Specialized Predation on Arthropod Eggs in a Myrmicine Ant, *Calyptomyrmex* sp. (Hymenoptera: Formicidae), in the Oriental Tropics

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ABSTRACT A colony of the rare myrmicine ant, *Calyptomyrmex* sp., was collected in the Bogor Botanic Garden, West Java, Indonesia. Laboratory observation suggested that the species is a highly specialized predator of arthropod eggs. Workers fed on arthropod eggs and often showed larval hemolymph feeding. The queen never fed directly on prey eggs but took nutrients mainly through oral trophallaxis from workers.

Key words: ant / prey specialization / egg predation

Most ant species are generalist predators, although some species show remarkable specialization on certain prey animals (Hölldobler & Wilson 1990). Specialized predation on arthropod eggs has been known in a few ponerine genera, *Discothyrea*, *Proceratium*, and *Plectroctena* (Brown, 1979; Masuko, 1986) and myrmicine ants, *Stegomyrmex vizottoi* (Diniz & Brandao 1993), *Oligomyrmex* (= *Erabomyrma*) *nevermanni* and *O.* (= *E.*) *urichi* (Wilson, 1986; Hölldobler and Wilson, 1990). Among them, *Proceratium*, *Discothyrea*, and *Stegomyrmex* are exclusive egg predators; the former two genera feed on spider eggs and *Stegomyrmex vizottoi* predaes on spirobolid millipede eggs (Brown, 1957, 1979; Masuko, 1986; Dejean & Dejean, 1998; Diniz & Brandao, 1993). Ants in the myrmicine genus *Calyptomyrmex* are, in spite of their wide tropical distribution, very rare, and therefore, nothing is known about their biology and feeding habits (Baroni Urbani, 1975; Bolton, 1981). Fortunately, I collected one colony of *Calyptomyrmex* sp. in Indonesia, and revealed that it is a highly specialized egg predator.

A colony of *Calyptomyrmex* sp. (colony code FI95-404) was collected in the Bogor Botanic Garden, West Java, Indonesia. This species awaits description. Voucher specimens are deposited at the Bogor Zoological Museum. The colony was kept in an artificial nest in a laboratory to study feeding behavior and food preference. To know their feeding habits, I gave the colony diluted sugar water and several kinds of soil animal including centipedes, termites, isopods, springtails, eggs and adults of spiders and earwigs. This experiment was repeated four times. Feeding behavior of ants was observed for five hours over five days under a dissecting binocular microscope. Additionally, feeding habit of the dealated queen was recorded on video for 2 to 6 hours per day over 5 days (total 24 hours). During the observation of feeding behavior, several eggs of earwigs were always found in the nest chamber.

Queens and workers were dissected under the microscope after the last observation to check ovarian development.

The colony contained one dealate queen, 40 workers, and some immatures. In the nest chamber, we found five arthropod eggs. In all experiments, only the eggs of spiders and earwigs were brought into the nest chamber. A forager held an egg with its forelegs and grasped it with its mandibles. Then the egg was carried into the nest chamber. When the egg was too large to hold, a worker rolled it with mandibles and fore- and mid-legs. In the nest chamber, prey eggs were deposited near brood, which was usually located in the innermost part of the chamber.

In the nest chamber, workers often licked earwig eggs and fed on the contents by pinching them with their mandibles. The remains of the eggs after worker feeding were given to larvae, although workers continued to pick up and feed on these remains. Workers also performed larval hemolymph feeding (LHF, Masuko, 1986); a worker grasped the larval body with her mandibles, and fed on hemolymph from the puncture and anal excretion (observed 9 times during 5 hours). Unlike *Amblyopone silvestrii* (Masuko, 1986), the scars caused by larval hemolymph feeding were distributed all over the larval body. The larvae subjected to LHF did not die as a result of LHF. The dealate queen never fed directly on the earwig eggs (29-hour observation). She was mainly fed by regurgitation from workers (34 times). Oophagy of a worker-laid egg by the queen was also observed once. It is not clear if the worker-laid egg was trophic or reproductive. We dissected only 8 workers, in which 6 workers had yolky oocytes. The dealate queen had three ovarioles per ovary while workers had one per ovary.

Our preliminary observations revealed the novel nutritional ecology of *Calyptomyrmex* sp. Firstly, they exclusively feed on arthropod eggs. This represents a second example of highly specialized predation on arthropod eggs in the subfamily Myrmicinae. Morphological specialization for egg predation in *Calyptomyrmex* sp. is not conspicuous. In *Proceratium* and *Discothyrea*, the forward-pointing abdominal tip assists in the handling of arthropod eggs (Brown, 1979; Hölldobler & Wilson, 1990; Masuko, 1992). In contrast, *Calyptomyrmex* does not have such abdomen morphology. A common morphological feature of the highly specialized egg predators among ants may be hardness of cuticle, even though this is also found in several ants other than the egg specialists. Secondly, workers show LHF. It is considered to be an alternative feeding mode for specialized predators, in which prey capture is difficult and/or not constant (Masuko, 1986). Among egg predators, it has been known in three species of *Proceratium* but not in *Discothyrea* (Masuko, 1986). LHF has also been reported in *Amblyopone silvestrii*, *Prionopelta kraepelini*, and *Leptanilla japonica* (Masuko, 1986, 1989; Ito & Billen, 1998). In all cases so far reported, LHF is mainly performed by queens and provides her main nutrition. In this regard, *Calyptomyrmex* sp. is unusual; the queen did not perform LHF and she took nutrients exclusively through oral trophallaxis from workers. Further research will be necessary to explain why the queens does not participate in LHF.

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伊藤文紀 東南アジア産フタフシアリ亜科の1種 *Calyptomyrmex* sp. における節足動物卵に特殊化した食性

フタフシアリ亜科の稀種 *Calyptomyrmex* sp. のコロニーをインドネシア・西ジャワ州ボゴール植物園で採集し、その捕食習性を調査したところ、本種は節足動物卵に特殊化した捕食者であることが明らかになった。働きアリは節足動物卵とともに、コロニー内のアリ幼虫に噛みつき血リンバを摂食した。一方、女王は節足動物卵はけっして食わず、もっぱら働きアリからの口移しによって栄養を得ていた。