

SHORT COMMUNICATION

**Evidence for a sex attractant in burying beetles**

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**Key words.** Sex attractant, burying beetle, *Nicrophorus vespilloides*, pheromones, acoustic communication.

**Introduction**

In common with other members of its genus, the burying beetle *Nicrophorus vespilloides* Herbst (Coleoptera: Silphidae) buries carrion and uses it as a food source on which larvae are raised. Large numbers of burying beetles may arrive at a corpse; individuals of the same sex then fight one another until one male and one female are left in possession (Pukowski, 1933). Pukowski noted that if a male arrived at a corpse and found no female there, he adopted a characteristic 'sterzeln' position, with hind legs extended and abdomen pointing up. Subsequent authors have assumed, as Pukowski herself suggested, that the position indicated the release of an attractant by which females were drawn to the site. The original suggestion of a pheromone signal (Pukowski, 1933) was challenged by Halfiter *et al.* (1933) who argued for an acoustic signal after being unable to find any glands in the male by which a pheromone could be produced. The behaviour is limited to males: females arriving at a corpse are almost always already inseminated (Christie, 1981) and can bury the corpse and raise young without assistance from a male. However, Pukowski did not try to show directly that females were attracted by males. This was the purpose of the experiments described here.

**Methods**

A circular plastic container (a paddling pool) 1.5 m in diameter was used as a laboratory enclosure. It was filled with earth and two containers placed opposite each other near the sides so that their tops were level with the surface of the soil in the pool. Each container had a shallow layer of earth inside with its surface 5 cm below the surface of the surrounding earth; in one container a mouse was placed, in the other a mouse and a male beetle. The contents of the containers were not visible from the centre of the pool.

The experiments began at midday (artificial lighting was used with a cycle of 16 h light:8 h dark) and the male buried the mouse during the afternoon. Over the same period I covered the other mouse with earth. In the evening the male adopted the sterzeln position. The behaviour seems to begin only an hour or so before dark. Once the male had been 'signalling' for at least an hour, a female was allowed to leave a container in the centre of the pool where she had been enclosed at the beginning of the experiment.

In the field, a similar choice was given. Pairs of containers, 10 m apart, were laid in a row with 50 m from one pair to the next. In one of each pair was a male beetle with a mouse which he had buried in the laboratory the previous day, in the other a mouse which had been buried by hand over the same period. The containers were

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taken in mid-afternoon to an area of deciduous woodland known to contain *N. vespilloides*. The males began signalling and the containers were left overnight.

A test for a vibration signal through the twigs or stones from which males often signal was done with the help of Dr A. W. Ewing of the Zoology Department, Edinburgh. A stylus tip was placed against the post and connected either to earphones or to an oscilloscope. In either case the equipment was sensitive enough to record the footsteps of a beetle climbing the post.

## Results and Discussion

In the laboratory enclosure, females were significantly more likely to go to the container with a male than to the one without (Table 1a). In the field experiment, no beetles were attracted to the hand-buried mice but each of the signalling males attracted a beetle. Of the beetles attracted, seven were male, nine female (Table 1b).

TABLE 1. Proportion of beetles going to signalling male.

	Male and mouse	Mouse only	$\chi^2$ test
(a) Laboratory Females going to each container	17	4	$P < 0.01$
(b) Field Beetles going to each container	16	0	$P < 0.01$

No acoustic signal was found. Burying beetles stridulate, using the 'file' structure on the underside of the elytra (Niemitz, 1972), but the obvious movements performed when stridulating never occur during sterzeln signalling, at which time the tip of the abdomen quivers

slightly and is stroked by the hind legs but no sound can be heard. No vibration is passed through the signalling post: once the beetle stopped moving and began to signal there was no vibration recorded through the stylus. It seems likely that the means of the attraction demonstrated here will prove to be pheromonal rather than acoustic.

It is clear that males attract other beetles to a corpse. The 'sterzeln' position is probably associated with the release of an attractive signal. Males sometimes signal close by an unburied corpse and their attraction must then act in addition to the attraction provided by the carrion itself. It is not surprising that males as well as females should respond to a male signal if it announces the presence of a corpse: the outcome of fights is determined by size (personal observation) and a large male which responds has a chance of displacing the signalling male in the subsequent struggle for female and corpse.

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