XV.—THE THICK OR THIN FERTILIZATION OF EGGS.

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It is well known that to this day practical pisciculturists are doubtful whether the roe squeezed out of the female fish is to be put in a little water, or whether it should be allowed to mix with the milt, and water only be added after this process is finished. There are various reasons, *pro* and *con*, interesting and important enough to form the subject of a short article.

The outer skin of the fish-egg is porous; it consequently absorbs the water from every direction and swells considerably. This process of absorption, however, is finished in a very short time, and then the egg, in a *physical* sense, is dead to its surroundings; it exercises no power of attraction on the water or on the sperm floating in it, and the latter has therefore no occasion to approach the eggs from all sides and endeavor to effect an entrance. On the other hand, it has been shown that the spermatozoa when mingling with the water dies very soon, while it will keep alive much longer when contained in the natural undiluted moisture of the fish. These facts speak strongly in favor of mixing roe and milt without previous addition of *water*, as thereby the roe would waste its power of absorption on the water and the sperm be made to die gradually. The only objection which can be raised is that such a procedure is not in accordance with the dictates of nature, which in such imitations should be followed as closely as possible. This latter reason, however, is only *seemingly* correct and tenable, and at any rate is not applicable to all cases.

It is an open question whether the natural process is not an impregnation of the egg if not entirely outside the water, at any rate with but a slight coating of the eggs with water, in which case the milt would come in contact with the roe as if diluted, and the absorption of water would only take place gradually. Some species of fish, moreover, have some sort of copulation, approaching each other until their lower sides almost touch, bringing roe and milt in such close contact with each other that at least during the first moments a dilution by water can scarcely be thought of.

* *Dick oder dünn Befruchten der Eier, von G. F. Reisenbichler.*—[Translated by Herman Jacobson.]

From the above it will be seen that the mingling of roe and milt *without water* is not entirely without its prototype in nature, as it might appear to a superficial observer, and that this reason, therefore, is without force. There is in reality no advantage, except for a more *general fertilization* of the roe, in gathering it in an empty vessel, sprinkling the milt over it, mixing the two well, and then after a few minutes adding a small quantity of water. In this manner far more eggs are impregnated than when they are placed directly in the water, and thus *physically* killed before the milt can make its influence felt. This procedure, as we have shown above, is *by no means without its parallel in nature*, and cannot be termed unnatural, although in nature it is carried out in a somewhat different manner. Care should be taken, however, in squeezing the roe into an *empty* vessel to *diminish the violence of its fall as much as possible*, because the eggs may be injured in striking the bottom of the vessel, which danger is of course averted if they fall into the water.

The fish from which roe or milt is to be extracted should be brought as close *as possible* to the bottom of the vessel, which has previously been *moistened* with a *clean wet cloth*, so that the distance which the roe and milt have to fall may be diminished as much as possible. For this reason flat vessels with a low edge are the most suitable, because in such the fish can be brought close to the bottom, which is quite smooth, and which has *previously been moistened a little.* At present round vessels are generally used, but *long, oval* vessels, corresponding somewhat to the shape of the fish, would be better, as then the fish might be held over them in its full length. The vessel would, therefore, best have the following shape: it should be long, oval, and flat, and have at the end two raised places in the edge, between which the tail of the fish could be placed, so as to prevent its frequently very violent movements, which hinder the extraction of the roe and milt, while the long shape of the vessel, corresponding to the length of the fish, makes it easier to hold it. The fish may be placed almost entirely in the vessel and made almost to touch the bottom without having either its head or tail resting on the edge of the vessel, or letting only its tail rest in an indentation of the edge. Pisciculturists should never be without such vessels, which make the process of impregnation much easier and pleasanter. It is best if two persons are employed in this process, one holding the spawner and the other the milter, bringing their lower sides close together in a slightly oblique direction over the vessel, and extracting milt and roe simultaneously, so that they may mingle as much as possible immediately on leaving the fish. As one milter is sufficient to impregnate the roe of 3 to 5 spawners, the milter should in this *simultaneous* impregnation either be only partially emptied, and should therefore be used for 3 to 4 spawners, or 2 to 3 of the latter should first be emptied, and while extracting the roe from the last (the fourth) spawner the milter should be emptied completely, thus making only the last extraction a mingling process. This method, which at first seems a little more difficult, is certainly the

best for obtaining as complete an impregnation of the eggs as possible. Two persons, however, should always be employed, and the above-mentioned vessel should be used. The partial emptying of the milter is always difficult and often a doubtful experiment. It will, therefore, be best first to extract the roe from three spawners and empty the last spawner at the same time as the milter in the manner above mentioned.

Roe and milt are usually mixed with the hand, which, however, should not be done, as the warmth of the hand may easily injure the milt, and as the mingling process will not be very thorough. If roe and milt are not emptied into water the mingling process may be considerably facilitated by spreading the roe in broad layers and squeezing the milt evenly over it. But for making the mingling thorough a sort of *comb* with *blunt, rounded-off* teeth should be employed, and the teeth should be far enough apart to let the eggs pass through easily. Such combs are, properly speaking, *indispensable*, if the impregnation is to be perfect. The comb is several times drawn up and down through the roe and milt *as soon as* they have been extracted and before they have been watered; the necessary quantity is then immediately added, best by letting it flow evenly and rapidly from a watering-can with narrow apertures. The roe and milt are then again mixed several times by means of the comb, which will make the process of impregnation as complete as it is possible to make it.

All the above-mentioned operations must of course succeed each other *very rapidly*. Special attention should be paid to the temperature; the vessel destined to receive the roe and the milt, the comb and the water, should all have the temperature of the fish, or rather of the roe and the milt, and the use of the hands should therefore be avoided as much as possible. The water should always be taken from that in which the fish have previously lived. The weight of the water to be added should be fully one-half that of the roe and milt. After having been mixed with the comb the watery mixture should be left alone for about an hour in a cool place, so *the eggs may not get warm*, and the impregnated eggs should then be placed in the breeding-troughs with running water, which cleans them of the milt which has now become useless.*

*We have given the above article in its unaltered form, although we cannot entirely agree with some of the opinions advanced by the author, while we must condemn some of them. We therefore reserve our criticism for a future occasion.—EDITOR OF FISCHEREI-ZEITUNG.

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