

# Host Shifting, Symbionts, and Speciation in the *Enchenopa binotata* complex

Do symbiont amino acid synthesis pathways exhibit variation between host plant adapted *Enchenopa binotata* species that indicate selection on these genes through speciation events across distantly related host plants?

Might variation in symbiont amino acid synthesis capabilities permit host shifting events that create reproductively isolated populations?

## Species, Species Complexes, and Speciation

The Biological Species Concept: A group of interbreeding natural populations, that does not interbreed with other such groups

Species complex: Sister species with a single trait that has permitted the proliferation of reproductively isolated lineages

Speciation requires reproductive barriers and ecological differentiation

## Enchenopa binotata Life History

- 1) Synchronous time of hatching
- 2) Uniform age structure of cohort
- 3) Temporal delay between maturation and mating
- 4) Small window of time in which mating occurs
- 5) Females mate once
- 6) Oviposition of eggs into plant vascular tissue
- 7) Fall die-off and winter egg diapause

## Host Plant Fidelity and Mediation of Life History Timing

ECBI species live and feed on only a single species of host plant

Egg development after winter diapause is prompted by spring sap flow through plant tissue

ECBI species on different species of host plants are temporally reproductively isolated by life history asynchrony

## The Role of Bacterial Symbionts

ECBI species rely on a bacterial symbiont, *Sulcia*, to synthesize amino acids and vitamins not found in the plant sap they feed on

Symbiont amino acid synthesis capabilities may complement host plant nutrient profiles, nutritionally restricting ECBI species to their specific host plants

## Experiment

Novel PCR primers were developed to investigate an arginine synthesis gene, CarB

This gene was compared between host plant adapted species to determine if there is variation in their ability to manufacture arginine

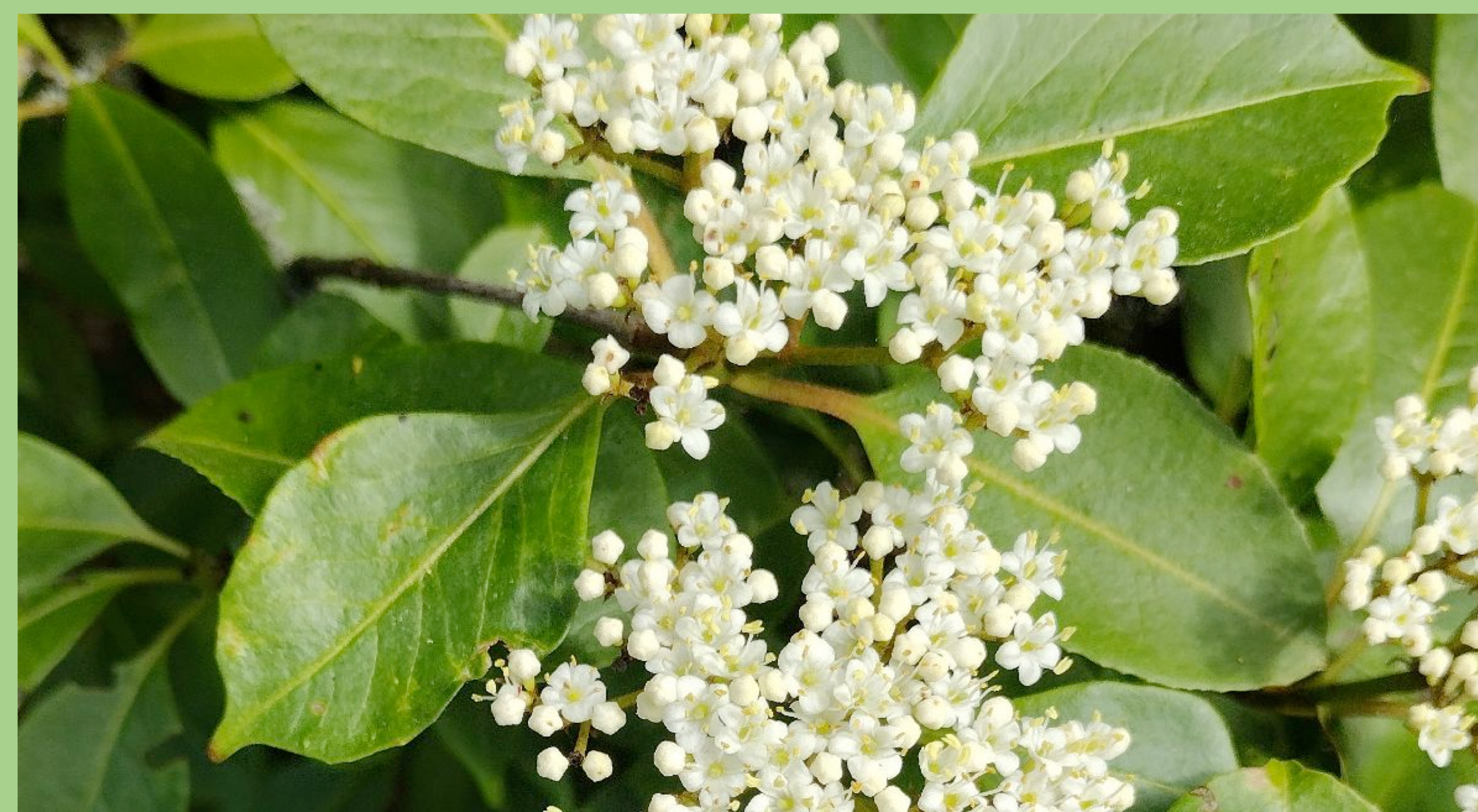


Bacteria live inside the insect's gut

Bacteria synthesizes amino acids and other nutrients not found in plant sap



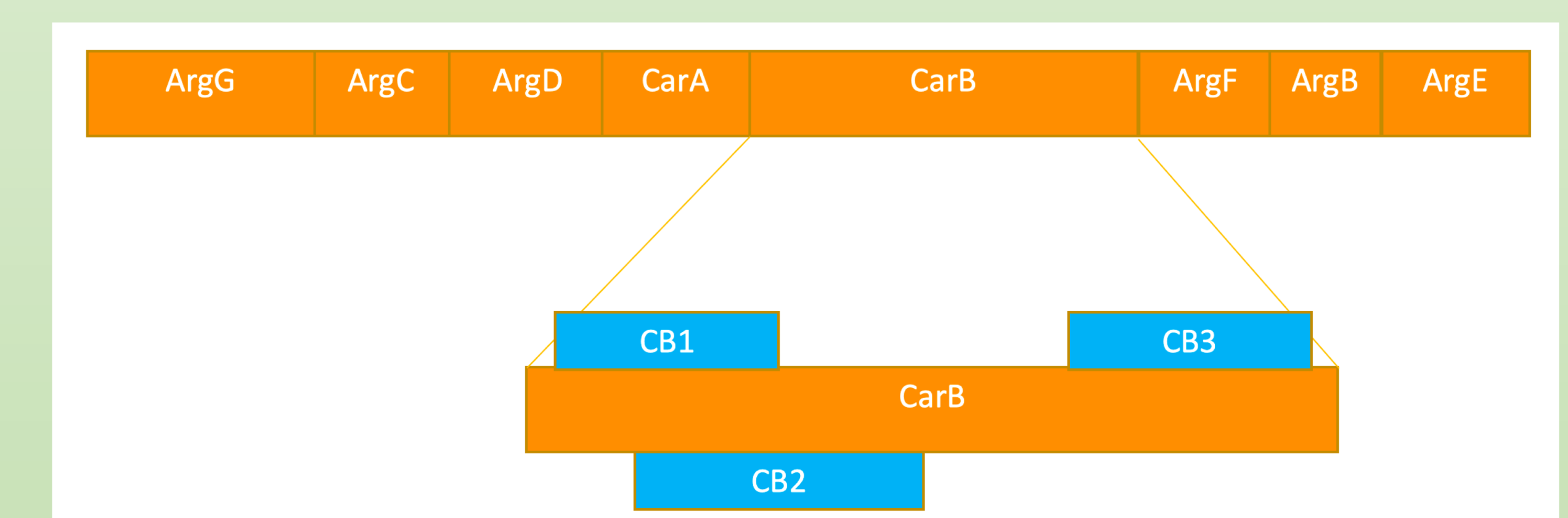
Sugar rich plant sap lacking in other nutrients



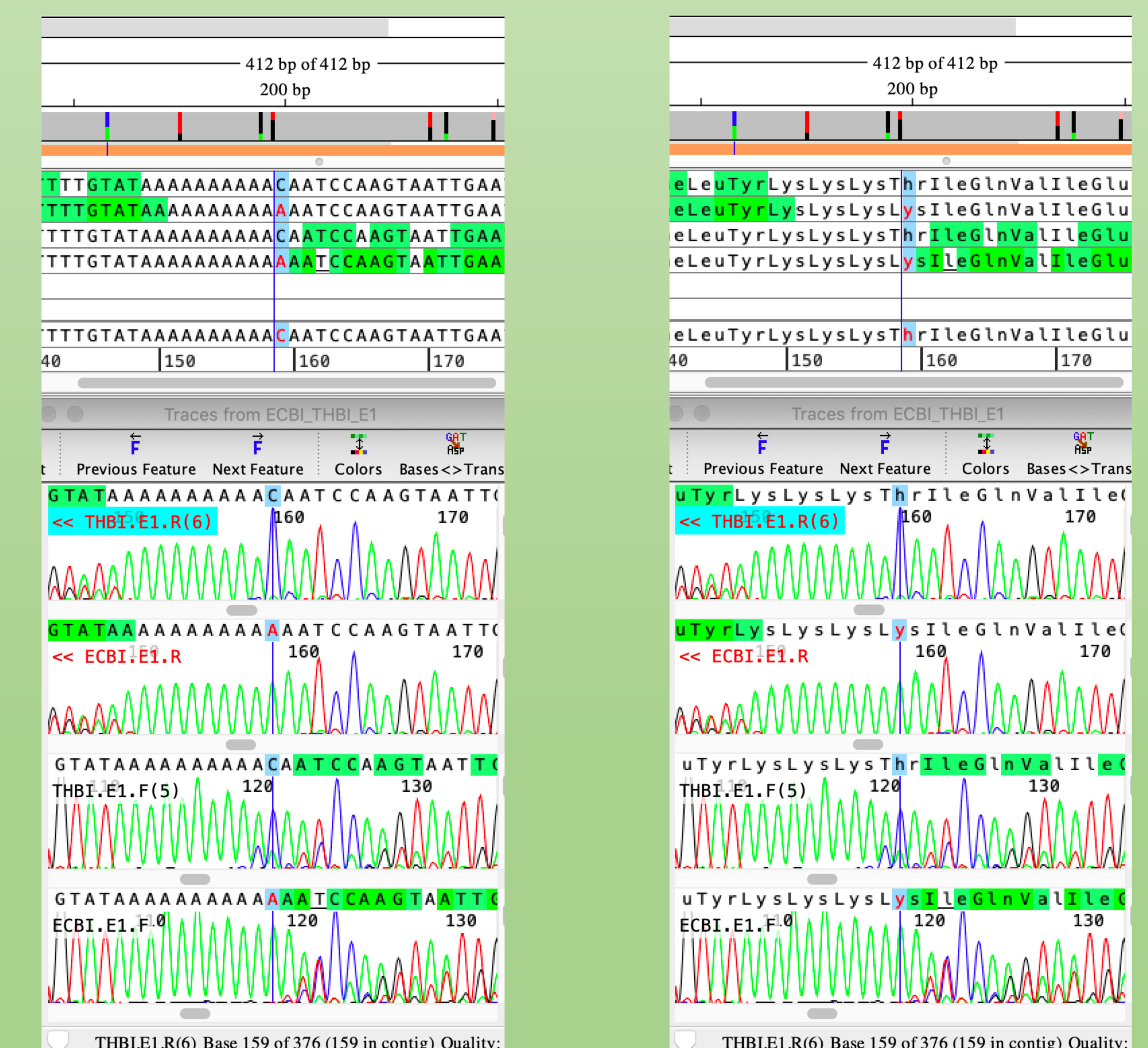
## Enchenopa binotata Life Cycle



## The Arginine Synthesis Pathway



## A Difference in Sequences



## Results

Sequences were consistent between ECBI species but differed from related treehoppers

Variation may still be found in other amino acid synthesis genes

This CarB gene does not appear to be under selection through speciation events in the ECBI complex but may be involved in broader treehopper diversification events