SEXUAL COMPETITION IN SCATOPHAGA STERCORARIA: SIZE- AND DENSITY-RELATED CHANGES IN MALE ABILITY TO CAPTURE FEMALES

by

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(With 11 Figures)

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INTRODUCTION

In resource-based mating systems male success in aggression with conspecific males is a primary determinant of male mating success (VERNER, 1964; BROWN, 1964; ALEXANDER, 1975; BORGIA, 1979). The mating system of the fly, Scatophaga stercoraria (Diptera: Scatophagidae), has offered an opportunity to test one aspect of this theory; that changes in patterns of resource structure influence individual male success in obtaining matings (BORGIA, 1980a). Results of these experiments showed that large males reproduce at a higher rate than small males under conditions of limited availability of resources. This result is consistent with models of mate choice developed for systems in which females choose mates. However, Scatophaga males capture females and this leads to different predictions for the effect of male size on individual mating success. Specifically, that at low resource availability large males should be no more successful than small males (BORGIA, 1979).

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In this paper I explore how changes in resource structure and male density affect male agonistic and mate-searching behavior. This is done to document the effect of changes in resource availability on male behavior, and to help interpret results from resource manipulation experiments.

Males of *Scatophaga* commonly aggregate around droppings or pats of fresh cow dung to capture females that visit pats to oviposit. Males copulate with females immediately after capture and then guard the females as they oviposit (see Hammer, 1941; Foster, 1967a, b, c; Parker, 1970a, b, d, e, 1974c; Borgia, 1979, 1981a). Single males also attack other individuals that are amplexing with females, attempting to separate the pair and take the female. Males successful in takeovers copulate with the female and fertilize most of the eggs she carries (Parker, 1970e). Sexually mature male *Scatophaga* vary greatly in size (5.2-11.5 mm wing length), and size differences are largely a product of varying larval growth conditions (Borgia, 1980c).

Parker (1970d) made an extensive study of male behavior around the oviposition site of *Scatophaga* in England. He described males around the site as in "turmoil", moving rapidly about with frequent attacks on one another. He provides a detailed analysis of behavior sequences and rates of attack by males on other unpaired males and males engaged with females. Parker's emphasis, however, is largely typological, and although valuable in understanding generalized behavior patterns common within a species, tends to mask patterns of intrasexual variation in aggressive ability and mating success. This is best illustrated by his assertion that "... all males searching for females achieve an approximately equal fertilisation rate..." (Parker, 1970d) that conflicts with results of my work in Michigan that shows that male mating success is strongly size dependent (Borgia, 1981a).

The study of intrasexual variation in patterns of mate-searching forms the focus of this report. Male-male interactions are analyzed with special reference to how size differences among males influence individual success in the capture and control of females. Specific behaviors considered include analysis of 1) attacks on individuals of different size in the vicinity of the oviposition site, 2) territorial behavior by males on low male density pats, 3) non-territorial behavior with searching behavior common at high male density, and 4) influence of male size on the ability to win and resist replacement or "takeover" attempts.