GEPHE SUMMARY

Gephebase Gene
bab (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^bab^#gephebase-summary-title)

GepheID
GP00002425

Entry Status
Published

Main curator
Courtier

PHENOTYPIC CHANGE

Trait Category
Morphology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Morphology^#gephebase-summary-title)

Trait
Coloration (wing; male ; irridescence) (https://www.gephebase.org/search-criteria?/and+Trait=^Coloration (wing; male ; irridescence)^#gephebase-summary-title)

Trait State in Taxon A
Colias philodice - non irridescent scales on the dorsal wings of males

Trait State in Taxon B
Colias eurytheme - irridescent ultraviolet UV scales on the dorsal wings of males

Ancestral State
Unknown

Taxonomic Status
Interspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Interspecific^#gephebase-summary-title)

Taxon A

Latin Name
Colias philodice (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Colias philodice^#gephebase-summary-title)

Common Name
clouded sulphur butterfly

Synonyms
clouded sulphur butterfly; common sulphur butterfly; Colias philodice Godart, 1819

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Endopterygota; Amphiesmenoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Ditrysia; Obtectomera; Papilionoidea; Pieridae; Coliadinae; Colias

Parent
Colias (clouded yellows) - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 42295)

NCBI Taxonomy ID
72851 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 72851)

is Taxon A an Infraspecies?
No

Taxon B

Latin Name
-

Common Name
-

Synonyms
-

Rank
-

Lineage
-

Parent
-

NCBI Taxonomy ID
42296NULL (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 42296NULL)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
bab1

Synonyms
anon-WO0118547.639; bab; BAB; BAB-1; bab-I; Bab1; BAB1; bric-a-brac; CG13910; CG9097; Dmel\CG9097

String
7227.FBpp0072538 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 7227.FBpp0072538)

Sequence Similarities
-

GO - Molecular Function
GO:0003700 : DNA-binding transcription factor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0003700)
GO:0003680 : AT DNA binding (https://www.ebi.ac.uk/QuickGO/term/GO:0003680)

GO - Biological Process
GO:0006357 : regulation of transcription by RNA polymerase II

UniProtKB Drosophila melanogaster
Q9W0K7 (http://www.uniprot.org/uniprot/Q9W0K7)

GenebankID or UniProtKB
()

(https://www.ebi.ac.uk/QuickGO/term/GO:0006357)
GO:0006355 : regulation of transcription, DNA-templated
(https://www.ebi.ac.uk/QuickGO/term/GO:0006355)
GO:0007548 : sex differentiation (https://www.ebi.ac.uk/QuickGO/term/GO:0007548)
GO:0006351 : transcription, DNA-templated
(https://www.ebi.ac.uk/QuickGO/term/GO:0006351)
GO:0048085 : adult chitin-containing cuticle pigmentation
(https://www.ebi.ac.uk/QuickGO/term/GO:0048085)
GO:0007455 : eye-antennal disc morphogenesis
(https://www.ebi.ac.uk/QuickGO/term/GO:0007455)
GO:0046660 : female sex differentiation
(https://www.ebi.ac.uk/QuickGO/term/GO:0046660)
GO:0007478 : leg disc morphogenesis
(https://www.ebi.ac.uk/QuickGO/term/GO:0007478)
GO:0048086 : negative regulation of developmental pigmentation
(https://www.ebi.ac.uk/QuickGO/term/GO:0048086)
GO:0048092 : negative regulation of male pigmentation
(https://www.ebi.ac.uk/QuickGO/term/GO:0048092)
GO:0048070 : regulation of developmental pigmentation
(https://www.ebi.ac.uk/QuickGO/term/GO:0048070)
GO:0048071 : sex-specific pigmentation
(https://www.ebi.ac.uk/QuickGO/term/GO:0048071)

GO - Cellular Component

GO:0005634 : nucleus (https://www.ebi.ac.uk/QuickGO/term/GO:0005634)

Presumptive Null

No (https://www.gephebase.org/search-criteria?/and+Presumptive Null=^No^#gephebase-summary-title)

Molecular Type

Cis-regulatory (https://www.gephebase.org/search-criteria?/and+Molecular Type=^Cis-regulatory^#gephebase-summary-title)

Aberration Type

Unknown (https://www.gephebase.org/search-criteria?/and+Aberration Type=^Unknown^#gephebase-summary-title)

Molecular Details of the Mutation

no fixed coding variation at the bab locus between the sister species. Lower expression of bab in the irridescent scale species. CRISPR bab mutants show that bab is a negative regulator of irridescent scales.

Experimental Evidence

Linkage Mapping (https://www.gephebase.org/search-criteria?/and+Experimental Evidence=^Linkage Mapping^#gephebase-summary-title)

Main Reference

A genetic switch for male UV iridescence in an incipient species pair of sulphur butterflies. (2022) (https://pubmed.ncbi.nlm.nih.gov/35012980)

Authors

Ficarrotta V; Hanly JJ; Loh LS; Francescutti CM; Ren A; TunstrÃ¶m K; Wheat CW; Porter AH; Counterman BA; Martin A

Abstract

Mating cues evolve rapidly and can contribute to species formation and maintenance. However, little is known about how sexual signals diverge and how this variation integrates with other barrier loci to shape the genomic landscape of reproductive isolation. Here, we elucidate the genetic basis of ultraviolet (UV) iridescence, a courtship signal that differentiates the males of Colias eurytheme butterflies from a sister species, allowing females to avoid costly heterospecific matings. Anthropogenic range expansion of the two incipient species established a large zone of secondary contact across the eastern United States with strong signatures of genomic admixtures spanning all autosomes. In contrast, Z chromosomes are highly differentiated between the two species, supporting a disproportionate role of sex chromosomes in speciation known as the large-X (or large-Z) effect. Within this chromosome-wide reproductive barrier, linkage mapping indicates that cis-regulatory variation of bric a brac (bab) underlies the male UV-iridescence polymorphism between the two species. Bab is expressed in all non-UV scales, and butterflies of either species or sex acquire widespread ectopic iridescence following its CRISPR knockout, demonstrating that Bab functions as a suppressor of UV-scale differentiation that potentiates mating cue divergence. These results highlight how a genetic switch can regulate a premating signal and integrate with other reproductive barriers during intermediate phases of speciation.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

@SexualTrait