NOTES ON THE BIOLOGY OF A MUD EGG-CASE MAKING FULGORID, *HYSTEROPTERUM BEAMERI* DOERING (HOMOPTERA:FULGORIDAE)

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The occurrence of this species was first brought to my attention by R. L. Sisson, through Leslie M. Smith, both from the University of California. Mr. Sisson (in litt.) noted that an extremely large population of this unknown insect's mud cases was causing some alarm to grape growers in a restricted vineyard area south of Cloverdale, Sonoma County, California. The following biological observations were carried out on this species at various times during the winter and spring of 1954 while I was a graduate student at the University of California at Davis. Due to other commitments during the spring of that year, I was unable to concentrate on the habits of this species, but when K. C. Doering of the University of Kansas informed me (in litt.) that this was a new species of the genus *Hysteropterum* and that she did not have any literature reference to the peculiar mud egg-case construction habit, I endeavored to gather as much information as possible in the short time then available. Thus, these notes are admittedly sketchy and inconclusive, but it is hoped that they may stimulate interest for others to find out how and under what conditions the eggs are deposited in the mud cases. This species is described by Dr. Doering in the preceding article of this issue of the Journal as *H. beameri*.

Upon entering the infested vineyard on February 1, 1954, one could see the peculiar mud cases commonly on the woody part of the vines, on the vine stakes and on the adjacent telephone poles (fig. 1). The majority of the mud cases were located from about 10 to 30 inches above ground, although some were found as low as 5 inches or as high as 6 feet up on the telephone poles. In searching around this area it was found that only about 10% of the population had emerged by this date. No nymphs were seen near the mud cases, but some were found on the damp ground and a few were seen feeding on the small stems of several species of grass, of which cultivated oats (*Avena sativa* L.) was the most common host. All of the individuals observed were small (1 mm.) first-instar nymphs and were of a light grey color with an obvious, bushy, white-haired tail that was about as long as the entire body. No specimens were seen feeding on the grapevines during the whole period under observation, and it was concluded that this species did not damage grapes or grapevines in any way.

That the mud egg cases were extremely abundant is shown by the fact that a count of those on one grapevine stake (4′ × 2″ × 4″) was 5,680. Using a sample of 100 egg cases, a count of the number of eggs per case showed a range of 6 to 13 with an average of 9.5. The lengths of the egg cases ranged from 2 to 5 mm. (average 3 mm.), while the width varied from 1.5 to 2.5 mm. Since the average number of eggs found per egg mass was 9.5, this indicated there were about 53,900 eggs deposited on this one stake. Several vine stakes were equally covered with eggs and many more

were observed with about one-half as many. The grapevines averaged only about 100 to 200 egg cases, suggesting that the flat surfaces of the stakes were more suitable for egg-case construction.

The mud used to make these egg cases consisted mostly of a fine-grain sand and clay. In the laboratory these cases were found to break up easily in distilled water with a little force of a dissecting needle. It is not known whether or not any salivary secretions were used to cement the mud cases, but at any rate it is known that the normal amount of winter rain which had just preceded my observation did not in any way harm the cases.

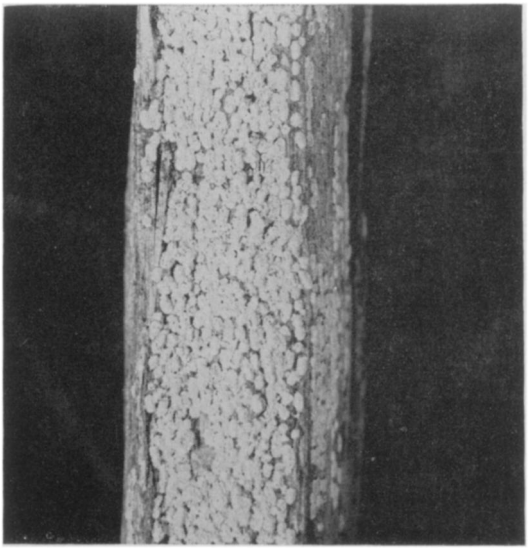


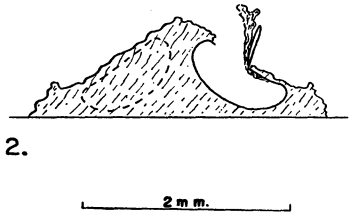
Fig. 1. Mud egg cases of *Hysteropterum beameri* Doering on grapevine stake. About ⅓ natural size. Photograph by H. Kido.

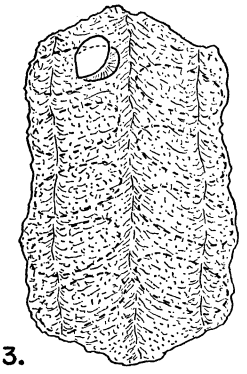
The question of how the adult fulgorid managed to carry the mud up onto the stakes and make the egg cases was not solved. It was found that the adults were not good flyers; however, they were remarkably good jumpers. They walked little without jumping, and when walking seemed to move in short spurts. It seems probable that the adult female carried the mud with her in small quantities as she walked or jumped to the oviposition site. Judging from the structure of the egg case, it appeared as though from five to fifteen individual mud-gathering trips were necessary to complete one case. It is not known how many egg cases are constructed by one female, since I was unable to obtain any egg production or mud-case construction during my preliminary laboratory investigations.

The evidence at hand showed that eggs were deposited singly in two unevenly opposing rows, each egg being laid at about a 30° angle with the head end up (figs. 2 and 3). The eggs were completely covered by mud and when first observed were all white and fairly transparent. Later on they

turned orange, and just prior to emergence the developing nymph was clearly visible. Measurements of a sample of 100 eggs showed a range in length of 0.95 to 1.10 mm. with an average length of 0.98 mm. The width varied only from 0.50 to 0.60 mm. The developing first-instar nymphs rest venter up, and emergence is effected by their cutting out the ventral upper part of the egg. The incision continues down each side about one-half the egg length, and when the nymph emerges the first-instar skin is shed and left attached to the operculum (fig. 2).

Laboratory rearings from the first instar to the adult stage required about sixty days when fed on oats under greenhouse conditions at Davis. Adult longevity ranged from two to three weeks under these conditions. Copulation was not observed and dissection of several two-week-old females revealed no eggs. No egg cases were constructed so that it is not known whether the female lays her eggs during the spring following emergence or whether she may aestivate during the warm, dry summer and lay her eggs in the fall.





Hysteropterum beameri Doering. Fig. 2, Cross section of egg case showing hatched egg on right with first-instar skin attached to operculum. Fig. 3, Dorsal view of egg case showing placement of eggs and hatched egg at upper left.

The only parasite reared from the eggs of this species was a mymarid of the genus *Gonatocerus*. Since parasites of the family Mymaridae are well known egg parasites of homopterous insects, and since parasitization by this *Gonatocerus* species on these eggs was only about 5% during February, 1954, as based on about 1,000 randomly selected eggs, one might theorize that normally this fulgorid species is not common due to natural enemies, which, in this particular year, had failed for unknown reasons. Although I was not present to investigate the situation from 1955 on, I have not heard of any reports from the original or other areas pertaining to similar outbreaks of this insect with its curious mud egg-case making habit.

I would like to thank Dr. K. C. Doering for identifying and describing the fulgorid, and also Dr. R. L. Doutt, University of California, Albany, for identifying the parasite involved.