Entomology, 6 by

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References and Notes
3. Larger males have a call that is lower in frequency than that of small males, and females are apparently more strongly attracted to the calls of larger males (1). Fairchild points out that a male’s body temperature as well as his body size can influence the frequency of his calls. But, a female’s attraction to male calls depends both upon the quality of the male’s call and also upon her own body temperature (D. Pettus, personal communication). Unfortunately, Fairchild did not report the body temperatures of females.

4. The frequency of the male’s calls directly correlates with body temperatures of toads. Fairchild’s hypothesis suggests that small males could sound larger by selecting a nanoclimate in which body temperature would be lower than that of large males.

7. R. D. Howard suggested several additional hypotheses that are consistent with existing data and the idea that small males are found surrounding the breeding pond as a way of competing with large males for mates (personal communication).

8. We thank R. D. Howard for sharing his ideas with us as we prepared this comment and J. P. Hailman and J. S. Turner for critically reading this manuscript. Supported in part by a Colorado State University graduate fellowship and a J. S. Guggenheim Foundation fellowship.

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6 July 1981; revised 20 April 1982.

To explain large male mating success in Fowler’s toads in terms of male competition, Christian and Tracy (1) have extrapolated mechanisms from other species and, in so doing, made invalid assumptions about Fowler’s toads. I have rarely observed displacement attempts by Fowler’s toads as described by Davies and Halliday (2) for common European toads, although I commonly observe such behavior in American toads. Furthermore, Davies and Halliday (2) did not find that mated males were larger than unmated males. They found that common European toads mate assortatively, that is, large males mate with large females and small males mate with small females. Mate selection in common European toads and in Fowler’s toads is very different.

Citing Howard’s bullfrog work (3), Christian and Tracy also suggest that large males may exclude smaller males and defend “suitable breeding sites.” Bullfrogs are truly aquatic, territorial, permanent pond residents; Fowler’s toads are not. Unlike bullfrogs, nearly all male Fowler’s toads call; there is little movement once the chorus begins; and Fowler’s toads do not defend extensive egg deposition territories as bullfrogs do. Bullfrogs and Fowler’s toads are clearly quite different.

The simplest explanation of large male mating success is that female choice is an important part of male selection. Some male competition hypotheses may be sufficient and necessary for other anuran species, but for Fowler’s toads, such hypotheses are rarely sufficient because males have little contact with one another and do not defend egg deposition sites. Furthermore, these hypotheses are never necessary given the demonstrated auditory discriminatory ability of females. My hypothesis is sufficient and, in the absence demonstrated male competition, necessary to explain male selection in Fowler’s toads.

Christian and Tracy are right to question the significance of the G-statistic in Table I. That statistic referred to an anteriori test used, not as a first line of evidence as they suggest, but merely to support the more robust a priori test concerning behavioral thermoregulation presented in [figure 1 in (4)].

In the latter case, however, they suggest that convection, radiation, evaporation, and conduction all act to reduce body temperatures of bank males but have minor effects on pond males. In other words, they suggest that an operative temperature model of heat exchange should be applied to bank males, but that an ambient temperature model is sufficient for pond males. Apart from the problem of mixing models, the fact is that the dorsal surfaces of both bank and pond males were wet and exposed to air and thus to the same thermal environment. Only the thermal environment of the ventral surfaces of pond and bank males differed.

For ventral surfaces, an operative temperature model is no better than an ambient temperature model. Factors affecting the components of heat exchange in an operative temperature model are wind speed (negligible at night), longwave radiation not from the “cold night sky” but from the bank which was at or near ambient temperature, shortwave radiation (nonexistent at night), and ambient temperature. Thus, ambient temperature (water temperature for pond males and air temperature for bank males) is the only appreciable factor affecting the operative temperature of ventral surfaces of either pond or bank males.

The best estimate of the important parameter, body temperature, would be a direct measurement. But for small, ectothermic animals, such as Fowler’s toads, direct measurements can be misleading. For example, Brown and Brown (3) found body temperature less reliable than either air or substrate temperature in predicting call characteristics of spring peepers. Consequently, I used air and substrate temperatures as predictors of body temperature. To argue that air and substrate temperatures are not accurate predictors of body temperature conflicts with past work (6).

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References and Notes
7. I thank H. M. Wilbur, R. Allford, and R. Harris for helpful comments on an earlier draft and S. A. Mahoney for critically reading this manuscript.

17 November 1982; revised 22 December 1982.
Thermoregulation and Mate-Selection in Fowler's Toads?
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Science 219 (4584), 519.
DOI: 10.1126/science.219.4584.519

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