

## A possible new record of *Cordyceps* species from Ginseng Camp, Maliau Basin, Sabah, Malaysia

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**ABSTRACT.** A *Cordyceps* species was found in Maliau Basin at an altitude of 620m, parasitizing an unidentified cicada nymph. Investigation of literature did not reveal any similar species, so it is postulated this may be a new undescribed species.

**Keywords:** New record, *Cordyceps*, Maliau Basin, Malaysia.

### INTRODUCTION

*Cordyceps* species has been an important ingredient in Chinese medicine for thousands of years. *Cordyceps sinensis*, the Chinese caterpillar fungus sometimes known as summer plant winter worm, or dong chong xia cao, was highly recommended as one of the most effective medicines for many illnesses. This usage dates back to the Qing Dynasty in 1757AD. *Cordyceps* are primarily collected wild and can be found in isolated places. Herbalists believe *Cordyceps* produced in China and Tibet are the most precious species with excellent value in medical treatment and healthcare (Zhu *et al.*, 1998a & 1998b).

*Cordyceps sinensis* grows on caterpillar larvae of insects that belong to the order Lepidoptera, e.g. moths belonging to the genus *Hepialus* (Hepialidae). *Cordyceps* exhibit pleomorphic life cycles that are defined by more than one free-living, spore-producing state. It is assumed that part-spores (and conidia), when encountering a suitable host (larvae or pupa), may germinate and penetrate

the larva or pupa. The fungus then proliferates and infiltrates the circulatory system, finally killing the host. During autumn, the mycelium stromatizes and the host becomes sclerotoid, leaving the exoskeleton intact. From the sclerotified host the stipitate-capitate stromata develop during spring or early summer producing perithecia and ascospores. The conidial state may develop on the same larva a few weeks later.

There are about 350 known species of *Cordyceps*. They are placed in the family Clavicipitaceae of the order Clivicipitales in the class Pyrenomycetes, whose members are known to be exclusively endoparasitic to insects (Kobayashi 1982). The majority of *Cordyceps* species parasitize insect hosts from various orders such as Homoptera, Lepidoptera, Coleoptera, Hymenoptera and Diptera. It has been shown that *Cordyceps* have host specificity, although the degree of specificity differs from species to species. Some *Cordyceps* parasitize only a single host species, such as *Cordyceps sobolifera* strictly on the nymphs of *Platypleura kaempferi*, whereas *Cordyceps militaris* parasitizes the pupa of a number of moth species. In the US, there are only about half a dozen or so *Cordyceps* that parasitize cicada pupa but there are many more in Asia (Spatafora, 2005 & *pers. comm.*).

### METHODS

The fungus was found on a hill slope, approximately 620 m a.s.l., close to a small

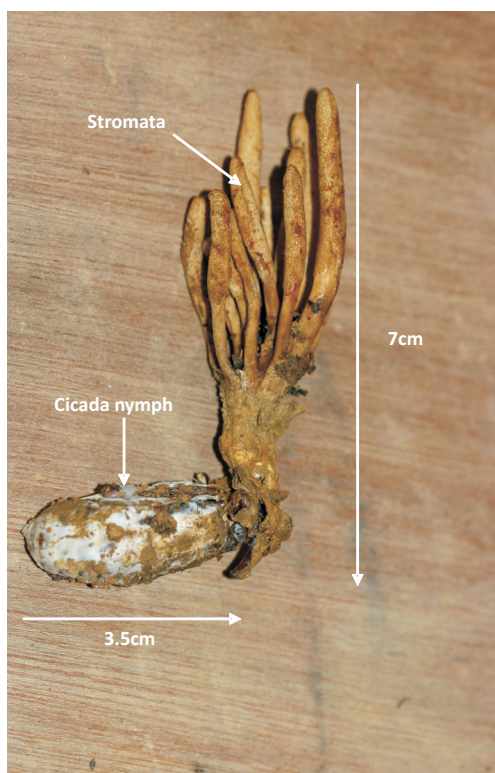
stream that leads to Ginseng Waterfall, about 400 meters from Ginseng Camp, at 04. 44.810' N, 54. 116.978' E. At first glance, it was thought to be a young coral fungus but on closer observation, it was found to be different. The dead leaves and surrounding top organic soil were then cleared from the area surrounding the base of the fungus (Figure 1). The authors then dug into the soil for about 6 cm to loosen the fungus from the attached soil and found it to be a *Cordyceps* with a cicada nymph as the parasitized host. The whole *Cordyceps* was photographed on the spot. When the specimen was still fresh, the cicada nymph (larva or pupa) was mostly covered with the white mycelium (Figure 2).

## RESULTS AND DISCUSSION

Nikoh & Fukatsu (2000) have listed seven species of described *Cordyceps*, and one more not fully described, parasitizing cicada nymphs found in Japan. These are *Cordyceps inegoensis*, *Cordyceps paradoxa*, *Cordyceps prolifica*, *Cordyceps kanzashiana*, *Cordyceps ramosopulvinata*, *Cordyceps heteropoda*, *Cordyceps sobolifera* and *Cordyceps* sp. In Australia, *Cordyceps heteropoda* Y.Kobayashi kills large populations of *Cicadetta crucifera* (sugarcane cicada) by mummifying the last instar nymphs with the white fungal hyphae (Moulds, 1990).



**Figure 1.** The *Cordyceps* as seen on the sloping ground after clearing the debris around its base.



**Figure 2.** The Cordyceps photographed at the Ginseng Base Camp. Note the number of branches of the stromata, their spectacular shape and numbers growing out of the host cicada nymph.

The gross morphological description of the Cordyceps consists of the parasitized cicada nymph (3.5 cm. x 2.2 cm) which was sclerotised and mostly covered with white mycelium (Figure 2) and the small groups of stromata (12 stalks) arising from a thick base which emerged from the cicada nymph. The stromata, (3.0 – 5.0 cm long and 0.4 - 0.6 cm broad) are pitted with black dots which may eventually develop into ascospores, eventually producing the spores for dispersal.

## CONCLUSION

Though we have so many species of cicadas in Malaysia, there is no record of Cordyceps parasitizing cicada nymphs recorded in

Malaysia or Borneo Island. A search of literature and discussion with mycologists specialising in Mushrooms and Cordyceps from New Zealand, USA and Thailand (Cole, 2005; Spatafora, 2005; Hywel-Jones, 2005 & *pers. comm.*) did not reveal any records of similar Cordyceps species as this specimen from Maliau, so it is possibly an undescribed Cordyceps. Further DNA profiling will be done on both the fungus and the cicada nymph.

## ACKNOWLEDGEMENT

The authors would like to thank Prof. Datin Dr. Maryati Mohamed and the Maliau Basin Scientific Expedition 2005 Secretariat, ITBC for inviting us to participate in the expedition. The ground support was superb. Our thanks also go to the Forestry Research Centre (FRC), Sandakan for transport from Tawau Airport to-and-from Agathis Camp, Maliau Basin. Our appreciation goes to the support staff of UMS, guides and park rangers, and Encik Azrie for the photos.

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