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**Article:**

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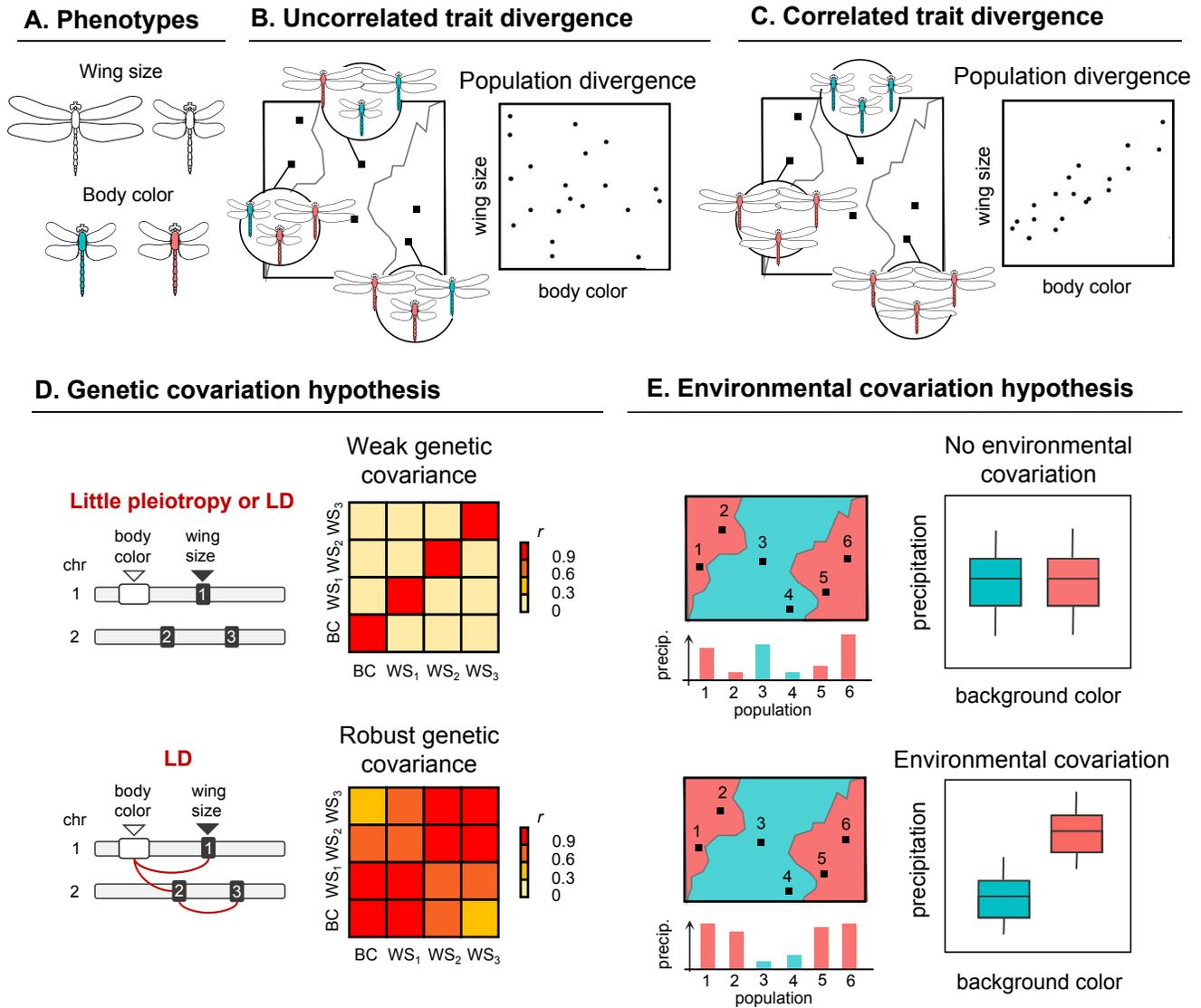
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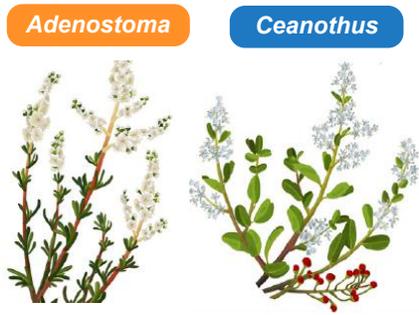


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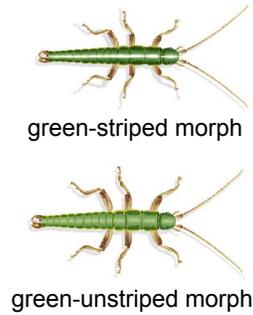


**Figure 1. Hypotheses to explain correlated trait divergence.** (A) Phenotypes for this hypothetical example. (B) Example of when population divergence in wing and in body color are not correlated. (C) Example of correlated trait divergence among populations. Greater divergence in wing size is correlated with greater divergence in body color. Two general and not mutually exclusive hypotheses are proposed to explain correlated trait divergence. (D) The ‘genetic covariation’ hypothesis predicts that genetic covariance between traits leads to correlated trait divergence. In this example, linkage disequilibrium (LD) between the gene controlling body color (BC) and the three genes controlling wing size (WS1-3) generates positive genetic covariance. (E) The ‘environmental covariation’ hypothesis predicts that correlated selective pressures lead to correlated trait divergence. In this example, background color influences body color, while precipitation levels (precip.) influence wing size across populations.

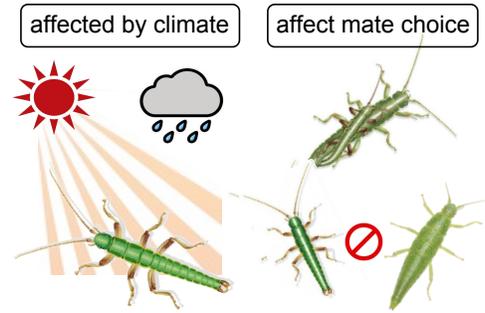
### A. *T. cristinae* host-plant ecotypes



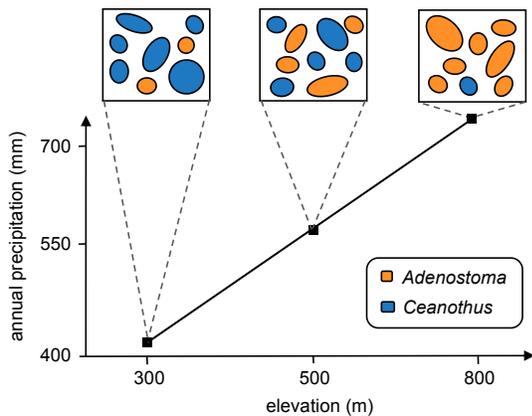
### B. Color-pattern morphs



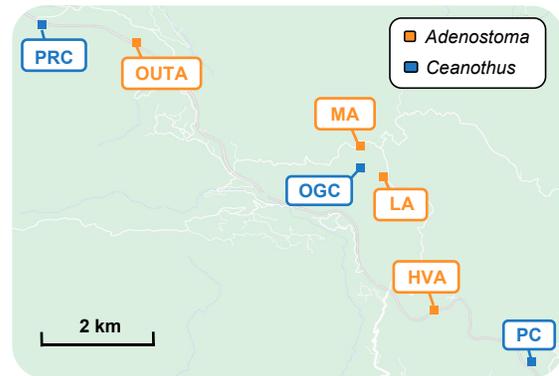
### C. Cuticular hydrocarbons (CHCs)



### D. Host plants and climate across the landscape

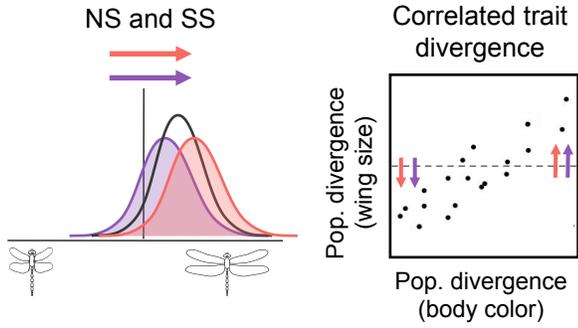


### E. Map of the study populations

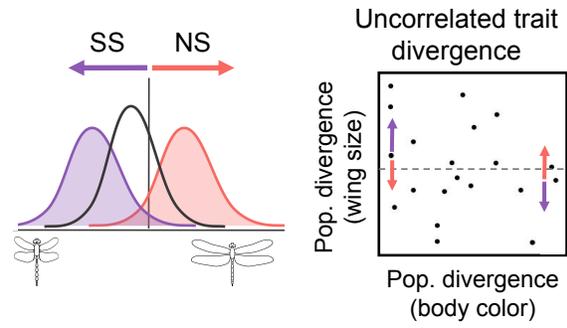


**Figure 2. *Timema cristinae* ecotypes and the traits investigated in this study.** (A) Host-plant species which define the ecotypes. (B) Color-pattern morphs in *T. cristinae*, mainly selected by host-plant species. (C) Female cuticular hydrocarbons (CHCs), with functions in chemical communication and water balance. Cuticular hydrocarbons are associated with climatic adaptation and they affect mate choice, thus are also influenced by sexual selection. (D) The relative abundance of different host-plant species and climatic variables both tend to vary with elevation across the landscape where *T. cristinae* is found. (E) Map of the populations used in this study. The association between host-plant species and climate was taken into account in the selection of study sites (*i.e.*, populations on *Adenostoma* and *Ceanothus* across different elevations).

### A. Prediction: alignment of NS and SS

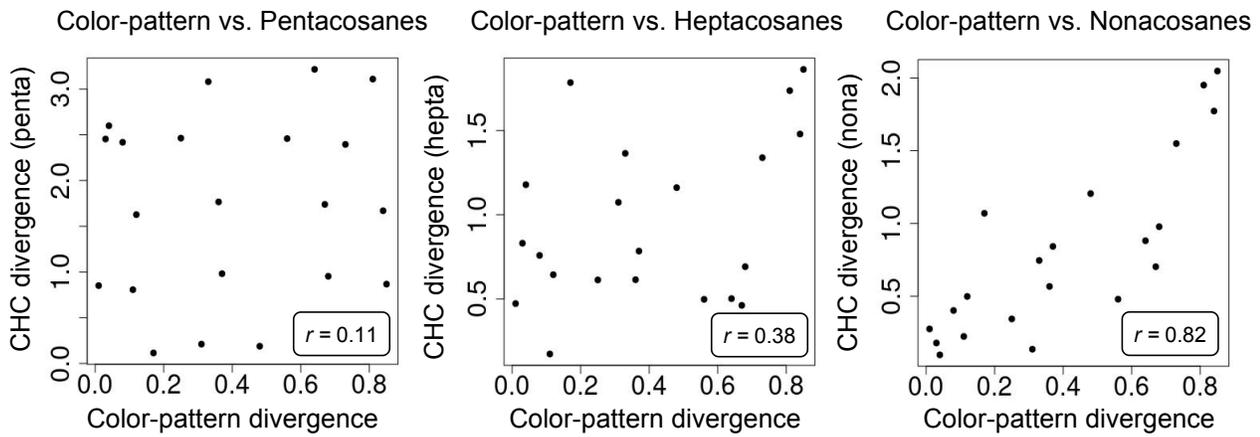


### B. Prediction: misalignment of NS and SS



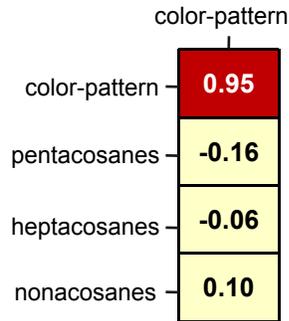
**Figure 3. Hypothesis of misalignment between natural (NS) and sexual (SS) selection to explain lack of correlation between trait divergence.** In this example, wing size is influenced by NS and SS (pink and purple, respectively). When these two pressures are aligned (**A**), correlated trait divergence can occur between wing size and body color. However, when NS and SS are misaligned (**B**), the phenotypic means can be shifted away from natural selection's optimal adaptive peak. Consequently, SS disrupts the correlated NS effects in wing size and body color, resulting in their divergence to not be correlated.

## Population divergence between color-pattern and different CHC traits

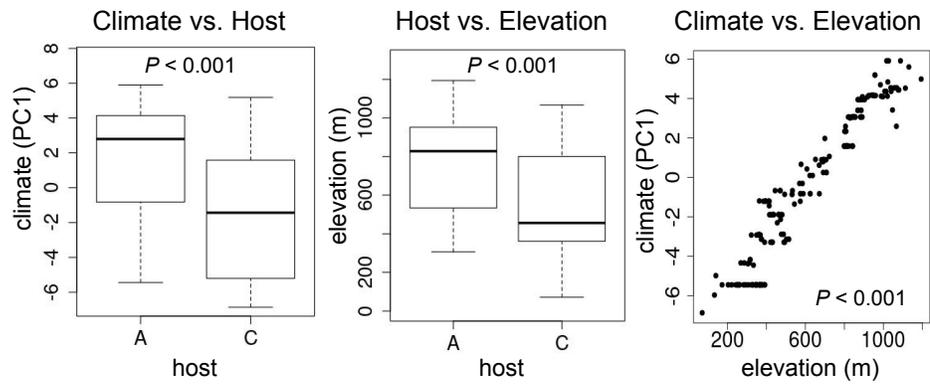


**Figure 4. Correlated divergence between color-pattern and female CHC traits.** Population divergence between color-pattern and pentacosanes ( $r=0.11$ ,  $P=0.27$ ), heptacosanes ( $r=0.38$ ,  $P=0.10$ ), and nonacosanes ( $r=0.82$ ,  $P<0.001$ , Mantel tests). Among the CHC traits, nonacosanes are the trait with strongest correlated divergence with color-pattern.

### A. Genetic covariance

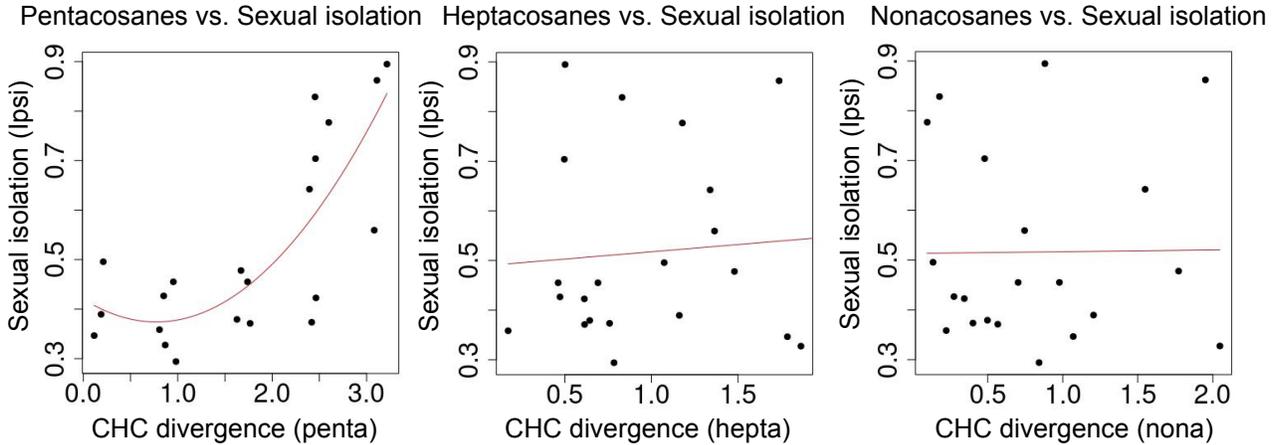


### B. Environmental covariation across *T. cristinae* populations



**Figure 5. Processes explaining correlated trait divergence between color-pattern and CHC traits, especially nonacosanes.** (A) Genetic covariance between color-pattern and the three different female CHC traits (yellow), represented by Pearson correlation coefficients. Based on these results, genetic covariance is unlikely to explain correlated trait divergence between color-pattern and CHC traits. Heritability in color-pattern (*i.e.*, the diagonal of the correlation matrix) is represented in red. (B) Environmental axes influencing color-pattern (host-plant species) and CHCs (climate). Host-plant species are strongly influenced by climate, represented by the first principal component axis summarizing 19 WorldClim variables (PC1=67% of variance explained;  $W = 7872$ ,  $P < 0.001$ , Wilcoxon signed-rank test). This relationship is explained by the common association between each environmental variable and elevation (host-plant species and elevation;  $W = 7932$ ,  $P < 0.001$ , Wilcoxon signed-rank test; PC1 summarizing climatic variables and elevation;  $r = 0.96$ ,  $P < 0.001$ , Pearson correlation). These correlated selective pressures can explain correlated trait divergence. Abbreviations: A= *Adenostoma*, C=*Ceanothus*.

## Relationship between *T. cristinae* CHCs traits and sexual isolation



**Figure 6. Association between the different CHC traits and sexual isolation.** Divergence in pentacosanes shows strong association with the degree of sexual isolation between population pairs, estimated using experimental mating trials (Bayesian linear mixed models, BLMM, linear  $\beta=0.76$  [0.49, 1.03, 95% ETPI], , quadratic  $\beta=0.40$  [0.07, 0.73, 95% ETPI]), suggesting a role for sexual selection. Meanwhile, divergence in heptacosanes ( $\beta=0.09$  [-0.38, 0.56, 95% ETPI]) and nonacosanes ( $\beta=0.02$  [-0.45, 0.48, 95% ETPI]) are not significantly correlated with sexual isolation (see Table S6 for best models' fit in BLMM). The strong correlation between pentacosane divergence and sexual isolation suggests that a misalignment between sexual and natural selection (the latter exerted by climate) could be disrupting the effects of environmental covariation, thus resulting in uncorrelated divergence between pentacosanes and color-pattern. Abbreviations: pop. = populations, penta = pentacosanes; hepta = heptacosanes; nona = nonacosanes