ONLY ONE SEEKING SEX: THE BEST STRATEGY FOR SEXUAL MEETING

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ABSTRACT. Usually males search for females. This strategy has been assumed to be optimal, but another alternative strategy — both partners seeking each other — has not been previously analyzed. Analyses indicate that both extreme possible strategies give the same probability for success by a sexual meeting. Thus, natural selection will reward the single-seeking-sex strategy because of its greater economy.

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If two individuals of different sex must meet each other, at least one of them must move. Generally itis the male sex that assumes risks and actively seeks for females, which remain relatively immobile. It is also assumed that this division of roles starts from the unequal size of the respective gametes. However, I believe there is a little, intermediate step which has not been focused and analyzed as far as I know: why should only one sex — and not both sexes — seek a partner? Is it obvious that the second strategy, where both sexes seek for each other, will be counterselected? Sexual meeting, for instance, may be a major problem for solitary, low-density animals which undergo strong predatory pressure. Natural selection will promote a locomotory strategy that maximizes the probabilities of meeting and minimizes costs (i.e. energy lost and predation risk). Considering the rarity of both sexes seeking for each other in nature, I hypothesize that sexual-meeting probabilities are equal in the two extreme cases: a) only one sex seeks (mobile male & immobile female, option MI), or b) the two sexes seek each other (mobile male & mobile female, option MM). Subsequently, biological pressures will select the first option. The aim of this note is to test this hypothesis in a simple way.

Suppose we use two dice. In one case one of the dice remains immobile, showing the number 6, while the other is rolled. The probability of the second die showing 6 is 1/6. This case represents the MI option. In the other case both dice are rolled. The probability of coincidence of any of the six faces will then also be 1/6. The second case represents the MM option. Thus, the MI and MM options give the same probability for meeting. The only difference will be in the meeting site: predetermined in MI and random in MM. Predictible female place will be important in the evolution of sexual meeting (for example, for the males' seeking patternor for habitat selection). This analysis supports the initial hypothesis.

The dice analogy also allows an extension of the analysis to more than one individual of each sex, including cases where different individuals have different probabilities of detecting, or of being detected. For nonrandomly placed individuals the result is equivalent to correlated dice, and again MI and MM are indistinguishable.

Considering mainly the energetic cost of locomotion and predation risk, option MI would be selected. If we assume that females (bearers of relatively few and large gametes) are limited resources for males, males will be selected to improve their sexual-meeting probabilities despite some degree of associated costs andrisks. Current knowledge shows that only one sex — ordinarily the male sex — actively searches for its sexual partner. My own experience of collecting arachnids using pitfall traps (simple Barber's traps) has shown a large bias of males over females. This bias is not present with more nearly random methods, such as hand collection.

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Starting from random meetings of mobile males seeking relatively immobile females, adaptive characteristics (morphological, physiological, ecological, ethological and others) that could improve sexual meeting have been selected. Males have done this in diverse ways. They have improved their locomotory performance and extended their area of potential influence, maximizing perceptive accuracy (vision, audition, olfaction, touch, etc.) They have evolved strategies such as emitting sounds, dancing, or displaying conspicuous colours, designs or decorations to facilitate their positioning or stimulate responses from females. Females have improved their probability of meeting mainly by releasing pheromones, which serve to enlarge the area in which they can be detected by males.

Even among plants there is only one mobile sex. The mobile unit is either gametes, as also with many marine invertebrates, or gametophytes such as pollen grains. Also, the hypothesis could be useful for analysis of the meeting of two gametes.

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