GEPHE SUMMARY

Gephebase Gene

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

GepheID

GP00001211

Entry Status

Published

Main curator

Martin

PHENOTYPIC CHANGE

Trait Category

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

Trait

Coloration (wing, Mullerian mimicry) (https://www.gephebase.org/search-criteria?/and+Trait=^Coloration (wing, Mullerian mimicry)^#gephebase-summary-title)

Trait State in Taxon A

Heliconius himera - central color patch

Trait State in Taxon B

Heliconius erato erato - "broken" color patch

Ancestral State

Data not curated

Taxonomic Status

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

Taxon A

Latin Name

Heliconius himera (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Heliconius himera^#gephebase-summary-title)

Common Name

-

Synonyms

-

Rank

species

Lineage

cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Amphiesmenoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Ditrysia; Obtectomera; Papilionoidea; Nymphalidae; Heliconiinae; Heliconiini; Heliconius

Parent

Heliconius () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 33416)

NCBI Taxonomy ID

33442 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 33442)

is Taxon A an Infraspecies?

No

Taxon B

Latin Name

Heliconius erato (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Heliconius erato^#gephebase-summary-title)

Common Name

crimson-patched longwing

Synonyms

crimson-patched longwing; Heliconius erato (Linnaeus, 1764)

Rank

species

Lineage

cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Amphiesmenoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Ditrysia; Obtectomera; Papilionoidea; Nymphalidae; Heliconiinae; Heliconiini; Heliconius

Parent

Heliconius () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 33416)

NCBI Taxonomy ID

33431 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 33431)

is Taxon B an Infraspecies?

Yes

Taxon B Description

Heliconius erato erato - "broken" color patch

GENOTYPIC CHANGE

Generic Gene Name

WntA

Synonyms

-

String

-

Sequence Similarities

Belongs to the Wnt family.

GO - Molecular Function

GO:0005102 : signaling receptor binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005102)

GO - Biological Process

GO:0007275 : multicellular organism development (https://www.ebi.ac.uk/QuickGO/term/GO:0007275)
GO:0016055 : Wnt signaling pathway

UniProtKB Vanessa cardui

A0A077DF90 (http://www.uniprot.org/uniprot/A0A077DF90)

GenebankID or UniProtKB

JN944589 (https://www.ncbi.nlm.nih.gov/nuccore/JN944589)

(https://www.ebi.ac.uk/QuickGO/term/GO:0016055)

GO - Cellular Component

GO:0005576 : extracellular region (https://www.ebi.ac.uk/QuickGO/term/GO:0005576)

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

Not identified

Experimental Evidence

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

Main Reference

Diversification of complex butterfly wing patterns by repeated regulatory evolution of a Wnt ligand. (2012) (https://pubmed.ncbi.nlm.nih.gov/22802635)

Authors

Martin A; Papa R; Nadeau NJ; Hill RI; Counterman BA; Halder G; Jiggins CD; Kronforst MR; Long AD; McMillan WO; Reed RD

Abstract

Although animals display a rich variety of shapes and patterns, the genetic changes that explain how complex forms arise are still unclear. Here we take advantage of the extensive diversity of Heliconius butterflies to identify a gene that causes adaptive variation of black wing patterns within and between species. Linkage mapping in two species groups, gene-expression analysis in seven species, and pharmacological treatments all indicate that cis-regulatory evolution of the WntA ligand underpins discrete changes in color pattern features across the Heliconius genus. These results illustrate how the direct modulation of morphogen sources can generate a wide array of unique morphologies, thus providing a link between natural genetic variation, pattern formation, and adaptation.

Additional References

RELATED GEPHE

Related Genes

1 (Optix) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^33442^/and+Trait=Coloration/or+Taxon ID=^33431^/and+Trait=Coloration/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

2 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^WntA^/and+Taxon ID=^33442^/or+Gene Gephebase=^WntA^/and+Taxon ID=^33431^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS

See follow-up paper : Van Belleghem et al. for high-resolution Association Mapping of the H. erato erato allele