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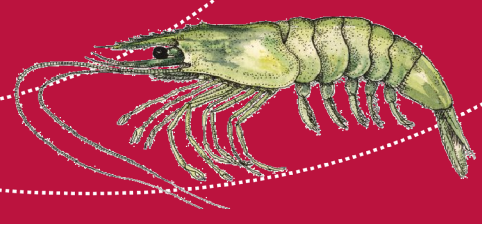
A cure survival model for Taura syndrome resistance in Pacific white shrimp (*Penaeus vannamei*)



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Introduction:

Disease challenge-testing is a widely used method for evaluation of specific disease resistance in aquaculture breeding programs. Survival analysis is typically used for genetic evaluation, modeling time until death and assuming that all animals are at risk. In cases where a fraction of the population is non-susceptible ("cured"), a cure survival model may be used to account for this. A Bayesian cure model was applied to survival data from challenge-testing of Colombian Pacific white shrimp (*Penaeus vannamei*) with taura syndrome virus (TSV).

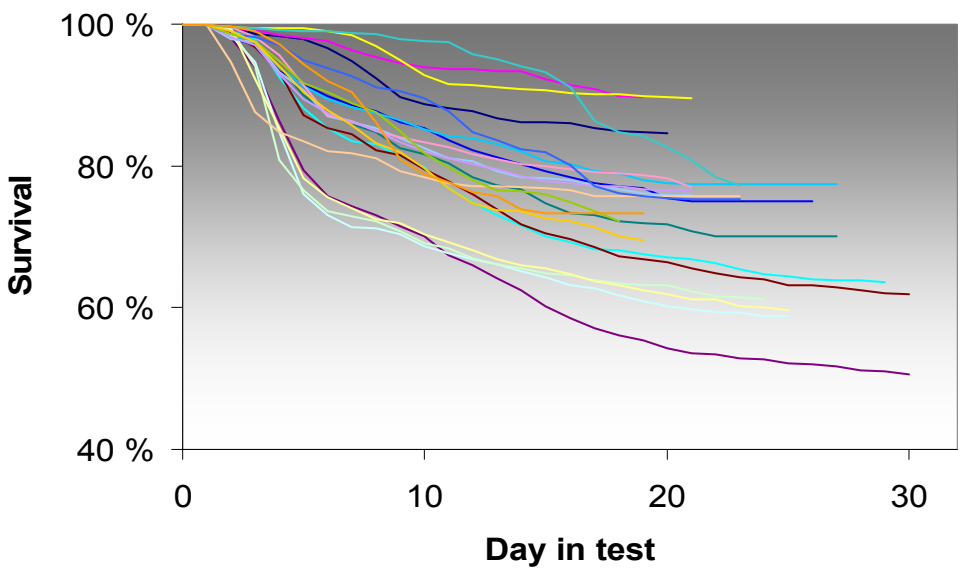

Fig. 1: *Kaplan-Meier survival curves for the different TSV challenge tests*

Aim:

Use a bivariate Bayesian cure model to:

- Separate recorded survival time into two traits
  1. Susceptibility (whether at risk or not)
     - Cross-sectional threshold model
  2. Endurance (time until death)
     - Sequential threshold survival score model
- Estimate genetic (co)variance components for these traits

Data:

- Recoded survival time of 15,261 Pacific white shrimp from Colombia (3 generations)
- 21 independent TSV challenge-tests (Fig. 1)
- 513 full-sib families (266 sires, 484 dams)
- The population was selected for increased TS resistance over several generations
- Average mortality at end of test was 28%

Results:

- Est. fraction (%) susceptible: 38±1
- Underlying heritability (%):
  Susceptibility: 39±6
  Endurance: 7±3
- Genetic corr. susc. – endur.: 0.22±0.25
- Comm. env. fam. effects (%)
  Susceptibility: 5±1
  Endurance: 7±2

Conclusions:

- Susceptibility and endurance under challenge with TSV are likely distinct genetic traits:
  - Improved endurance may not improve long-term survival
  - Reducing susceptibility should be emphasized
- End-survival under the current testing regime is largely controlled by susceptibility rather than endurance
  - Robust testing design
- Termination of challenge-test at still increasing mortality may shift selection towards endurance

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