemünde together

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* One cubic centimeter of the ovary contains:

	Eggs.
By the method of dissociation	2,500,000
By the method of sections	5,200,000
Mean	3,850,000

The volume of the ovary of an oyster, of medium size, varies between 6 and 8 cubic centimeters.

† *Ein Schollen-Bastard. Platessa vulgaris* × *Rhombus maximus. K. E. H. Krause, in: Archiv des vereins der Freunde der Naturgeschichte in Mecklenberg* (1881). May, 1882, pp. 119-120. Translated by H. G. DRESEL, U. S. N.