# Drone Engorgement in Honey Bee[1] Swarms[2]

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ABSTRACT

Male *Apis mellifera* L. (drones) accompanying reproductive swarms were analyzed for honey stomach contents to determine if they engorge honey prior to or during swarming. No evidence for engorgement was found. A diurnal feeding rhythm in drones was observed in nonswarming colonies.

Worker honey bees, *Apis mellifera* L., engorge prior to swarming (Maeterlinck 1901, Garifullina 1960, Combs 1972). Caron[3] cited engorgement as probably facilitating the process of selecting and settling in a new location. The object of the present investigation was to determine if the drone honey bee could serve as a possible carrier of food reserves during swarming.

Young drones receive food from workers rather than feeding directly from colony stores. Older drones take honey from food storage cells and seldom receive food from workers (Free 1957). Mindt (1962) reported that drones capable of mating flights receive additional food from workers. Worker-to-drone trophallaxis is a necessary condition for drone flight from swarm clusters, as I have shown (Burgett).[4]

## MATERIALS AND METHODS

The swarming season in Ithaca, N. Y., is May through July. During this investigation 7 swarms were investigated; the 1st swarm emerged May 30 and the last Aug. 14, 1970.

Drones in the swarm and the parent colony were sampled at the time of swarm emergence to determine the amount of food carried. Drones were taken directly from the alighting board as they exited with the swarm. In cases where this method was not possible, drones were taken from the forming swarm cluster. In all samples the drones were obtained within 10 min of swarm egress. Immediately following the collection of the swarm drones, the parent hives were opened, and corresponding samples of drones were taken from within the colonies. To circumvent any supplemental engorgement, the parent colonies were not smoked during the time the drones were collected.

Drones were dissected to isolate the honey stomach and its contents for weight determination.

For comparative purposes, it was necessary to determine an average honey stomach content for drones in a nonswarming colony. This was done by rearing capped drone brood in laboratory incubators. Samples were taken of newly emerged drones 1-3 days of age. Drones were also taken daily at 2-h intervals from colonies in a nonswarming condition, starting at 0900 h and continuing until 1700 h.

To determine a maximum honey stomach content in vivo, drones were captured just prior to afternoon mating flight. Drones returning from mating flights also were sampled.

## RESULTS

Sixty drones, 1–3 days old, reared in the laboratory, had a mean honey stomach weight of 2.0 mg. Drones sampled at 2-h intervals from colonies in a nonswarming state had an increase in stomach content during the day. A diurnal rhythm of feeding was noted. The honey stomach weight was minimal in the early morning (0900 h), it increased to a maximum between 1230 and 1330 h, then decreased (Fig. 1). Maximum honey stomach contents thus correspond to the start of afternoon flight. Drone flight is concentrated during the afternoon hours (Minderhoud 1932); maximum flight takes place between 1400 and 1600 h (Howell and Usinger 1933, Oertel 1940, Taber 1964).

Honey stomach of 164 drones taken immediately before natural mating flights weighed a mean of 17.7 $\pm$9.1 mg. Honey stomachs of 125 postflight drones had a mean honey stomach weight of 4.3$\pm$6.3 mg. Thus the average consumption of honey per flight was 13.4 mg. Free (1957) found the average weight of preflight drone honey stomach contents was 20.0 mg; postflight drones averaged 2.5 mg.

A total of 191 drones taken from swarms were examined for honey stomach weights; a sample of 216 drones from colonies which had swarmed also was examined. No significant difference between these drones was found except for the 2 swarms from June 16 and 18 (Table 1). In several instances the drones in the parent colonies had a higher mean honey stomach weight than drones in their cast swarms, but the difference was not significant.

## DISCUSSION

Drones have a limited capacity as a source of carbohydrate reserve because of their low numbers in a swarm (Burgett)[4] and smaller honey stomach capacity (Snodgrass 1956). Most drones in a colony and in the cast swarm have statistically similar honey stomach weights at the time of swarming. However, these are only ⅕–⅙ of the capacity of worker bees in a swarm (Combs 1972). It is evident that drones do not engorge in preparation for swarming. The

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[3] D. M. Caron. 1971. A study of swarming and the behavior of swarming in honey bees *Apis mellifera* L. Ph.D. thesis, Cornell University. 185 p.

[4] D. M. Burgett. 1971. A study of the behavior of drones in swarming honey bees *Apis mellifera* L. M.S. thesis, Cornell University. 45 p.

Table 1.—Honey stomach contents of drones from swarms and parent colonies.

| | Mean ± SD weight (mg) of honey stomach and contents | | | | | | |
|---|---|---|---|---|---|---|---|
| | Swarm number | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Swarm ♂ | 5.43±4.78[a] | 11.94±7.20[a] | 5.71±4.27 | 7.73±7.85 | 5.79±5.77 | 8.55±5.78 | 4.34±4.46 |
| Parent hive ♂ | 2.78±2.21 | 6.16±5.20 | 5.73±5.13 | 6.32±6.44 | 8.53±5.94 | 7.53±5.75 | 4.93±5.09 |

[a] $P = 0.05 > 0.01$.

quantity of food reserves that drones contribute to the communal stomach of a swarm is dependent upon the time of day a swarm issues from the colony. The evidence presented here reiterates the hypothesis that the sole function of the drone honey bee is reproduction.

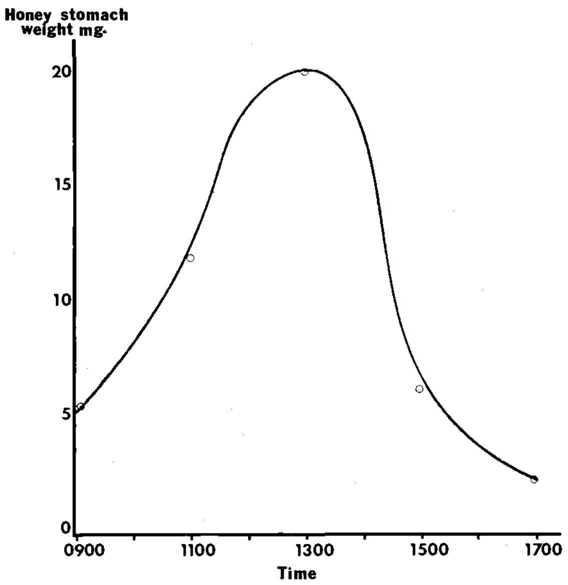


FIG. 1.—Diurnal rhythm of drone engorgement in the colony. Mean values ($n = 40$ for each time) for 0900, 1100, 1300, 1500, and 1700 h.

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