

*Citation:*

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Zoölogy. — "*The unfavourable condition of which complain the oyster cultivators on the Eastern-Schelde.*" By Dr. P. P. C. HOEK.  
(Communicated in the meeting of December 23, 1901.)

Dr. HOEK discusses the unfavourable condition of which the oyster-cultivators on the Eastern-Schelde complain and explains that the reason of this is; 1. that for some years the oysters have not thriven so well nor so quickly, 2. because of great mortality in certain years, 3. of a much greater mortality than formerly in all the later years. The speaker was commissioned to investigate this matter. A detailed report on the results of these researches was now in the press. With the permission of the Minister of Public Works, by whose order the investigation had taken place, the following summary was given of what these researches had brought to light.

There were three possibilities, which were successively taken under consideration, viz.

1<sup>st</sup> that the physical circumstances under which the cultivation takes place, had undergone changes;

2<sup>nd</sup> that the oyster itself had altered;

3<sup>rd</sup> that the less favourable condition, in which the oyster-culture finds itself at present, was to be imputed to that culture itself.

As regards the physical circumstances, it would not seem probable *a priori* that meteorological factors have played a prominent part in this decline, considering the period of 1870—85 as a time of high prosperity of the oyster-culture in Zeeland and the years 1885—1900 as a period of decline. Some of those interested in the culture, are of opinion, that the laying of the dyke at Woensdrecht has raised the salinity of the water in the eastern part of the Western-Schelde and that the consequences have become fatal for the oysters, which are cultivated there.

Considering however that this dyke has been built in 1867, that the oysterculture only began after 1870 and from the beginning attained to a period of prosperity, this supposition must also be rejected as extremely improbable. From investigations made in '81—82 and from a comparison of those with similar ones of later years, it is moreover evident that the salinity has not been raised in any way in the last twenty years.

It would appear from informations supplied by the "Waterstaat" that the quantity of seawater, which at every tide restocks the Eastern-Schelde-basin, has not diminished to any amount, since the oyster-culture there has appeared to be in a less favourable condition. And in regard to the nature of the soil the hydrographic survey has indeed brought to light that here and there, locally, shallow places have lately

arisen by accumulation of sand. If it must therefore be considered as proved, that places which had formerly value for the oyster-culture, have lost in quality, the evidence has however not been given that by such influence the good qualities of the oysterbeds in general should have been lost.

The assertion, as if a change, a degeneration of the oyster itself, were the ground of the less favourable results of the culture in the later years, is founded on the supposition that an injurious influence is still exercised by the French oysters which were many years ago imported in the Eastern-Schelde, and that therefore the Zeeland-oysters should have lost of their good qualities by interbreeding. This idea finds a slight affirmation in the extraordinary rich brood-production of these later years. But really not more than the slightest; for in the first place it is not at all sure that the French oysters produce a more numerous posterity than the original Zeeland oysters. And in the second place the abundance of births can very well be explained by the great mortality and the unusual numerous population of oysters, which for many years have been found in the Zeeland-oyster-beds; abundance of births, bad growth and great mortality are symptoms connected with one another; which combined, give proofs of overproduction and of insufficient nourishment of the separate individuals caused thereby.

Proofs can easily be furnished, that the very first young Zeeland oyster taken, still exhibits the same excellent disposition to grow to be an extremely suitable shell-fish fit for human food. This proof is given by the excellent results, which again for instance in this year, have been obtained with young Zeeland oysters transported to other waters; to de Grevelingen, near Bruinisse; to some places on the Western-Schelde; to places in the Zuiderzee, near the coast of Texel.

Not the oyster itself is therefore to be blamed for the decline of which the cultivators complain, but the oyster-culture as such. The circumstances, the favourable results in the first years, competition, which raised the leases tremendously, have occasioned heavier claims to have been put to the oyster-producing territory. Considering the thorough renewal of water of some hundred millions cubic Meters of water with every tide, and taking for granted that the oyster feeds itself with the small organisms, which are carried along with the tide and form the so-called plankton, the quantity of oysters to be obtained seemed indeed unlimited. From investigations made in Zeeland for some years, it has however become evident that the oysters do not chiefly feed on plankton but on small vegetable

organisms abiding near the bottom, Diatomaceae, of the benthos.

These bottom-Diatomaceae however are found not to be equally abundant in all parts of the Eastern-Schelde-bed, but their appearance is very markedly connected with the nature of the sea-bottom. The latest investigations of G. KARSTEN, who has made the bottom-Diatomaceae in the Gulf of Kiel a subject of his studies, have now made it very probable that different nutritive salts which are present in the bottom of the sea, have an active part in the development of those Diatomaceae; a part comparable to that which they play in the development of agriculture. Whether certain bacteria will prove to render the same important services here as in the growth of our agricultural plants, can as yet only be supposed, however probable this may be. It is already obvious however that exhaustion of the soil, in consequence of overpopulation in the oyster-culture, is equally imaginable as in any other culture.

The speaker hopes soon to be able to present to the Academy a copy of the report on his investigations, for which he has obtained considerable co-operation from different sides.

**Physiology.** — “*A new law concerning the relation of stimulus and effect.*” By Dr. J. K. A. WERTHEIM SALOMONSON. (2<sup>nd</sup> Communication). (Communicated by Dr. C. WINKLER).

In a former essay I have formulated a law expressing the relation between the magnitude of a stimulus and the effect operated by it. Our deductions were based exclusively on wellknown physical principles, viz. on the fact that an infinitely small increment of stimulus will cause an infinitely small but proportional increment of consumption of the substance by the transformation of which the effect is occasioned, whilst we admitted finally with GULDBERG and WAAGE that the magnitude of this transformation, must be proportionate to the quantity of transformable substance. Starting from these perfectly admissible premises, we finally found a law, expressing the relation we were in search of, in the following formula:

$$E = A \{ 1 - \varepsilon - B(R-C) \}$$

We tested this law in the first place to the relation of stimulus and *muscle-effect*, and arrived at the conclusion that on this point there existed a perfect accordance between my law and the results, obtained experimentally by other investigators.

In this way we proved the validity of the law for the muscles.

We will try now to examine whether our law prevails also in regard to other organisms or parts of organs.