PSYCHE

VOL. XVII.

JUNE, 1910.

No. 3.

COLONIES OF ANTS (*LASIUS NEONIGER* EMERY) INFESTED WITH *LABOULBENIA FORMICARUM* THAXTER.

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It appears, from the exhaustive researches of Prof. Roland Thaxter, the leading authority on the Laboulbeniaceæ, that only two species of these extraordinary ectoparasitic fungi are known to occur on ants. One of these species is *Rickia wasmanni* Cava, found by Wasmann on *Myrmica levinodis* Nyl. at Linz on the Rhine; the other is *Laboulbenia formicarum* which Thaxter has taken at Cambridge, Mass. on *Lasius niger* L. var. *americanus* Emery and *Formica subpolita* Mayr var. *neogagates* Emery. Both species are described and beautifully figured in the second part of Thaxter's "Contribution toward a Monograph of the Laboulbeniaceæ," Mem. Amer. Acad. Arts and Sci., Vol. XIII, No. VI, 1908, pp. 248 and 359, Pl. XXXIV., Figs. 1-13 and Pl. LVIII, Figs. 14, 15.

For some time I have been looking for Laboulbeniaceæ on the ants which I have collected myself or received from correspondents, but it was not till very recently that I happened on any specimens of these fungi. April 20-24, while collecting insects on the seashore at Ellisville, Mass., a small settlement about twelve miles south of Plymouth and six miles north of Bournedale, I came upon two localities about a mile apart, in which nearly all the colonies of *Lasius niger*, var. *neoniger* were infested with what Professor Thaxter has kindly identified for me as the second of the two species of Laboulbeniaceæ mentioned above, namely *Laboulbenia formicarum*. I first found a number of infested *neoniger* colonies a mile south of Ellisville in a small triangular area about a dozen yards in diameter and adjoining the beach. The soil of this area consists of a mixture of sand and humus and must be well within the reach of

the salt spray during stormy weather. A few days later I discovered a much larger area, comprising a narrow strip about a quarter of a mile in length and forming the border of a salt meadow between Salt Pond and the beach at Ellisville. Here there are dozens of infested colonies which have a very definite and interesting distribution. On the beach itself, which consists of a deep layer of pure sand, there are colonies of *Formica fusca* var. *argentata* Wheeler, *Myrmica scabrinodis* Nyl. var. *sabuleti* Meinert, *Tapinoma sessile* Say and *Lasius neoniger*. The last is far and away the most abundant and its workers are of large size. None of the ants in this locality, including the *neoniger*, was found to be infested with Laboulbeniaceæ. On the border of the salt meadow, however, immediately adjoining the beach, where the soil is moist, consisting of a mixture of rather sour, decomposing humus mixed with sand, and probably not infrequently wetted by the spray and occasionally even submerged at very high water, the only ant is *L. neoniger*, but its colonies are less populous than those on the beach, the workers are distinctly smaller and are practically all infested with the *Laboulbenia*. Passing over from this zone of infestation to the pasture land adjoining the salt meadow, the variety *neoniger* is replaced by *L. niger* L. var. *americanus* Emery which is the form of the species commonly occurring in higher and dryer pastures and fields. None of the workers of this form, which lacks on the scapes and legs the erect hairs so conspicuous in the var. *neoniger*, was found to be infested with the fungus. It would seem, therefore, that while *neoniger*, unlike any of the other ants, is able to exist in a depauperate condition in the damp, sour soil at the edges of salt meadows, it does so only at the risk of becoming infested with *Laboulbenia formicarum*. Indeed, the infestation of the ants in this strip of littoral at Ellisville is often so excessive that they resemble hedgehogs, fairly bristling with tufts of the fungus.

According to Thaxter, both *Rickia wasmanni* and *Laboulbenia formicarum* grow on all parts of their hosts, but this statement requires some qualification, at least in the case of the latter species. An examination of several hundred specimens of *L. neoniger* shows that the *Laboulbenia* grows most abundantly on the abdomen, middle and hind femora and tibiæ and posterior portions of the head. The thorax and coxæ, as a rule, are entirely free from the fungus;

the clypeus and gula are generally free, and this seems to be invariably the case with the mandibles, antennal funiculi, palpi, labium, maxillæ and eyes. In a very few specimens I have seen one or two of the little plants on the antennal scapes, but, as a rule, these organs are perfectly clean.

Heavily infested workers were seen toiling at their excavations, constructing the craters of the nest and running about as nimbly as uninfested individuals, but the colonies, judging from their rather limited personnel and the reduced number and small size of the craters seemed to be decidedly less prosperous than those of the larger, uninfested form of the same variety on the sandy beach. I excavated a considerable number of the nests of the infested colonies but in only one instance did I find larvæ, and I failed to find any queens, but as larvæ were not seen in the uninfested colonies and as the old queens of all of our species of *Lasius* are very rarely seen in the nests, these negative observations have little significance.

It is strange that this should be the first time in my rather extensive experience in collecting ants, that I have happened on a locality in which the colonies of a species are infested with Laboulbeniaceæ, and it is even more surprising that previous observers have found only two ant-infesting species of these fungi, which are represented by so many much larger and more remarkable forms on other insects. At first sight ants would seem to be particularly favorable hosts for such parasites since these insects are in the habit of huddling together in masses in warm subterranean galleries, where the fungi might be supposed to develop luxuriantly and transmit their spores from ant to ant with great facility. Further consideration of the matter, however, leads to the conclusion that other habits of the ants must, in all probability, tend to suppress or render impossible the development of the fungi, except under unusual conditions such as those in which I found the colonies of *L. neoniger* living at Ellisville. All ants devote a great deal of time and attention to cleaning their own integument and that of their nestmates. They are, indeed, forever combing and scraping the surfaces of their bodies with their tongues and strigils, so that fungi must find it difficult to gain a precarious foothold in their nests, to say nothing of an opportunity to proliferate. And even on

the rare occasions, when this happens, important organs like the mandibles, antennæ, labium, maxillæ, palpi and eyes are kept scrupulously free from the parasitic growth. Although, as previously stated, many of the *L. neoniger* bristled with the *Laboulbenia*, there were scattered over their chitinous integument numerous minute black dots representing the points of attachment of fungi that had been completely torn away, either by attrition against the walls of the nest galleries, or more probably, by the strigils and tongues of the ants themselves. The observations at Ellisville indicate that the parasitic fungus can luxuriate only on the members of ant-colonies which have become enfeebled or depauperate through nesting in soil which is too moist, saline or foul, or of an abnormally high temperature when exposed to the sun.

ON THE REPUGNATORIAL SECRETION OF CARABUS VINCTUS.

A rather unexpected occurrence happened at the capture of my first specimen of this species, which I had discovered under some old boards near the Shawshine River in Andover, Mass. I picked it up between the thumb and finger for a closer examination and, when perhaps a foot from my face, heard a slight snapping noise which was followed by the sensation that might be produced by the application of red hot needles to one's face. This intense burning lasted until I bathed my face in alcohol. Since then I have taken two specimens in Framingham and, in each case, noticed the same snapping noise, but as I took good care not to get the insect very near my face, I did not experience the previous unpleasant results.

The elytral edges are strongly reflexed in this beetle and at the apices a slight hollow is formed which would hold a small quantity of the fluid secreted; and when the elytra receive the pressure of the thumb and finger they snap past each other and the resultant spring throws the fluid off in a fine spray.

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