

sides black. *Sternum* oval, narrower at anterior than at posterior extremity, ochraceous, with broad black margin. *Abdomen* elongate, oval, slightly pubescent, pale dull ochraceous, with numerous blackish short lines or spots; on the sides these spots range themselves in longitudinal lines; on each side of the upper medial line is a broad longitudinal band composed of confluent black spots, approximating to each other towards each extremity, where they meet; the spots on the under surface are fewer and more minute; down the medial line extends a narrow band composed of more distinct spots, some of which are confluent. *Sexual organs* black. *Branchial opercula* pale yellow.

I found a single adult female of this large and handsome species at Southport, Lancashire, during the last week of September; it was sunning itself on a gate close to the shore on the south side of the town: it appears to be new to science. The name by which I have designated it will commend itself to all your readers. My esteemed relative and friend Mr. Blackwall has for many years devoted himself to the study of this Order, and the result of his unassisted labours is simply this:—twenty-five years ago I suppose from forty to fifty species were all that were known as recorded indigenous representatives of this Order; we can now boast of a catalogue comprising TWO HUNDRED AND FORTY-SEVEN. I rejoice to find that others are actively following where he has so long led; for there is little doubt but that this our present list, however in itself creditable to science and honourable to him, will be still further increased.

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XXXI.—*Observations on the Habits of the Stickleback* (being a continuation of a previous paper). By ROBERT WARINGTON, Esq.

DURING the early part of the last summer I had the good fortune to observe the whole progress of the various stages in the breeding of the Three-spined Stickleback, *Gasterosteus leivurus*, which will therefore enable me to complete the notice already published on this subject in the 'Annals and Magazine of Natural History' for October 1852.

In the account there given, the observations extended to the completion of the nest by the male fish, and it is my intention in the present communication to carry on the details of the progress from that point, premising that the water was the same which had been employed for the original experiments of 1849, and that the fish contained in the aquarium consisted of three Stickleback, one male and two females, two Tench, and a Goldfish.

The position selected by the male fish for the construction of the nest was between two plants of *Vallisneria spiralis*, at the point where the leaves spring from the root, and directly in front of a fragment of limestone which rose behind the plants and acted as a protecting background to the position. The nest being all prepared, exactly as before described, although by another individual, the eggs were deposited, I presume, during the night of May 8th: this was judged of, not from observance of the act of spawning; but from the altered appearance of the female fish evidencing that she had shed her spawn, from the immediate change made by the male fish in the arrangement of the materials forming the nest, and, likewise, the violent repulsion of the female from the neighbourhood of its position, to which previously he had been as assiduous in driving her.

From this period the nest was opened more to the action of the water, and the vibratory motion of the body of the male fish, while hovering over its surface, caused, as before described, a current of water to be propelled across the surface of the ova; this action was repeated almost continuously. The apparent luminosity of the body, if I may so term it, also decreased, and in this state all continued without change until the 18th of May, making a period of ten days. After this date the whole nest was destroyed, and the materials of which it had been composed thrown aside, with the exception of a few wiry stems of a decayed water moss, and a space cleared around the spot of about 3 inches in diameter; the mud or sand at the bottom being carefully removed with its mouth and carried in this manner to some distance, leaving the rounded stones of the gravel clean and free from any obstruction around them.

Watching carefully for a short time, to understand what all this busy alteration indicated, I at last had the pleasure of observing, by the aid of a long-focused pocket-lens, some of the young fry,—of course most minute creatures, fluttering upwards here and there, by a movement half swimming, half leaping, and then falling rapidly again upon or between the clean pebbles of the shingle bottom. This arose from their having the remainder of the yelk still attached to their body, which, acting as a weight, caused them to sink the moment the swimming effort had ceased.

Around all this space above mentioned, and across it in every direction, the male fish, as the guardian, continually moved. And now his labours became still more arduous than they had been before, and his vigilance was taxed to the utmost extreme, for the other fish, three of them some twenty times larger than himself, as soon as they perceived that the young fry were in motion, used

their utmost endeavours, continuously, to pounce upon the nest and snap them up. The courage of this little creature was certainly now put to its severest test, but nothing daunted he, drove them all off, seizing their fins, and striking with all his strength at their heads and at their eyes most furiously. All the assistance that could possibly be afforded him was of course rendered, short of actual interference, by keeping them pretty well fed, in order to allay, if possible, their voracity. Another circumstance, which appeared to add greatly to the excitement that he was constantly subjected to, arose from the second female fish, being in spawn, endeavouring most pertinaciously to deposit her ova in the same locality, and hence rushing frequently down towards the spot; but the male fish was ever on the alert, and although he did not strike at her in the furious way he attacked the larger ones, yet, he kept continually under her, with the formidable back spines all raised erect, so that it was impossible for her to effect her apparent object.

The care of the young brood, while encumbered with the yolk, was very extraordinary, and as this was gradually absorbed and they gained strength, their attempts to swim carried them to a greater distance from the parent fish; his vigilance, however, seemed everywhere, and if they rose by the action of their fins above a certain height from the shingle bottom, or flitted beyond a certain distance from the nest, they were immediately seized in his mouth, brought back, and gently puffed or jetted into their place again. This was constantly occurring, the other fish being continually on the watch to devour these stragglers, and make a savoury morsel of these Lilliputian truants. Indeed, the greater number of the whole brood must have fallen a prey to their voracity, as it was only some three or four that reached a size to place them beyond the power of these destroyers.

As soon as the young fry could swim strongly the parent fish gradually relinquished his duties, although a constant watch appeared to be still quietly maintained on their motions as they swam about near the surface of the water and among the floating leaves of the *Vallisneria* and *Lemna*. It is a curious circumstance, that, very soon after these young Stickleback were left unmolested by their companions, both the parent fish disappeared, and I presume have died in some hiding-place among the rock-work; as though, their allotted functions, namely the propagation of their species, having been completed, their period of existence must terminate.

Apothecaries' Hall, Sept. 11, 1855.