Review of 'The successful invasion of the European earwig across North America reflects adaptations to thermal regimes but not mean temperatures.'

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General comments

This manuscript reports an impressive sampling effort in which life-history traits were measured across 19 populations of earwig in North America. The authors examine whether variation in life-history across populations is correlated with aspects of the thermal climate experienced by each population: mean temperature and seasonality of temperature. They find some fascinating correlations between life-history and thermal climate; correlations with the seasonality of temperature, but not with mean temperature.

The manuscript is well written and reported, and I see no major flaws with the science. There is an issue of interpretation that needs thought, however, which is how much we expect the measured traits to reflect plasticity (e.g., simple constraints) versus genetic differences. My reading is that, because the animals were collected as juveniles and grown in lab conditions for most of their development and all of their reproductive lives, life-history variation here would most likely reflect genetic differences. If plasticity is involved, it might be through maternal effects rather than direct environmental constraints.

The other place where I think the manuscript can be improved substantially is by adjusting the focus. This is not just a dataset that speaks to invasive species, but it has important relevance to climate change and adaptation to climate, generally. I feel like the authors are missing a big opportunity here by not linking their work to that literature in thoughtful ways. It is increasingly appreciated, for example, that species adjust their phenology in response to climate change. Here you have some fascinating data on precisely that, with time scales relevant to impending climate change, and a reasonable argument that this is adaptation, not just constraint. Much of the literature looking at adaptation in animals in response to climate change has focussed on physiological traits (see, for example, some relevant examples on *Drosophila* in Australia in work by Sgro and Hoffmann), this study would be a relatively uncommon example of a study that examines life-history traits.

Specific comments

Introduction

L47: might be worth mentioning that dispersal is primarily human-mediated (I assume).

Some of the basic setup here reminds me of Huey *et al.* 2000 Science 287:308-309.

Methods

L128-130: It is a shame you can't identify subspecies post hoc, because it could add substantial strength to the study by allowing you to examine whether there are convergent responses across the two subspecies.

L152: A word missing here? "PCA; an analysis without *a priori*".

L157, 161: these might be best expressed as capturing variation in seasonality, rather than a "trade-off". It seems both PC2 and 3 capture the degree of seasonality (PC2: summer-winter; PC3: fall-spring); this might be more reader-friendly terminology throughout.

L167: `lm()` in R specifies a linear model (OLS fitting procedure), not a generalised linear model (likelihood-based fitting).

Results

Nicely done.

Discussion

L224: the time-course of data collection is not relevant here, and has the potential to confuse. Suggest dropping reference to it. Instead, X clutches across 19 populations is the more informative metric.

L238: apostrophe of posession: "females' physiological.."

L244:

> Overall, these results suggest that changes in the timing of first reproduction and females' reproductive strategy did not evolve to better cope with novel thermal constraints, but instead that they are simple by-product of these constraints.

It is great that you consider the fact that there are simple energetic/metabolic constraints driven by temperature, but all your animals were collected as juveniles and raised in constant lab environment, correct? Given this, how much of the variation you see in the lab do you think you can ascribe to energetic constraints in the collection environment?

270-274: fascinating!