GEPHE SUMMARY

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

GepheID
GP00001758

Entry Status
Published

Main curator
Courtier

PHENOTYPIC CHANGE

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

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

Trait State in Taxon A
Pyrophorus plagiophthalamus - YG allele - yellow-green

Trait State in Taxon B
Pyrophorus plagiophthalamus - GR allele - green

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

Common Name
-

Synonyms
Pyrophorus plagiophthalmus

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Coleoptera; Polyphaga; Elateriformia; Elateroidea; Elateridae; Agrypninae; Pyrophorus

Parent
Pyrophorus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 30010)

NCBI Taxonomy ID
30011 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 30011)

is Taxon A an Infraspecies?
Yes

Taxon A Description
Pyrophorus plagiophthalamus - YG allele

Taxon B

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

Common Name
-

Synonyms
Pyrophorus plagiophthalmus

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Coleoptera; Polyphaga; Elateriformia; Elateroidea; Elateridae; Agrypninae; Pyrophorus

Parent
Pyrophorus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 30010)

NCBI Taxonomy ID
30011 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 30011)

is Taxon B an Infraspecies?
Yes

Taxon B Description
Pyrophorus plagiophthalamus - GR allele

GENOTYPIC CHANGE

Generic Gene Name
-

Synonyms
-

String
-

Sequence Similarities
Belongs to the ATP-dependent AMP-binding enzyme family.

GO - Molecular Function
GO:0005524 : ATP binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005524)
GO:0046872 : metal ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0046872)
GO:0051087 : chaperone binding (https://www.ebi.ac.uk/QuickGO/term/GO:0051087)
GO:0047077 : Photinus-luciferin 4-monooxygenase (ATP-hydrolyzing) activity (https://www.ebi.ac.uk/QuickGO/term/GO:0047077)

GO - Biological Process
GO:0008218 : bioluminescence (https://www.ebi.ac.uk/QuickGO/term/GO:0008218)

UniProtKB Photinus pyralis
P08659 (http://www.uniprot.org/uniprot/P08659)

GenebankID or UniProtKB
AAQ11735 (https://www.ncbi.nlm.nih.gov/nuccore/AAQ11735)

GO - Cellular Component

GO:0005777 : peroxisome (https://www.ebi.ac.uk/QuickGO/term/GO:0005777)

Presumptive Null

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

Molecular Type

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

Aberration Type

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

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

exact causing amino acid change(s) unknown

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	-	-	-

Main Reference

Darwinian natural selection for orange bioluminescent color in a Jamaican click beetle. (2003) (https://pubmed.ncbi.nlm.nih.gov/14623957)

Authors

Stolz U; Velez S; Wood KV; Wood M; Feder JL

Abstract

The Jamaican click beetle Pyrophorus plagiophthalamus (Coleoptera: Elateridae) is unique among all bioluminescent organisms in displaying a striking light color polymorphism [Biggley, W. H., Lloyd, J. E. & Seliger, H. H. (1967) J. Gen. Physiol. 50, 1681-1692]. Beetles on the island vary in the color of their ventral light organs from yellow-green to orange and their dorsal organs from green to yellow-green. The genetic basis for the color variation involves specific amino acid substitutions in the enzyme luciferase. Here, we show that dorsal and ventral light color in P. plagiophthalamus are under separate genetic control, we resolve the allelic basis for color variation, and, through analyses of luciferase sequence variation, we demonstrate that natural selection has produced a long-term adaptive trend for longer wavelength (more orange) ventral light on Jamaica. Our results constitute a novel example connecting the selective fixation of specific nucleotides in nature to their precisely determined phenotypic effects. We also present evidence suggesting that a recently derived ventral orange luciferase allele on the island has deterministically increased in frequency. Thus, the current luciferase polymorphism for P. plagiophthalamus appears to be mirroring the long-term anagenic trend on Jamaica, revealing a possible ongoing adaptive color transition in progress.

Additional References

Complementary DNA coding click beetle luciferases can elicit bioluminescence of different colors. (1989) (https://pubmed.ncbi.nlm.nih.gov/2655091)
Luc genes: introduction of colour into bioluminescence assays. (1990 Apr-Jun) (https://pubmed.ncbi.nlm.nih.gov/2336971)

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

3 (https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^luciferase^/and+Taxon ID=^30011^/or+Gene Gephebase=^luciferase^/and+Taxon ID=^30011^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS