OXFORD UNIVERSITY PRESS | Behavioral Ecology

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Journal:	*Behavioral Ecology*
Manuscript ID	Draft
Manuscript Type:	Invited Commentary
Keywords:	n/a

An (almost) fatal blow to conventional wisdom: A comment on Richardson and Zuk

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Main text

Researchers studying mate choice typically face a common decision early in the experimental design process: should I use mated or unmated (virgin) females? We ask this question because we are familiar with the conventional wisdom that mated females will be choosier than unmated females, because of the risk to unmated females of rejecting too many suitors and failing to mate. For this reason, studies quantifying mate choice often use only mated females, whereas studies that require matings often use only unmated females. But where does this conventional wisdom come from? Certainly not from a large empirical base or any formal survey or analysis. Rather, it seems to come from a combination of: a) predictions from sexual selection theory (e.g. Kokko & Mappes, 2005), b) a small number of well-cited examples using model species (e.g. Kodric-Brown & Nicoletto, 2001), and c) unpublished observations of one's own study species.

Put like this, the basis for this 'wisdom' seems quite thin, and Richardson & Zuk (2022) have done an excellent job in formally quantifying this effect for the first time. They used meta-analysis to compare the strength of mate choice observed in experiments using unmated, mated, or wild-caught females (who are likely to be mostly mated). Perhaps surprisingly, their results did not support the conventional wisdom: mated females were no choosier than unmated females. Notably, I have recently found this same result using a sample of ten studies comparing mated and unmated females of the same species (Dougherty, in press). It therefore appears that the risk of rejecting too many partners and failing to mate is not as important for the expression of female choice as previously assumed. Instead, the choosiness of both unmated and mated females probably depends on a myriad of factors, including a female's state, her current environment (Dougherty, 2021), her previous experiences, and the traits being chosen (Jennions & Petrie, 1997).

However, I would like to suggest one important caveat to this result. The ideal test of this question would be an analysis comparing the choosiness of the *same females* observed before and after their first mating. Such studies appear to be rare (but see e.g. Kodric-Brown & Nicoletto, 2001), possibly because of practical concerns associated with experience effects (Dougherty, 2020), and so a comparative analysis of this type is probably a long way off. Nevertheless, such an analysis needs to be done before the conventional wisdom can truly be put to bed.

Lastly, I would like to reflect on what these results mean for our experimental design decisions. One take-home from this meta-analysis might be that we can now stop worrying about female mating history when measuring female choosiness. But of course, no one would suggest this: there are other ways that mating history might change female mating behaviour, and it seems unwise to ignore this potential source of bias. The authors make this point themselves, and instead advise choosing those females that are most ecologically relevant for the question being tested, regardless of how this affects experimental outcomes (Richardson & Zuk, 2022). This is a suggestion I wholeheartedly agree with (Dougherty, 2020). However, a meta-research perspective is also useful here. As with many meta-analyses in ecology and evolution (Senior et al., 2016), Richardson & Zuk (2022) detected very high variation in female choosiness across species, with little variation explained by any of the examined biological or methodological moderators. This means we can't yet predict where a given species will sit on this continuum. For this reason, this meta-analysis will probably do little to change our experimental design decisions. If we want to confidently rule out an effect of mating history in our own species, in relation to any mating behaviour, we need to test for it, regardless of the average effect detected by meta-analysis. And we need to publish the data, so that others do not waste their effort, or are forced to rely on anecdote or conventional wisdom.

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