GEPHE SUMMARY

Gephebase Gene

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

GepheID

GP00001066

Entry Status

Published

Main curator

Martin

PHENOTYPIC CHANGE

Trait Category

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

Trait

Courtship song (sine song frequency) (https://www.gephebase.org/search-criteria?/and+Trait=^Courtship song (sine song frequency)^#gephebase-summary-title)

Trait State in Taxon A

Drosophila mauritiana; and other Drosophila simulans strains

Trait State in Taxon B

Drosophila simulans - strain sim5 (7.8Hz lower sine song frequency than D. mauritiana)

Ancestral State

Taxon A

Taxonomic Status

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

Taxon A

Latin Name

Drosophila simulans (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Drosophila simulans^#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; Diptera; Brachycera; Muscomorpha; Eremoneura; Cyclorrhapha; Schizophora; Acalyptratae; Ephydroidea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila; Sophophora; melanogaster group; melanogaster subgroup

Parent

melanogaster subgroup () - (Rank: species subgroup) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 32351)

NCBI Taxonomy ID

7240 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7240)

is Taxon A an Infraspecies?

No

Taxon B

Latin Name

Drosophila simulans (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Drosophila simulans^#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; Diptera; Brachycera; Muscomorpha; Eremoneura; Cyclorrhapha; Schizophora; Acalyptratae; Ephydroidea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila; Sophophora; melanogaster group; melanogaster subgroup

Parent

melanogaster subgroup () - (Rank: species subgroup) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 32351)

NCBI Taxonomy ID

7240 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7240)

is Taxon B an Infraspecies?

Yes

Taxon B Description

Drosophila simulans - strain sim5 (7.8Hz lower sine song frequency than D. mauritiana)

GENOTYPIC CHANGE

Generic Gene Name

slo

Synonyms

BcDNA:GH10751; CG10693; Dmel\CG10693; dslo; dSlo; Dslo; dSlo1; fSlo; Slo; Slo1

String

-

Sequence Similarities

Belongs to the potassium channel family. Calcium-activated (TC 1.A.1.3) subfamily. Slo sub-subfamily.

GO - Molecular Function

GO:0015271 : outward rectifier potassium channel activity (https://www.ebi.ac.uk/QuickGO/term/GO:0015271)
GO:0015269 : calcium-activated potassium channel activity (https://www.ebi.ac.uk/QuickGO/term/GO:0015269)

UniProtKB Drosophila melanogaster

Q03720 (http://www.uniprot.org/uniprot/Q03720)

GenebankID or UniProtKB

NP_001260212 (https://www.ncbi.nlm.nih.gov/nuccore/NP_001260212)

GO:0060072 : large conductance calcium-activated potassium channel activity (https://www.ebi.ac.uk/QuickGO/term/GO:0060072)

GO - Biological Process

GO:0006813 : potassium ion transport (https://www.ebi.ac.uk/QuickGO/term/GO:0006813)
GO:0042493 : response to drug (https://www.ebi.ac.uk/QuickGO/term/GO:0042493)
GO:0042391 : regulation of membrane potential (https://www.ebi.ac.uk/QuickGO/term/GO:0042391)
GO:0007623 : circadian rhythm (https://www.ebi.ac.uk/QuickGO/term/GO:0007623)
GO:0045433 : male courtship behavior, veined wing generated song production (https://www.ebi.ac.uk/QuickGO/term/GO:0045433)
GO:0034765 : regulation of ion transmembrane transport (https://www.ebi.ac.uk/QuickGO/term/GO:0034765)
GO:0048512 : circadian behavior (https://www.ebi.ac.uk/QuickGO/term/GO:0048512)
GO:1900074 : negative regulation of neuromuscular synaptic transmission (https://www.ebi.ac.uk/QuickGO/term/GO:1900074)
GO:0008582 : regulation of synaptic growth at neuromuscular junction (https://www.ebi.ac.uk/QuickGO/term/GO:0008582)

GO - Cellular Component

GO:0016021 : integral component of membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0016021)
GO:0005886 : plasma membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0005886)
GO:0016020 : membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0016020)
GO:0043025 : neuronal cell body (https://www.ebi.ac.uk/QuickGO/term/GO:0043025)
GO:0043005 : neuron projection (https://www.ebi.ac.uk/QuickGO/term/GO:0043005)
GO:0045211 : postsynaptic membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0045211)
GO:0008076 : voltage-gated potassium channel complex (https://www.ebi.ac.uk/QuickGO/term/GO:0008076)

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

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

Insertion Size

1-10 kb

Molecular Details of the Mutation

6.7kb "Shelder" retroelement insertion in slowpoke intron; with effect on splicing

Experimental Evidence

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

Main Reference

Natural courtship song variation caused by an intronic retroelement in an ion channel gene. (2016) (https://pubmed.ncbi.nlm.nih.gov/27509856)

Authors

Ding Y; Berrocal A; Morita T; Longden KD; Stern DL

Abstract

Animal species display enormous variation for innate behaviours, but little is known about how this diversity arose. Here, using an unbiased genetic approach, we map a courtship song difference between wild isolates of Drosophila simulans and Drosophila mauritiana to a 966 base pair region within the slowpoke (slo) locus, which encodes a calcium-activated potassium channel. Using the reciprocal hemizygosity test, we confirm that slo is the causal locus and resolve the causal mutation to the evolutionarily recent insertion of a retroelement in a slo intron within D. simulans. Targeted deletion of this retroelement reverts the song phenotype and alters slo splicing. Like many ion channel genes, slo is expressed widely in the nervous system and influences a variety of behaviours; slo-null males sing little song with severely disrupted features. By contrast, the natural variant of slo alters a specific component of courtship song, illustrating that regulatory evolution of a highly pleiotropic ion channel gene can cause modular changes in behaviour.

Additional References

RELATED GEPHE

Related Genes

1 (Period (per)) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^7240^/and+Trait=Courtship song/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

@Splicing The sim5 strain insertion is rare and derived within D. simulans - http://flybase.org/reports/FBal0343839