

June 1852 the larva ceased to move, and changed into a pupa on the 4th of July. On the 3rd of August this pupa gave birth to a very large female of *Cebrio gigas*.

"I wished to know how these larvæ could live at a depth of 50–60 centimetres in earth so dry, that during the summer a few plants could scarcely vegetate upon it. I endeavoured to ascertain how these insects could travel through a soil, which during long droughts becomes of an extraordinary degree of hardness. Several circumstances assisted to explain the whole to me. One day, whilst holding in my hand the earth which contained one of these larvæ, I felt the efforts which it made to open a way for itself, and found that it diffused a liquid for the purpose of softening the hard and compact earth, and that the first segment of its thorax possessed the faculty of enlarging by its dilatation in this moistened earth, the passages which the larva is obliged to pass through in search of its nourishment, which consists of roots.

"On the 8th of November last, I found, in a small space, three larvæ of different ages, from which we may conclude that they remain several years in the earth."—*Comptes Rendus*, Jan. 31, 1853, p. 225.

On the Reproduction of the Toad and Frog without the intermediate stage of Tadpole. By EDWARD JOSEPH LOWE, Esq., F.G.S., F.R.A.S.

The following brief remarks on the Toad (*Bufo vulgaris*) and the Frog (*Rana temporaria*) may perhaps be received with some degree of interest, as they are, I believe, contrary to the generally received notion of the procreation of these reptiles. Ray, and most naturalists, at least, consider toads and frogs as oviparous animals, yet it is apparent that they are viviparous as well, or if they do not bring forth their young alive, have the power of reproduction in a different manner to the ova and subsequent tadpole.

Mr. J. Higginbottom of Nottingham, who has paid great attention to this subject, has clearly proved the development of the tadpole to the perfect toad in situations wholly deprived of light, as I have through his kindness several times witnessed. My present remarks are intended to show that *occasionally* frogs and toads are reproduced in localities where it would be impossible for the intermediate stage of tadpole to have any existence.

First. *Toads deposit spawn in cellars and young toads are afterwards observed.*

Last summer several masses of spawn were procured from my cellar, having been found deposited amongst decaying potatoes, &c., and subsequently young toads were noticed. The cellar is free from water, and at a considerable distance from any brook.

Secondly. *Young toads are observed about hot-beds.*

In the kitchen-garden at Highfield House (which is entirely walled round) young toads have been noticed about the cucumber- and melon-beds. The gardeners have been in the habit of bringing

toads to these beds to destroy the insects; these have continued amongst the warm damp straw all summer. It is after these beds have remained three or four months that the young ones have been noticed. Toads would have to travel nearly half a mile to reach this garden from the brook or lake, and also to mount a steep hill, besides taking the opportunity of coming through the door. Toads so small are not seen in any other part of the gardens.

Thirdly. *Young toads and frogs observed in abundance at the summit of another hill, whilst quite small.*

During the past summer, especially in the month of July, very many young toads and frogs were seen amongst the strawberry plants, apparently from a week to a month old. These might possibly have travelled from the brook a few hundred yards distant; yet it is strange, that with the exception of these beds, no young toads could be found elsewhere in the garden. A number of full-grown toads are mostly to be seen about these beds.

Fourthly. *Young frogs dug out of the ground in the month of January.*

In digging in the garden amongst the strawberry-beds (near where so many toads were observed last summer) in the middle of January in the present year, a nest of about a score young frogs were upturned. These were apparently three or four weeks old. This ground had been previously dug in the month of August and many strawberry plants buried; it was amongst a mass of these plants in a state of partial decomposition that these young ones were observed.

Fifthly. *Young frogs are bred in cellars where there is no water for tadpoles.*

In mentioning this subject to Mr. Joseph Sidebotham of Manchester (an active botanist), he informed me that young frogs, and in fact frogs of all sizes, were to be seen in his cellar amongst decaying dahlia tubers. The smallest of them were only about half the ordinary size of the young frog when newly developed from the tadpole. He further stated that there was no water in the cellar, and no means of young frogs entering, except by first coming into the kitchen, a mode of entry, if not impossible, highly improbable. Mr. Sidebotham never found any spawn.

It seems probable from the above, that frogs are occasionally born alive in situations where no water can be found for the spawn to be deposited in, and that toads are either reproduced in the same manner, or from the egg directly. The latter mode seems most likely, owing to spawn having been found previously to the young toads.

Mr. Higginbottom tells me the same remark on the birth of the Triton, without the stage of tadpole, has been mentioned to him.

These are the facts; should the subject be deemed worthy of further investigation, I shall be glad to continue observations upon these reptiles during the present year, or to make any experiments that may be deemed advisable.



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