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Scientific note

A scientific note on the ovarial and pheromonal development of drifted and non-drifted Cape honeybee workers (*Apis mellifera capensis*)

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***Apis mellifera capensis* / drifting / honeybee / ovaries / pheromones / social parasitism**

Cape honeybee workers (*Apis mellifera capensis* Escholtz) are facultative social parasites and colonies of other subspecies are susceptible hosts (Neumann and Hepburn, 2002). Drifting of workers is one dispersal mechanism (Neumann et al., 2001), but the consequences of drifting, presence or absence of the queen, and race of mother and host colony on the development of workers are unknown.

The pheromonal and ovarial development of *A. m. capensis* drifters from the same age cohort, from both queenright and queenless mother colonies, were compared to mother colony nest mates and workers of the same age in queenright host colonies of *A. m. capensis*, *Apis mellifera scutellata* Lepeletier and naturally occurring hybrids (Hepburn and Radloff, 2002).

Six colonies each of *A. m. capensis*, *A. m. scutellata* and their hybrids were split into a queenright and queenless nuclei (Neumann et al., 2001). Newly emerged workers were labeled as to colony origin and returned to their original hives. After 10 days drifted and non-drifted workers were sampled. For each bee the mandibular gland ratios of 9ODA: 10HDA (Moritz et al., 2000) were determined and ovary activation assessed. From these values a measure of reproductive status was assigned to each bee (Wossler, 2002; see Tab. I).

Drifters from queenright colonies into queenright *A. m. capensis* or *A. m. scutellata* colonies (Groups A & B) showed no significant difference in either the mandibular gland ratios of 9ODA: 10HDA ($T = 96$, $P > 0.05$, Mann-Whitney rank sum test) or in the degree of ovarial development (Tab. I). Queenless drifters (Groups C & D) had significantly more queenlike 9ODA: 10HDA ratios than workers of the same age in the host colony they entered (9ODA: 10HDA: Group C vs. Host $T = 83$, $P < 0.01$; Group D vs. Host $T = 70$, $P < 0.01$) and showed higher degrees of ovarial development (Tab. I). While the mandibular gland ratios of drifters from queenless into queenright *A. m. capensis* colonies (Group C) were not significantly different from those queenless *A. m. capensis* drifters that entered queenright hybrid colonies (Group D) (9ODA: 10HDA, $T=189$, $P > 0.05$, Tab. I), the ovarial development of the latter was double that of the former (Tab. I). Queenless *A. m. capensis* drifters entering queenright hybrid colonies (Group D) also had four times as many false queens (used here as worker bees with undeveloped or slightly developed ovaries and levels of 9ODA in mandibular gland secretions equivalent to a queen) as those drifting into queenright *A. m. capensis* colonies (Group C, Tab. I).

The data clearly show that drifted workers from queenless colonies developed more often into false queens than drifted workers from queenright colonies. Both pre-drifting and post-drifting ovarial and pheromonal development occurred in *A. m. capensis* workers, probably influenced by the presence or absence of a queen in the mother colony and the taxon of the host colony. Queenright drifters into queenright hosts had lower degrees of ovarial development as their non-drifted nestmates suggesting that foreign bees with some degree of ovarial development were either denied access to the host colonies and are attacked by other workers (Neumann and Hepburn, 2002) or had a lower propensity for drifting. If bees with developed ovaries are denied access to host colonies, how did drifters from queenless colonies with developed ovaries gain access to the host colonies? Possibly, queenless drifters drift in the early

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Table I. Ovary activation and pheromonal development of drifted Cape honeybee workers and the respective host workers (ovary activation: class 1 = inactive, class 2 = some degree of activation; reproductive status: normal = class 1 ovaries & mandibular gland secretion with < 25% 9ODA, intermediate = class 1 ovaries & mandibular gland secretion with 25–45% 9ODA or class 2 ovaries & mandibular gland secretion with < 45% 9ODA; false queen = class 1 or 2 ovaries & mandibular gland secretion with > 45% 9ODA (Wossler, 2002).

Drifter group	Workers	Queenstate	N	Ratio (mean ± SE) 9ODA/10HDA	Ovary activation (class)		Reproductive status		
					1	2	normal	inter.	false queen
A	Drifted *A. m. capensis*	queenright	18	0.2 ± 0.1	18	0	18	0	0
	Host *A. m. capensis*	queenright	10	0.2 ± 0.1	7	3	7	3	0
B	Drifted *A. m. capensis*	queenright	6	0.1 ± 0.01	6	0	6	0	0
	Host *A. m. scutellata*	queenright	10	0.5 ± 0.2	8	2	8	2	0
C	Drifted *A. m. capensis*	queenless	18	5.1 ± 3.5	18	0	15	1	2
	Host *A. m. capensis*	queenright	10	0.2 ± 0.1	7	3	7	3	0
D	Drifted *A. m. capensis*	queenless	11	17.3 ± 10.8	8	3	4	2	5
	Host hybrid	queenright	10	0.2 ± 0.1	6	4	6	4	0

stages of development and are able to enter the host colony before this development is detectable by the guards. A faster pheromonal development in queenless colonies may also facilitate the admission of bees which have started ovarial development (Neumann and Hepburn, 2002). The hybrid colonies appeared unable to suppress post-drifting development of *A. m. capensis* workers, suggesting that they are not resistant and that the stability of the hybrid zone may be rather due to the low population density (Neumann et al., 2001; Moritz, 2002).

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Note scientifique sur le développement ovarien et phéromonal des ouvrières de l'abeille du Cap (*Apis mellifera capensis*) ayant ou non changé de colonie.

Eine wissenschaftliche Notiz zur Entwicklung von Ovarien und Pheromonen bei verflogenen und nicht verflogenen Arbeiterinnen der Kaphonigbiene (*Apis mellifera capensis*).

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