

their parasites than others. The occasional humidity of the country greatly encourages the appearance of this singular fungus; at least it is always after their tubes have been filled by the heavy rains, which fall in immense quantities at lengthened intervals, that the entomophytes are found."

In this country it is reputed that *Cordyceps entomorrhiza* is more commonly found on the larva of *Hepialus* than on any other insect, albeit it was Mr. Gray's opinion that the larva figured by Dickson for this parasite was coleopterous, belonging to the family *Silphidæ*.

NEW ZEALAND VEGETABLE CATERPILLAR.

Cordyceps Robertsii. Hook.¹

The first succinct account of this entomophyte we have met with was the report of its exhibition at one of the meetings of the Entomological Society in 1836,² when the caterpillar was presumed to be that of a *Sphinx* feeding on the sweet potato (*Convolvulus batatus*), an error which probably originated with Dieffenbach, as this passage occurs in his "Travels."³

¹ Hooker, "Icon. Plant.," i. pl. 11; *Journ. Bot.* (1841), iii. pl. 1; Colenso, *Lond. Journ. Bot.* (1842), i. p. 304; Berkeley, in *Lond. Journ. Bot.*, ii. 209.

² Children, *Proc. Ent. Soc.* (1836), p. 6; Evans, *ibid.* (1838), iii. p. 4, f. 4.

³ Dieffenbach, "Travels in New Zealand," ii. 284.

The caterpillars feed on *Convolvulus batatas*; the *Sphæria Robertsii* is found parasitical on this cater-



FIG. 29.—*Cordyceps Robertsii* on New Zealand caterpillar.

pillar, which only occurs at the roots of the rata tree (*Metrosideros robusta*). It was called by Thompson the "bul-rush caterpillar" soon after, and seems somehow to have got the name of *Sphæria larvarum*,¹ soon followed by that of *Sphæria Robertsii*, and somehow *Sphæria Forbesii*,² which soon dropped. Whilst mentioning synonyms, it may be observed that Corda figured it in his "Icones" under the name of *Sphæria*

Hugelii, and when the old genus *Sphæria* was split

¹ Westwood, *Journ. Ent. Soc.* (1836), p. vi.

² *Lond. Journ. Bot.* (1848), vii. 578.

up into smaller genera, this, with all similar entomophytes, came under the genus *Cordyceps*, for which Tulasne endeavoured to substitute *Torrubia*, but it settled down to *Cordyceps*.

The report of the exhibition at the Entomological Society, by Mr. Children, of specimens of a caterpillar from New Zealand, from the back of the neck of which a long dry vegetable protuberance had been produced, was to the following effect: "The grub of New Zealand in appearance resembles that of a large caterpillar. It lives entirely on the sweet potato (*Convolvulus batatas*, or Kumera of the New Zealanders). During the season it continues healthy and active, but ultimately dies; it retains its natural appearance, but becomes dry and hard, when an appendage sprouts from the tail from four to six inches long, resembling a small twig." With the view of exciting inquiry into the particulars of the growth of this vegetable, which was believed both by Messrs. Robert Brown and J. Bennett to be most probably a species of *Clavaria*, he mentioned that O. F. Muller had published a memoir on the subject of vegetable excrescences found upon animals, all of which, however, were dead at the time of their discovery; but that Dr. Mitchell had published a paper in *Silliman's Journal*, in which he stated that he had noticed many similar instances, especially in a wasp's nest, the larvæ of which were not full grown, but that

incipient vegetation had commenced in the bodies of these larvæ, which, however, continued growing, as well as the vegetable substance within their bodies, until the latter burst out and killed the larvæ subsequently to its attaining its size. The circumstance of the growth of mould on the outside of living chrysalides was also mentioned, as proving that it was not essential that the animals should be dead, and also that the introduction of the germs of a plant, or the larvæ of *Æestridæ*, into the stomach of an animal, had not the effect of destroying their vital properties, and therefore that it was not contrary to nature that the *Clavaria* found upon these caterpillars had grown within their bodies whilst still living.

When described and figured, for the first time, under the name of *Sphæria Robertsii*, only the following notes were given, after stating that it came from New Zealand. "It is there not uncommon, always growing on the dead larvæ of a peculiar insect which feeds on the sweet potato (*Convolvulus batatas*), and in all the specimens I have seen it springs from the back of the neck, just below the head. The larva, though probably when living of a very soft or fleshy character, when dead becomes perfectly hard, and almost horny, so that were it not for the colour it would appear to form one substance with the parasite. Although my specimens are simple, yet there is on

each an appearance that would indicate the stipes to be sometimes branched. The whole plant is of a perfectly black colour, and both the stipes and head are much elongated." The supposed indication of branching is the little nodule on the stem, which is present in all specimens, and does not develop further. The whole plant being of a black colour might possibly refer to badly preserved specimens, but is not applicable to the many specimens we have seen. As to the contents of the caterpillars, the remarks of Professor Westwood here following will suffice.¹ "He stated that he had examined the internal appearance of one of these caterpillars, and that the interior was filled with a hard dry whitish matter, like the kernel of a nut, and that a very slender tortuous black line ran down the centre of the body. Dr. Buckland considered that the substance found in the interior of the body of the caterpillar was vegetable, burning with the odour of hay, without any smell of animal matter, being, as he apprehended, analogous to the subterraneous plant (mycelium) which produces for its fruit the common mushroom."

Bearing also upon this subject, an extract was published from a letter by Dr. J. D. Hooker,² then upon a voyage of discovery in the South, to the

¹ *Trans. Entom. Soc. London* (1841-43), iii. p. v.

² Hooker's *Journal of Botany*, vol. ii. p. 209.

following effect: "About *Sphæria Robertsii* I collected all the information and as many specimens as I could, but am still much at a loss to account for its development. They are found in spring generally under tree-ferns; the caterpillar is buried in the ground, as is the lower portion of the fungus. Now, both these fungi (*i.e.* this and *C. Taylori*) belong to caterpillars which bury themselves for the purpose of undergoing the metamorphosis; and both Mr. Taylor and Mr. Colenso hold the same opinion, that in the act of working the soil the spores of the fungus are lodged in the first joint of the neck, and the caterpillar settles head upwards to undergo its change when the vegetable develops itself. 'I do not remember,' you have remarked in your 'Icones,' 'that the entire body of the insect is filled with a pith or corky vegetable substance, and that the intestines are displaced, which my specimens in spirits show well, and then what does the muscular fibre of the animal become? It must, I suppose, be all turned into vegetable, for the skin of the creatures remains quite sound all the time. This change may take place from the displacement of one gas and development of another; it also occurs in the dark, and is hence somewhat analogous to the formation of fungi on the timber-work in mines. However this may be, the whole insect seems entirely metamorphosed into vegetable with the exception of the skin and intestines." To

this M. J. Berkeley adds, "As in silkworms attacked by *Botrytis Bassiana*, it is most probable that the caterpillar lingers a short time till the vital organs are clogged up with the mycelium. It does not appear that in any case it has made any progress with its cocoon."

Before entering fully upon the entomological aspect, as interpreted by Mr. Gray, we will quote the remarks of Dr. Pereira on this point, made in 1842. "Dieffenbach suggests that the insect is a species of sphinx which feeds on the sweet potato (*Convolvulus batatas*); but the absence of any spine or horn on the last segment of the larva is an objection to this suggestion. Mr. Doubleday thinks that it may be *Hepialus virescens*, which is found at the root of the rata tree. He has a caterpillar apparently identical with that on which the fungus grows, and which is believed to be the larva of *Hepialus virescens*."¹

With this suggestion as to the relation of the host, we revert to the account given in the "Notices" of this caterpillar and its affinities. "It has² the prothorax entirely covered. The mesothorax has an interior and a posterior transverse shield, with a somewhat quadrate spot of the same horny substance on the lower part of the side; while the metathorax

¹ Pereira, in *Pharmaceutical Journal* (1842), vol. ii. p. 592.

² Gray's "Notices of Insects," pp. 6, 7.

is furnished with a narrow anterior transverse shield, with a subtriangular and a subquadrate small shield on each side beneath it. The anal segment of the body is also apparently protected by a horny covering."

These caterpillars are usually found in certain districts during spring beneath the "rata" and the tree-ferns that grow in a light porous and peaty soil, under which the caterpillar burrows perpendicularly in search of its food, consisting of the young and fibrous roots of those trees, and afterwards forms horizontal chambers in passing from one root to another. These roots generally extend to a distance from, and form a circle round, the trunk; the moisture that drops off the leaves keeps the soil in a certain degree of softness, which is beneficial in several ways to the insects. These reside entirely in the earth during the first two states of their existence, as caterpillar and as pupa, and it is not until the third, or perfect state, that they are seen flying about, or settling on the plants in the neighbourhood of their late abode. The perfect state is known to entomologists under the name of *Charagria virescens*. It is of a buffy white satiny colour, with green irregular lines distributed over the surface of the upper wings, while the under wings are of a greenish white. There is also a second species, named *C. rubroviridans*, which is of a larger size, and has the under wings of a pale rusty

colour. The caterpillars of both these species may readily become the bases of this fungoid parasite, as their habits are altogether similar."

"The female deposits her eggs in the crevices of the bark of trees and between the fronds of the tree-ferns near the surface of the earth, which the insects of this family are enabled to do by the attenuation of their abdomen and its great capability of extension, which allows it to become an ovipositor of considerable length. As soon as the young comes into existence, it burrows into the earth in search of its food, and it is certain that the caterpillar does not pass any portion of its life on trees, as is supposed by some writers; but the insect remains in the earth during the first two stages of its existence. It is probable, therefore, that the parasite becomes connected with the caterpillar by means of the seed being taken with the food, and thus passing into the interior of the insect, which had previously become sickly and weakened by the rains which fall at times in great quantities, saturating the earth around it. It is certainly only after such atmospheric influences that the germination of the plant predominates over the growth of the insect, which is found of various ages with the fungus in different stages of growth."

Taylor says that the New Zealanders' name for this plant-caterpillar is "Hotete," "Aweto," "Weri," and "Anuhe." The natives eat the plants, which when

fresh have the flavour of a nut, and also use them when burnt as colouring-matter for their tattooing, rubbing the powder into the wounds, in which state it has a strong animal smell.¹

“The interior of the insect becomes completely filled by the inner plant, or thallus (mycelium); after which the growing head of the outer plant or fungus, passing to a state of maturity, usually forces its way out through the tissue of the joint between the head and first segment of the thorax. The fungus grows to various lengths, reaching in some examples to the length of ten or more inches; of course, this depends in a great measure on the depth to which the caterpillar may be buried at the commencement of the outer growth of the fungus. It is stated that this caterpillar settles head upwards to undergo its change, when the vegetable develops itself.

“But it is evident that the caterpillars are subject to the full development of the parasite at various periods of their growth; certainly some of them, from their size, are attacked long before they are sufficiently matured to place themselves in that position which it is necessary for them to assume before they undergo their final metamorphosis. This idea may have originated from the specimens having the parasite usually projecting forwards, but it may

¹ Taylor, *Tasmanian Journal* (1842), p. 307.

readily be observed, on examining them, that the base of the plant invariably rises perpendicularly from its origin before it is bent, as if the caterpillar had become stationary in a horizontal position in consequence of its being affected by the internal thallus, and the plant had then naturally made its way directly upwards through the peaty soil to the surface, which it would eventually appear to surmount by two or three inches, which portion becomes granulated when matured. It may be added, from information conveyed to the writer, that the fungus, after appearing above the earth, has been gradually withdrawn through the loose soil with the caterpillar attached when the latter has been found in the living state; of course, in such a case the caterpillar was not buried far in the soil, and therefore the fungus was short and easily removed.¹

“The stem of this parasite, it may be remarked, is sometimes slightly coated on the part which is near the surface of the earth with a white woolly matter; the stem is also slender, and somewhat weak in proportion to some others, and it appears to be often broken when a new stem arises from or near the same place—which, it is said, is ‘not known to occur in

¹ A similar caterpillar has been found perfectly changed into a vegetable substance, but in want of the external fungus, numerous examples of which were dug up in a garden at New Plymouth, New Zealand (Taylor, “New Zealand,” p. 424).

any other plant with which we are as yet acquainted in the vegetable kingdom.'"¹

The figure by Corda² represents the plant proceeding in a perpendicular manner from the "tail,"³ or anal portion of the caterpillar. Such examples must be rare; for though a great many specimens of this entomophyte have been examined by the writer, yet he has never met with it in a single instance. A specimen has also been recorded "with an undeveloped stipes growing out of the tail of the caterpillar, as well as one from the back of the head."⁴

Great confusion has existed as to this caterpillar. "One writer evidently confounds it with that of the *Sphinx Carolina*, which cosmopolitan insect is extremely common in New Zealand, as elsewhere, feeding on the *Convolvulus batatas*, to the great annoyance of the natives, who cultivate that plant for food. This insect, when in its perfect state, is the one referred to by the same writer⁵ as attracted by the scarlet flowers of the 'rata,' flitting from blossom to blossom, seeking the honey which abounds within them. A wood-boring larva has also been sent from New Zealand as the same as that with which the

¹ *Medical Times* (1844), p. 200.

² *Sphæria Hugelii*, Corda, "Icon.," vol. iv. p. 44, t. ix. f. 129.

³ *Journ. Proc. Ent. Soc.* (1836), ii. p. 6.

⁴ *Tasmanian Journal* (1849), p. 75.

⁵ Colenso, *Lond. Journ. Bot.*, i. p. 304.

parasite is connected. These mistakes probably originated through the misinformation conveyed to travellers by the natives."

Amongst the features presented by this *Cordyceps*, it is worthy of note that the stem is always very long and slender in proportion to other species, and that there is a little nodule or projection on one side of the stem, scarcely half-way up. The fertile portion is also very long and cylindrical, the perithecia being arranged around the central axis, closely packed together, nearly free, and not immersed in the stroma, as in the majority of species (fig. 29). The perithecia are very small, and densely packed together, so that the peculiarity is not so observable as it would be if the perithecia were larger and not so densely packed together. There is often a suggestion of a cuticle covering the perithecia in the young condition, which is probably the case.

AUSTRALIAN VEGETABLE CATERPILLAR.

Cordyceps Gunnii. Berk.¹

Although collected some years previously, in Tasmania, this entomophyte was first made known in

¹ Berkeley, in Hooker's *Lond. Journ. Bot.* (1848), vol. vii. p. 563, pl. 22; Currey, *Linn. Trans.*, xxii. pl. 45, figs. 1, 2; Saccardo, "Sylloge," ii. No. 5030.

1848, when it was described and figured, since which period it has been several times found both in Tasmania and in parts of Australia. "The stem, with caterpillar attached, is



FIG. 30.—*Cordyceps Gunnii*, from Tasmania.

from five to eighteen inches long, rarely branched, flexuous, rugged below, cylindrical, solid, white, collecting particles of sand by means of a few downy threads. The head is from two to three inches long, one-third to one quarter of an inch thick, perfectly cylindrical, or lanceolate, obtuse, or a little acute at the apex, sometimes compressed, yellow below, with

the top of the stem becoming black above. The mouths of the perithecia scarcely projecting; sporidia breaking up into truncate (almost quadrate) joints." This description is accompanied by an extract from

the letter of Mr. Gunn. "The caterpillar burrows in the ground to various depths, from four inches to one foot, and the fungus seemed to fill up the hole made by the caterpillar, which in all cases is erect (we figure one in which it was at angles with the caterpillar). The caterpillar and stipes varied from five to eighteen inches in length, and were white, except about two or three inches which projected above the surface of the ground, and were shaded off from the white colour below the ground to yellow at the surface, and thence to a deep olivaceous black at the extremity."

The specimen figured differs from those ordinarily seen in some important particulars (fig. 30). It was from a dried specimen, selected for its short stem, and it is smaller and less robust than usual; moreover, the parasite rises at right angles from the caterpillar, whereas it is usually continued in a line with the body. The specimens figured by Berkeley¹ are of the more usual size and proportions, and that given by Gray² is also equally good (plate 1, fig. 4). There is also to be found in the fructification of this species a good feature not to be overlooked, in that the linear sporidia are broader than usual, and break up into quadrate joints; in other species, as a rule, they are

¹ Berkeley, in Hooker's *Journal* (1848), pl. 22.

² Gray, "Notices," pl. 11, fig. 6.

considerably longer than broad. It is found not only in Tasmania, but in many parts of Australia, especially in the south, and though constantly obtained by collectors without the caterpillar, and sometimes only a fragment of the stem, there is no difficulty in its identification.

As to the insect which is subject to the attacks of this entomophyte, we could not presume to write with authority, although Berkeley supposed it was a *Cossus* or *Hepialus*, but fortunately we can fall back upon Mr. Gray for his opinion on the subject, and the evidence on which it was based.

First of all, as to a caterpillar bearing a species of *Cordyceps*, doubtless only a variation of *C. Gunnii*, with an abnormal head, Mr. Gray says, "Among a series of Entomophytes from New Zealand (?) was found one;¹ but whether it had been accidentally placed among them for preservation, or had come with them from that country, is unknown. It, however, differs greatly from its companion in the horny shields on the thorax, each segment of which is strongly protected in front by a somewhat crescent-shaped shield; that on the prothorax is the largest, while the other two gradually decrease in size; the one on the metathorax has beneath it on each side a spot of the same kind of horny substance. It may

¹ Gray, pl. 2, fig. 6.

be remarked that in the formation, and position, of the shields it approaches very nearly to those seen on the caterpillar of *Hepialus lupulinus* of Europe. It is probable that the habits and food of this caterpillar are similar to those of *C. Robertsii*; but in this case it evidently endeavours to seek the mouth of its perpendicular tube after it becomes affected by the internal germination of the seed of the fungus, which eventually checks its progress when near the orifice, where it remains stationary, after which the external growth of the fungus takes place while the insect is in an upright position, causing it to burst forth apparently through the suture above the labium, and thus it grows on the same plane with the caterpillar. Its growth having taken place in a ready-formed tube, also allows of the free development of the stem, which so increases in thickness as to split the head into two equal parts; while a portion of the fungus, when fully developed, always appears above the orifice, and the end spreads out into a palmate form."

Then follows an account of the normal form of the same. "The caterpillar of *Cordyceps Gunnii* was found in Tasmania.¹ The prothorax is almost entirely covered by a horny shield; the mesothorax is furnished with a semicircular shield in front, and a lengthened subtriangular spot of the same horny

¹ Gray, pl. 5, figs. 7, 8.

substance on each side close to the posterior margin ; while the metathorax has a moderately-sized subquadrate spot on each side, of a less horny substance. Another caterpillar¹ was brought from Victoria, and differs from the former in possessing an additional narrow semicircular shield in front of the metathorax. Another caterpillar is also known to the writer, which is found in New South Wales ; but it is only furnished with a semicircular shield on the front of the mesothorax, and with a small subquadrate spot on the side of the metathorax, both of which are apparently of a less horny substance than that which entirely covers the prothorax.

“Such variations of the shields are observed in those found in the European species of the genus *Hepialus*. The similarity of their modes of life, however, causes these three caterpillars to become the bases of the same kind of fungus parasite ; and it is probable that these caterpillars are all referable to species of the genus *Pielus*, or of some closely allied forms.”²

“Certain localities of Australia and Tasmania³ are more favourable for procuring these caterpillars, with their parasites, than others. The occasional humidity

¹ Gray, pl. 2, fig. 7.

² Gray, “Notices,” p. 7.

³ Melbourne and Hunter’s River ; but it is in the neighbourhood of Launceston, Tasmania, that the greatest number of specimens have been found.

of the country greatly encourages the appearance of this singular fungus ; at least, it is always after the tubes have been filled by the heavy rains, which fall in immense quantities¹ at lengthened intervals, that the entomophytes are found. The caterpillars that become the bases of the fungi vary much in size, reaching in some examples to the length of four and a half inches ; this may be considered to show that the caterpillars become possessed of the germ of the parasite at various periods of their age, and that it must be obtained while residing in the burrows, wherein they pass the chief portion of their existence, and which they form quite regardless of the nature of the soil, whether it be composed of sand or clay. The tubes are sometimes made to the depth of two or three feet, and are lined when formed with a coarse web, which greatly facilitates their progress within them ; and these tubes are sometimes extended in a horizontal position, while seeking for the various roots that are buried beneath the soil, and which constitute their food. When the caterpillar feels the effects of the inward growth of its enemy, it no doubt, from the position of the plant, which is longitudinal with the insect, seeks the orifice of its perpendicular tube, but it is apparently checked in

¹ The fall of rain on one occasion, in Tasmania, during February, 1854, was equal to eight and three quarter inches in thirty-eight hours.

its progress at a distance from the opening, which distance is shown by the length of the fungus on the different specimens of the entomophytes, reaching in some examples to a foot and more. After the thallus (mycelium) has filled the interior, the outer portion of the plant invariably bursts forth about the head and prothorax, which two portions are usually covered by the mycelium from which the parasite takes its rise; it then appears for about two or three inches above the earth, ending in a lengthened oval velvety head, of an olivaceous black colour, while the stem beneath the ground is white, shadowing off into yellow above it. In some cases two, and in others three, fungi take their rise from the same base. It may be further remarked that the caterpillar is sometimes discovered coated with a white mould; and it may be added that chrysalides were also found by Mr. Hawkes at Franklin Village, Tasmania, each of which had a fungus growing from it. The germ from which the fungus sprung had probably been taken by the caterpillar before its metamorphosis into the chrysalis state, and, the rainy weather happening to set in soon after, caused the germination of the spore."

TASMANIAN VEGETABLE CATERPILLAR.

Cordyceps Hawkesii. Gray.¹

This entomophyte is, in many particulars, distinguished from *Cordyceps Gunnii*, and, like that species, is found in Tasmania. Mr. Gray was the first to point out its distinctive character and apply to it the above name. The entire length of the club and its host is from five to nine inches, of which the club does not occupy an inch; it is cylindrical, slightly narrowed and truncate at the apex, dotted with the immersed perithecia. The stem is irregular, flexuous, from two to four or five inches long, but slender, and for a great part of its length clad with a fulvous woolly coating (plate 1, fig. 8). It is not thicker than a straw in many specimens, and altogether of a much more slender habit than *C. Gunnii*. Two clubs arise together from the same spot in some instances, or from different parts of the same caterpillar, and occasionally there are three or four clubs on one individual. The internal structure is undoubtedly the same as in this genus, but the dimensions of the sporidia are not named.

The specimens were obtained by Mr. Hawkes in Tasmania in the month of April, and after him the

¹ Gray, "Notices of Fungi," p. 8, pl. 5, figs. 10-12; *Grevillea* (1891), vol. xix. p. 76.

species has been named. It can scarcely be confounded with *Cordyceps Gunnii*, for the club is not nearly so thick or dark, and has a different form. The stem, besides being more slender, is irregular, contorted, and knotted, besides being woolly. From *Cordyceps Robertsii*, again, it differs in the broader and shorter head, as well as in the character of the stem. A comparison of the figures of the two will show that there is no difficulty in distinguishing them. To the entomologist an important difference from both the other species will be recognized, in the clubs springing from any part of the body of the insect.

This species has not been noticed in recent mycological works, partly on account of the memoir in which it was recorded having been privately printed, and hence comparatively unknown, and partly from the absence of any definite technical description. Although *Cordyceps Gunnii* appears now and then in different localities in Australia, the present species has not as yet been recognized outside of Tasmania.

We must, however, advert to the account which Mr. Gray¹ has given of this entomophyte from his own point of view, and his opinion of the host upon which it establishes itself. "It bears," he says, "a great similarity to those of New Zealand, and, from its manner of growth, one is induced to suppose that

¹ Gray, "Notices," p. 8.

the external plant also forces its way at once through the sandy soil, wherever the insect may happen to be situated in its burrow when overtaken by the effect of the internal development of the thallus. Judging from the various lengths of the plant, this takes place at different depths from the surface; and it is sometimes evident that the two ends of the caterpillar, when so affected by parasites, are buried at unequal depths. Thus the plant emerging at the anal portion in one example was apparently buried for three and a half inches, while that originating at the anterior part was not buried for more than two and a half inches, showing a difference of one inch between the two ends, and at the same time proving the justice of the opinion previously expressed in reference to the New Zealand entomophytes, that the plant takes its rise from the caterpillar while in a horizontal or nearly horizontal position. The specimens in general show that the stem above the surface (*i.e.* between the earth and the fructification) did not exceed a half or a quarter of an inch in length; and the buried portion of the stem, it may be remarked, especially that nearest the surface, is covered with a quantity of fulvous woolly matter, which matter sometimes extends itself to the body of the caterpillar.

“The most curious feature, however, of this parasite is that it grows from various portions of the body of

the caterpillar, and in this respect offers a great difference from that of the New Zealand kind. Various examples of this distinction are among the specimens sent by Mr. Hawkes to the British Museum. One exhibits two fungoid tubercles forcing their way through the head, two fungi growing from the same base on the side of the abdominal segments, and a short fungus proceeding from the anal segment posteriorly. Another specimen was apparently in the act of progressing head upwards, but which had been checked in its progress, and the fungus had thus grown from both its ends; yet the two plants had appeared above the surface of the earth near to each other. That from the head is about five and a quarter inches, while the one from the anal portion is eight and a quarter inches in length; the latter, however, proceeded from a short stem which had first apparently grown downwards before the plant turned towards the surface. The stem is irregular in its length, and in places is very woolly, especially the part near the surface, and is more so on the one from the head. Some of these caterpillars bear a fungus composed of a short stem at the base, which has evidently been broken, and has then given origin to several branches; these branches are more slender than where the plant consists only of a single stem throughout. The discovery of this species of parasite has dispelled the idea which had been entertained up

to the present time, that *Cordyceps Gunnii* was the only one to be found in Tasmania. A similar one, or perhaps the same species, is also found in Victoria.

"The caterpillar may be that of a species of *Pielus*, or of some closely allied genus; but the perfect insect is unknown at present. The fungus was found in a sandy district, but the exact locality was not mentioned, and from its appearance it is not improbable that the mode of life, and food of the caterpillar, are extremely like those of the New Zealand entomophytes. It is, however, of a peculiar deep reddish purple colour, about three or four inches in length, partaking of the same form as the others; but the shields on the thorax differ. The prothorax is almost entirely covered; the mesothorax has a narrow shield forming a crescent towards the anterior margin; the metathorax is only furnished with a very narrow crescent-shaped shield, and a subquadrate spot on the side."

MURRUMBIDGEE VEGETABLE CATERPILLAR.

Cordyceps Taylori. Berk.¹

The largest and finest of all entomophytes is that which was brought originally from the banks of the

¹ Berkeley, Hooker's *Journ. Bot.* (1842), ii. p. 210, pl. 7; Saccardo, "Sylloge," ii. No. 5041.

Murrumbidgee, in Australia, and thus described by the Rev. M. J. Berkeley: "Springing from the head of an extremely large caterpillar. About six stems grow from the same point, forming a compact cylindrical mass two and a half inches long, three quarters of an inch thick, connate, slightly branched and anastomosing; expanding slightly upwards, and giving off a branch of short, much-compressed, forked, and palmate branches, which are dotted above with the perithecia. The apices are somewhat pointed. The colour of the whole is a deep red brown, inclining to tawny when dry. The whole of the branches are clothed with a very thin coat of extremely short forked irregular flocci, which give the surface a dull appearance when dry. They are at first solid, but at length become hollow. A portion of the caterpillar is filled with a white corky substance, for the root is more or less coated with a spongy mass, consisting of very slightly branched wavy threads.

"The only specimen I have seen was not mature, but probably arrived nearly at its full growth, as the incipient perithecia were evident towards the tops of the branches."

The following notes are from a letter of Dr. Joseph Hooker. The information, he states, was received from the Rev. Mr. Taylor, of Waimate. "This caterpillar fungus was picked up on the banks of the Murrumbidgee river, ten miles from the township of Yap (in

New Holland), in a rich thick alluvial soil, with many others of the same kinds. When fresh it was eight inches long, and three inches of the fungus from the nape of the neck were buried underground, on the surface of which is the oval or circular flower-like bunch of branches of a brown velvety appearance when fresh. The caterpillar has a great resemblance to the green wattle caterpillar, which produces a large brown moth. The discoverer, Mr. John Allan, the only person who has heard of it, found many empty holes near, as if the chrysalis had been hatched, and he saw many empty shells of these grubs scattered about the same place, and at night the brown moths were so numerous as to be quite troublesome. The body of the insect was solid and pithy; the outer skin attached to the substance of the centre, which has no roots in it; and, moreover, the pith is of the same substance as the stem, which is as thick as, if not thicker than, the body of the caterpillar. Both the pith and stem when burnt have a strong animal smell. Mr. Allan saw nearly thirty about March, 1837."

Another specimen, sent over a year or two since, was in excellent fruit, being fully mature, and with this the technical description was completed (fig. 31).

Mr. Gray has some observations on this species which may be added to the above, although not containing much additional information, still leaving the grub undetermined. "The remarkable large

caterpillar found in the neighbourhood of the river Murrumbidgee, New South Wales (probably also found at Murray River, Port Macquarie), may ultimately prove to be a species of the same family; but it is to be regretted that no opportunity has occurred for carefully examining an example."

The caterpillars of these entomophytes, each of which measures some six inches in length, were found in a rich black alluvial soil; and nearly thirty examples were secured by Mr. Allan in 1837.¹ Attention was directed to them in consequence of the ground being perforated in many places. From some of the tubes were seen emerging numerous pupa-cases, and from others these entomophytes, partly projecting above the surface of the earth. Many of the pupa-cases were open, as if the insects had performed the last act of their transitional life, *i.e.* throwing off the pupa-case, or last skin, before appearing in their aërial condition. The perfect insects afterwards showed themselves as night approached, and became extremely troublesome to travellers by flitting about their lights. On obtaining one it proved to be a large 'brown moth,' which may turn out to be an undescribed, though known, species of *Pielus*, or of an allied genus. The female measures, in expanse of wings, nearly ten inches, while the male is rather less.

¹ Taylor, *Tasmanian Journal* (1842), p. 308, fig. 2; Thompson, *Medical Times* (1844), p. 200.

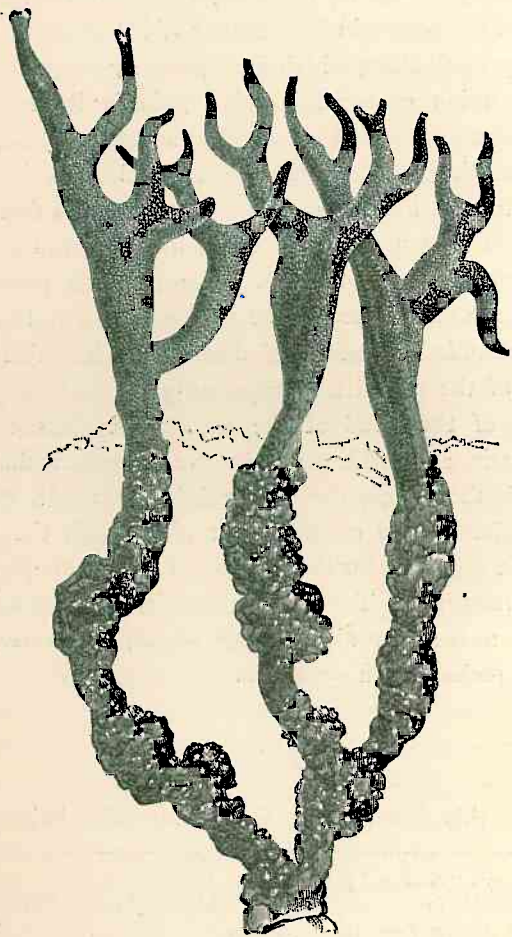


FIG. 37.—*Corycyceps Taylori* (from *Gardener's Chronicle*).

"The parasite is, however, totally different from any of the others in the manner of its growth; it has a very thick stem, which is apparently formed by the close union of several stalks (this is its condition when immature, but when fully matured the separate stalks divide from each other, and each becomes distinct and free), having the apical portion distinctly divided into a series of short irregular branches of a brown velvety texture. The anterior portion is just seen above the surface at the orifice of the tube, and affords the means of discovering it. The basal part of the parasite is apparently forced through the front of the head of the caterpillar. These latter portions are hidden within the perpendicular tube which the caterpillar had originally made, causing the plant to be on the same plane with the insect, which accounts for the peculiar manner of growth of the fungus."¹ To this entomophyte a second and later name was also given,² which, of course, now only reckons as a synonym.

GOAT-MOTH FUNGUS.

To this family, Mr. Gray³ remarks, belongs the

¹ Gray's "Notices," p. 9.

² *Sphæria innominata*, Taylor, *Tasmanian Journal* (1842), p. 308, fig. 2; *Medical Times* (1844), p. 200.

³ Gray's "Notices," p. 9.