PARASITISM AND SKEWED HOST SEX RATIO IN A PROTOZOAN – INSECT SYSTEM: INTEGRATING FIELD AND LABORATORY EVIDENCE

Abstract. Parasites are known to cause sex-biased host mortality. The mechanism involved basis on the idea that parasite-induced mortality is sex-biased against the most vulnerable gender in a host population. The operational sex ratio (OSR), defined as the ratio of males to females ready to mate in a population at a given moment, depends on the degree of spatial and temporal clumping of the limiting sex, as well as on life history differences between sexes. This metric can strongly influence the mating system, sex differences in parental care and the form and opportunity for sexual selection. Furthermore, if parasite induced mortality is sex-biased against the most vulnerable gender, parasite infection may also modify the sex ratio (i.e., the number of males and females in a host population at any given time). Current evidence indicates that sex ratio distortion often occurs from male biased rather than female-biased host mortality. This situation implies that males may be more costly to the parent to produce than females, and natural selection will favor the parent overproducing the less costly sex to reach a 1:1 sex ratio. This idea first suggested by Darwin and Fisher has received a great deal of attention in the last two decades. More specifically, the effect of parasitic sex ratio distorters on host ecology and evolution has been widely studied. Such distorters have the potential to influence the mechanisms underlying sex determination and sex allocation. However, such effects can be hampered by ecological factors affecting the operational sex ratio in host populations. This research evaluates the extent to which parasitism affects the operational sex ratio (OSR) in a host parasite relationship and its effects on the sex ratio produced by parents. The protozoan parasite *Trypanosoma cruzi*, the causative agent of Chagas disease, infects several native mammal species (reservoir hosts) in Chile, and its most important wild vector is the kissing bug *Mepraia spinolai* (definitive host). Previous studies have reported that *T. cruzi* affects some life history traits of *M. spinolai*, including developmental time, body weight, reproductive output and survivorship. Interestingly, under laboratory conditions *T. cruzi* inflicts male-biased mortality which impacts the sex ratio of adults, however, it is unknown whether this phenomenon occurs in natural populations. Biased sex-ratios might reduce the genetic variation within populations, and the potential to respond to infection could be severely constrained in highly parasitized host populations. In this proposal, the effect of *T. cruzi* on the OSR of the host *M. spinolai* will be examined on a regional context, in a replicated set of 20 populations, considering additional biotic and abiotic variables in the analyses. More specifically, the following questions will be addressed:

1. Does the parasite *Trypanosoma cruzi* produce, under natural conditions, *M. spinolai* sex-biased mortality against males?
2. Do levels of infection in *M. spinolai* populations correlate with female biased OSR?
3. If *T. cruzi* -induced mortality is male sex-biased: Do reproductive female hosts produce male biased sex ratio in clutches?

To examine these questions, a set of causal relationships among variables will be analyzed at each population: (i) OSR, (ii) sex ratio in clutches, (iii) host population size, (iv) prevalence of *T. cruzi* in *M. spinolai* populations, (v) potential blood donor vertebrates supporting *M. spinolai* populations, and (vi) relevant abiotic variables. Results from this study will be relevant to gain a more precise understanding on the multiple factors determining sex ratio in natural populations. By integrating previous laboratory data with field evidence, a more complete description of the phenomenon will be reached.