

seite sich noch eine Falte erhebt, die am Ende in eine hyaline, den Höcker überragende Haut ausläuft, deren Spitzensaum aber noch nicht die Länge des kürzeren der beiden äußeren Arme erreicht. Durch ein gelbes Bälkchen ist der Spermalapparat an das eigentliche Hinterblatt angekittet.

(Schluß folgt.)

## 2. The Reproduction of the Lobster.

By Francis H. Herrick, Adelbert College, Cleveland, Ohio, U.S.A.

eingeg. 20. März 1895.

An article on »Lobster Reproduction« by Mr. S. Garman has recently appeared in the *Zoolog. Anzeiger* (No. 467, Feby. 4th, 1895), in which he enumerates some interesting observations originally published in a report to the State Fishery Commission of Massachusetts, in 1892. The impression is conveyed, quite unintentionally no doubt, that until the publication of the original paper, little was definitely known regarding the breeding habits of the lobster. While pointing out that this is not the case, I do not wish to detract from the interest and value of his work.

In May, 1891, I published two short papers on the lobster<sup>1</sup>, which I sent to Mr. Garman at his request. In September, 1891, Bumpus published a careful work on the embryology of the lobster<sup>2</sup>, in which many important facts bearing upon the problems of reproduction were accurately stated. The report by Garman, addressed Dec. 17th 1891 to the Massachusetts State Fishery Commission, and published in the Annual Report of the Fishery Commissioner for 1892, is summarized by the author as follows: »1) The female lobster lays eggs but once in two years, the laying being two years apart; 2) the normal time of laying is when the water has reached its summer temperature, varying in different seasons and places, the period extending from about the middle of June till about the 1st of September, and 3) the eggs do not hatch before the summer following that in which they were laid, the time varying with the temperature, and the period extending from about the middle of May until about the first of August.«

In regard to the first point, the frequency of spawning, I had made the following observations in my paper just referred to: »The

<sup>1</sup> Notes on the Habits and Larval Stages of the American Lobster, and The Reproductive Organs and Early Stages of Development of the American Lobster. Johns Hopkins University Circulars, Vol. X. No. 87. Baltimore, May, 1891. An abstract of these papers was also published in the *Zoologischer Anzeiger*, Nos. 361 and 362, April—May, 1891.

<sup>2</sup> *Journal of Morphology*, Vol. V. No. 2. Sept. 1891.

lobster does not breed annually. This is abundantly proved by the slow growth of the ovarian eggs, by the immature condition of the ovaries at the time when the young are hatched, and by the large percentage of non egg-bearing female lobsters taken in the winter and spring.« — »Soon after hatching a brood the lobster may molt, but eggs are not laid again until at least another year.« This is equivalent to saying that it is not possible for the lobster to produce eggs oftener than once in two years. That it requires this time for the ovarian eggs to reach their normal size is an inference which was drawn from the anatomy of the organs. Over 100 dissections were made in the summer of 1890 (June 28—August 19) to determine this and other points. No one so far as I know has ever kept a female lobster during the entire period from one egg-laying to another.

In reference to the second point, the period of egg-laying, very explicit statements had been made both by Bumpus and myself. The following extracts are taken from my earlier paper already referred to. »The spawning season is confined to the summer months<sup>3</sup>, and the eggs which are then laid, are carried by the female through the fall, winter and spring, and are not hatched under natural conditions until the following summer.« »The period during which eggs were laid this year (1890) began about July 1st, and extended until about August 20th,« . . . . . »In 1889 the spawning was somewhat earlier.«

The third point—that the eggs which are laid in the summer do not hatch until the summer following (May—July), was also clearly stated by both Bumpus and myself. In addition to the statement made above, the following extracts from my paper published in May, 1891, illustrate it still further . . . . . »The eggs laid in summer develop with comparative rapidity and eye-pigment is formed in 27—30 days. Development slows up in the fall, and comes nearly though never quite to a standstill in winter.« »The hatching period at Woods' Holl (determined for the seasons 1889, 1890) extends over a period of six to eight weeks, from about May 15th, to July 15th.«

The rate of embryonic development at Woods' Holl was tabulated, and various other facts bearing upon the life history of the lobster were given in this paper.

In view of the foregoing facts the first part of the paragraph with which Mr. Garman closes his paper is rather surprising: »I am pleased to see that Mr. F. H. Herrick in the *Zoologischer Anzeiger*, No. 454. Aug. 13. 1894. p. 29, confirms my observations on times,

<sup>3</sup> I have since shown that this statement is inexact, and that a considerable number of lobsters extrude eggs at other times of the year. (See *Zool. Anz.* No. 454. Aug. 13th. 1894. p. 29, and the close of this article.)

rates and on variations along our coasts, etc., even though he does not make it entirely clear why he should prefer to give the impression that my work was first published in the Aquarium of January, 1894.«

While questions of priority are not of the first importance, one does not like to have the imputation made that what he puts forth as an original contribution merely confirms the work of a previous writer, when nothing could be farther from the truth. Neglecting my earlier paper published in 1891, still the facts recorded in »The Reproduction of the Lobster« to which reference is made (Zool. Anz. No. 454. Aug. 13th. 1894) do not confirm Mr. Garman's »observations on times, rates, and on variations along our coasts, etc.« in one very important particular, the time of spawning. While the majority of female lobsters capable of spawning, lay eggs in the months of July and August on the New England Coast, possibly as many as 20—25 % extrude eggs at other times, in the fall, winter or spring. This variation is perfectly normal and leads to a corresponding variation in the time of hatching. It is moreover independent of change of place and season. During a period of seven consecutive months five traps were kept set in the harbor of Woods' Holl, Mass., Dec. 1st, to June 30th, and were visited daily. Altogether 108 egg lobsters were taken, and 44 or 25,6 % of the number, bore external eggs which had been laid in the fall or winter. A corresponding variation was observed on the coast of Maine.

I regret that I should have had access only to The Aquarium, where Mr. Garman's report appears, since there is no statement whatever in that periodical to show, either from what source it had been reprinted, or that it had been previously published at all. Had I known of its earlier publication, I would have gladly acknowledged it.

Adelbert College, Cleveland, Ohio, March 6th, 1895.

### 3. On the Phylogeny of the Lepidoptera.

By A. S. Packard.

eingeg. 26. März 1895.

The taxonomic importance of Walter's<sup>1</sup> interesting discovery that *Eriocephala calthella* has maxillae constructed on the type of those of biting or mandibulate insects, i. e. with an inner (galea) and outer lobe (lacinia), besides the palpi, was apparently overlooked by him as well as by others, though its bearings on the phylogeny of the Lepidoptera insisted on by Walter are, it seems to us of the highest inter-

<sup>1</sup> Beiträge zur Morphologie der Schmetterlinge. 1885.

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