

Luciferase	Gephebase Gene	GepheID
luciferase (https://www.gephebase.org/search-criteria?/and+Gene Gephebase="luciferase"#gephebase-summary-title)	GP00000553	
	Entry Status	Main curator
Published		

Physiology (https://www.gephebase.org/search-criteria?/and+Trait+Category=^Physiology^#gephebase-summary-title)		Trait Category	
Bioluminescence spectrum (https://www.gephebase.org/search-criteria?/and+Trait=^Bioluminescence+spectrum^#gephebase-summary-title)		Trait	
Pyrophorus plagiophthalmus - YE (ancestral) allele		Trait State in Taxon A	
Pyrophorus plagiophthalmus - OR allele		Trait State in Taxon B	
Data not curated		Ancestral State	
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=^Intraspecific^#gephebase-summary-title)		Taxonomic Status	
Taxon A		Taxon B	
Pyrophorus plagiophthalmus (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Pyrophorus+plagiophthalmus^#gephebase-summary-title)		Pyrophorus plagiophthalmus (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Pyrophorus+plagiophthalmus^#gephebase-summary-title)	
Common Name		Common Name	
-		-	
Synonyms		Synonyms	
Pyrophorus plagiophthalmus		Pyrophorus plagiophthalmus	
Rank		Rank	
species		species	
Lineage		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		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		Parent	
Pyrophorus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=30010)		Pyrophorus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=30010)	
NCBI Taxonomy ID		NCBI Taxonomy ID	
30011 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=30011)		30011 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=30011)	
is Taxon A an Intraspecies?		is Taxon B an Intraspecies?	
Yes		Yes	
Taxon A Description		Taxon B Description	
Pyrophorus plagiophthalmus - YE (ancestral) allele		Pyrophorus plagiophthalmus - OR allele	

-	Generic Gene Name	P08659 (http://www.uniprot.org/uniprot/P08659)	UniProtKB Photinus pyralis
-	Synonyms	AAQ11735 (https://www.ncbi.nlm.nih.gov/nucore/AAQ11735)	GenebankID or UniProtKB
-	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)			

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

T739G and C740G in exon 4; leading to one amino acid change - colour difference between the yellow- and orange-emitting luciferases is due entirely to S247G

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	-	-	739
Amino-acid	Ser	Gly	247

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 plagiophthalmus* (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. plagiophthalmus* 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. plagiophthalmus* 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

@TwoNucleotideChangesInSameCodon