REPRODUCTIVE BENEFITS AND THE DURATION OF PATERNAL CARE IN A BIPARENTAL BURYING BEETLE, NECROPHORUS ORBICOLLIS

by

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(With 4 Figures)
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Introduction

Iteroparous breeders either must invest in an ongoing reproductive attempt or seek additional breeding opportunities. Such life history tradeoffs are the basis of current notions of parental investment (Trivers, 1972; Maynard Smith, 1977; Grafen & Sibley, 1978; Low, 1978) and suggest that patterns of parental care depend on the parent's ability to enhance the survival of current offspring relative to its ability to achieve reproductive success elsewhere (Robertson & Bierman, 1979; Pressly, 1981).

Experimental work under natural conditions on reproductive benefits and the duration of parental care in insects is rare (reviews in Wilson, 1971; Hinton, 1977; Zeh & Smith, 1985; Tallamy & Wood, 1986). Removal experiments demonstrate that parental care can reduce predation or parasitism (Eberhard, 1975; Peckham, 1977; Wood, 1978; Melber et al., 1980; Tallamy & Denno, 1981; Wyatt & Foster, 1990) and can protect larvae in a physiologically difficult environment (Smith, 1980; Wyatt, 1986). Little effort has been made, however, to...
systematically vary the context of care-giving and thereby alter the benefits of care or to examine variation in the duration of care.

To understand the evolution and variation of paternal care it is necessary to estimate benefits a male receives by providing care in the field and to examine plasticity of male behavior. In this study we examine the reproductive benefits and duration of paternal care in *Necrophorus orbicollis* Say. Similar studies of *N. orbicollis* have shown that the presence of a male parent reduced the number of larvae raised on a carcass but decreased the probability of a takeover by an intruder introduced near the carcass. No environmental or social variables affected male residence time as determined by multiple regression analysis (Scott, 1989; Scott, 1990; Scott & Traniello, 1990).

In this study I: estimate the reproductive benefits of paternal care on small and large carcasses in the field; extend the finding that males reduce takeovers by demonstrating that this occurs when competitors are free-flying beetles; find that males decrease the time that a large carcass is vulnerable to a takeover; find no evidence that males decrease other components of reproductive success; and determine that three variables (carcass size, the developmental stage of the larvae and the presence of the female) affect the duration of male care. I relate a longer duration of care on larger carcasses to estimates of reproductive benefits from the field and rule out two alternative hypotheses for more care on larger carcasses. In addition, the effect of prior reproduction on a male's reproductive success and residence time in a subsequent reproductive attempt is examined.

The study animal.

Parental care in *Necrophorus* is one of the most highly developed among the Coleoptera (Wilson, 1971; Zeh & Smith, 1985). Male and female burying beetles independently arrive at small vertebrate carcasses and compete with conspecifics of the same sex and heterospecifics until a single dominant pair remains (Pukowski, 1933; Milne & Milne, 1976). If a male fails to locate the carcass a lone female uses stored sperm to produce a clutch (Bartlett, 1988; Müller & Eggert, 1987). The single female or pair then inters the carcass, removes hair or feathers, rounds the carcass into a brood ball, deposits anal secretions, regurgitates to larvae and makes repairs in the crypt (Pukowski, 1933; Halfterter et al., 1983; Bartlett, 1988). A male that cooperates with a female in burying a carcass fathers over 90% of the brood (Müller & Eggert, 1989). At