

THE OCCURRENCE OF A *CORDYCEPS* ON THE ANT
CAMPONOTUS PENNSYLVANICUS (DEGEER) IN THE
HIGHLANDS, N. C., REGION^{1,2}

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The present notes on *Cordyceps* are an outgrowth of investigations which were done on the altitudinal distribution of ants in the Southern Blue Ridge Providence. The fungus was collected in the field and specimens were cultured in the laboratory. The resulting observations are recorded here.

Cordyceps is an ascomycete fungus of the Order Hypocreales. It is found to be parasitic on the larvae and adults of some insects, especially species of Lepidoptera, Coleoptera, Homoptera, Diptera, Hymenoptera, and Orthoptera (Steinhaus, 1946). In ants it has been found on adults of the genera *Camponotus* and *Formica*, and Masee (1895) states that it occurs on *Atta* in Brazil. Twenty species of *Cordyceps* have been reported from the mountainous areas of North Carolina and Tennessee (Mains, 1939).

C. unilateralis (Tul.) Sacc.,³ upon which the following observations were made, has been collected by Thaxter from Cranberry and Cullowhee, N. C., a distance of 15 to 20 miles from Highlands. Specimens of *C. unilateralis* (Fig. 1) collected at Highlands were found characteristically emerging from between the head and thorax of *Camponotus pennsylvanicus* (De Geer). Eighteen plants were taken between 4500 and 5000 feet elevation, and a preponderance of them was collected from Scaly Mountain near Highlands. All were taken from large fallen logs, rather deep within the woody tissues. The carpenter ant host had died in a horizontal position in each case. Collections were made between June 20 and July 12, 1954.

The life histories of the species of *Cordyceps* are not well worked out. Descriptions of life histories in literature all broadly concern the genus itself, and are consequently generalized. The following summary is based on the work of Gwynne-Vaughan and Barnes (1937). The filiform ascospores are multicellular, and break into separate sections when released from the perithecia. The insect host is penetrated by either germ tubes from these or

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² The project under which these observations were made was sponsored by a J. S. Sewell grant from the Highlands Biological Station in the summers of 1953 and 1954.

³ Identifications were made on the basis of the ascocarps by Drs. L. R. Hesler, Lindesay Olive, and E. B. Mains.

from the conidia. In either case, cells reach the blood stream of the host, where they undergo budding until the insect dies. Hyphae form a compact mass (the sclerotium) which replaces the internal organs, while leaving the exoskeleton intact. It is from this mass that the stromata emerge, with the perithecia in the distal portion. Many descriptions such as this one seem to be based upon *C. militaris*.

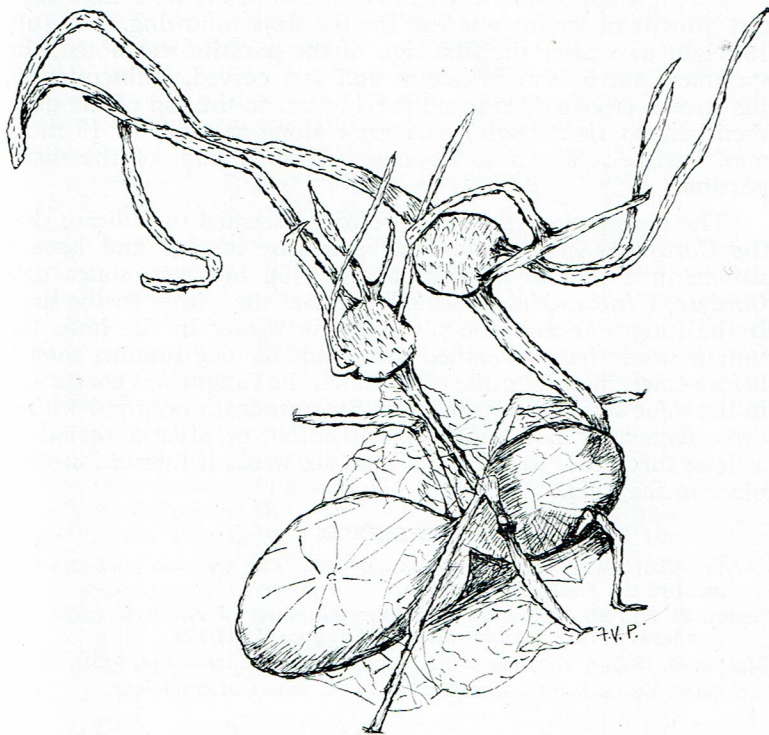


Figure 1. *Cordyceps unilateralis* emerging from both the neck and the base of the thorax of *Camponotus pennsylvanicus*. Note the secondary stroma issuing from the perithecia. This specimen was kept more than a year in the laboratory.

The following observations of the growth of the parasite on the host reveal no apparent parasite initially, and the ant in question alive and seemingly healthy. The fungus was brought into the laboratory at Highlands, and kept alive in petri dishes containing pieces of water-saturated filter paper. In the particular instance in question, an active minor worker of *C. pennsylvanicus* was admitted without handling to a dish containing a single specimen of *Cordyceps*. This was on July 6. There was

no fungus visible on the ant. On July 9 the ant died, and two days later, on July 11, five days after the ant had been placed with the *Cordyceps*, the first indication of a fungal growth appeared. This was a minute stroma about 1 to 1.5 mm. in length, growing vertically from directly behind the head of the host. The ant with its parasite was removed to another petri dish.

The growth pattern of the *Cordyceps* was recorded. The fungus grew approximately 1 mm. in each of the first three days, but growth in length was less for the days following. On July 19, eight days after the first sign of the parasite was noted, the specimen was 5 mm. in length and was curved. Subsequently, the stroma crookedly reached the 12 mm. to the top of the dish, then bent at right angles, and grew along the top for 13 more mm. Peritheca began to develop within 3. mm. of the distal portion.

The observations that were recorded seemed to indicate that the *Cordyceps* in question may parasitize an ant and issue a stroma in a few days. Steinhaus (1946), however, states that *Cordyceps* (no species indicated) survives the winter in the host. If the fungus in this case survived the winter in the host, the fungus would have remained in the ant for one summer month before emerging. If, on the other hand, the fungus was contracted in the same summer that it killed the ant, death occurred within three days after laboratory parasitization, or after a period of at least three days to not more than six weeks if infestation took place in the field.

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OAK RIDGE NATIONAL LABORATORY—BIOLOGY DIVISION

Melvin P. Stulberg has joined the Enzymology and Photosynthesis Group for a period of approximately one year as a Research Associate. Dr. Stulberg received the Ph. D. degree agricultural biochemistry from the University of Minnesota.

Charlotte Auerbach, a citizen of Great Britain, has joined the Cytology and Genetics Group as a visiting investigator. Dr. Auerbach completed her undergraduate study in Germany, following which she received the Ph. D. and D. Sc. in genetics from the University of Edinburgh. Since that time she has been at the University of Edinburgh on the faculty of the Institute of Animal Genetics. Dr. Auerbach is a Fellow of the Royal Society.

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