

GEPHE SUMMARY

cortex (#gephebase-summary-title)	Gephebase Gene	GP00001804	GephelD
Published	Entry Status	Martin	Main curator

PHENOTYPIC CHANGE

Morphology (#gephebase-summary-title)	Trait Category
Coloration (wing ; industrial melanism ; camouflage) (<a)<="" a="" href="https://www.gephebase.org/search-criteria/?and+Trait=^Coloration(wing;industrialmelanism;camouflage)^#gephebase-summary-title">	Trait
common pale (peppered) typica form	Trait State in Taxon A
melanic carbonaria form	Trait State in Taxon B
Taxon A	Ancestral State
Intraspecific (#gephebase-summary-title)	Taxonomic Status

Taxon A	Latin Name	Taxon B	Latin Name
Biston betularia (#gephebase-summary-title))	Biston betularia (#gephebase-summary-title))	Biston betularia (#gephebase-summary-title))	Biston betularia (#gephebase-summary-title))
pepper-and-salt moth	Common Name	pepper-and-salt moth	Common Name
Biston betularium; Biston betularius; pepper-and-salt moth; peppered moth; Biston betularius (Linnaeus, 1758)	Synonyms	Biston betularium; Biston betularius; pepper-and-salt moth; peppered moth; Biston betularius (Linnaeus, 1758)	Synonyms
species	Rank	species	Rank
cellular organisms; Eukaryota; Opistokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Amphiesmenoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Ditrysia; Obtectomera; Geometroidea; Geometridae; Ennominae; Biston	Lineage	cellular organisms; Eukaryota; Opistokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Amphiesmenoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Ditrysia; Obtectomera; Geometroidea; Geometridae; Ennominae; Biston	Lineage
Biston () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=82594)	Parent	Biston () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=82594)	Parent
82595 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=82595)	NCBI Taxonomy ID	82595 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=82595)	NCBI Taxonomy ID
Yes	is Taxon A an Infraspecies?	Yes	is Taxon B an Infraspecies?
Biston betularia typica (UK)	Taxon A Description	Biston betularia carbonaria (UK)	Taxon B Description

GENOTYPIC CHANGE

cort	Generic Gene Name	UniProtKB Drosophila melanogaster
CG11330; cor; Cort; Dmel\CG11330	Synonyms	GenebankID or UniProtKB
7227.FBpp0078949 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=7227.FBpp0078949)	String	KT182637 (https://www.ncbi.nlm.nih.gov/nuccore/KT182637)
Belongs to the WD repeat CORT family.	Sequence Similarities	
GO:0010997 : anaphase-promoting complex binding (https://www.ebi.ac.uk/QuickGO/term/GO:0010997)	GO - Molecular Function	

GO:0097027 : ubiquitin-protein transferase activator activity
(<https://www.ebi.ac.uk/QuickGO/term/GO:0097027>)

GO - Biological Process

GO:0048477 : oogenesis (<https://www.ebi.ac.uk/QuickGO/term/GO:0048477>)
GO:0045143 : homologous chromosome segregation
(<https://www.ebi.ac.uk/QuickGO/term/GO:0045143>)
GO:0031145 : anaphase-promoting complex-dependent catabolic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0031145>)
GO:0007349 : cellularization (<https://www.ebi.ac.uk/QuickGO/term/GO:0007349>)
GO:0007343 : egg activation (<https://www.ebi.ac.uk/QuickGO/term/GO:0007343>)
GO:0007144 : female meiosis I (<https://www.ebi.ac.uk/QuickGO/term/GO:0007144>)
GO:0007147 : female meiosis II (<https://www.ebi.ac.uk/QuickGO/term/GO:0007147>)
GO:0007143 : female meiotic nuclear division
(<https://www.ebi.ac.uk/QuickGO/term/GO:0007143>)
GO:0007279 : pole cell formation (<https://www.ebi.ac.uk/QuickGO/term/GO:0007279>)
GO:1905786 : positive regulation of anaphase-promoting complex-dependent catabolic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:1905786>)
GO:1904668 : positive regulation of ubiquitin protein ligase activity
(<https://www.ebi.ac.uk/QuickGO/term/GO:1904668>)

GO - Cellular Component

GO:0005737 : cytoplasm (<https://www.ebi.ac.uk/QuickGO/term/GO:0005737>)

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

10-100 kb

Molecular Details of the Mutation

Putative transposon insertion within the first intron ; consists of of ~9 kb tandemly repeated 2.3 times + three short tandem subrepeat units

Experimental Evidence

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

Main Reference

The industrial melanism mutation in British peppered moths is a transposable element. (2016) (<https://pubmed.ncbi.nlm.nih.gov/27251284>)

Authors

Van't Hof AE; Campagne P; Rigden DJ; Yung CJ; Lingley J; Quail MA; Hall N; Darby AC; Saccheri IJ

Abstract

Discovering the mutational events that fuel adaptation to environmental change remains an important challenge for evolutionary biology. The classroom example of a visible evolutionary response is industrial melanism in the peppered moth (*Biston betularia*): the replacement, during the Industrial Revolution, of the common pale typica form by a previously unknown black (carbonaria) form, driven by the interaction between bird predation and coal pollution. The carbonaria locus has been coarsely localized to a 200-kilobase region, but the specific identity and nature of the sequence difference controlling the carbonaria-typica polymorphism, and the gene it influences, are unknown. Here we show that the mutation event giving rise to industrial melanism in Britain was the insertion of a large, tandemly repeated, transposable element into the first intron of the gene cortex. Statistical inference based on the distribution of recombinant carbonaria haplotypes indicates that this transposition event occurred around 1819, consistent with the historical record. We have begun to dissect the mode of action of the carbonaria transposable element by showing that it increases the abundance of a cortex transcript, the protein product of which plays an important role in cell-cycle regulation, during early wing disc development. Our findings fill a substantial knowledge gap in the iconic example of microevolutionary change, adding a further layer of insight into the mechanism of adaptation in response to natural selection. The discovery that the mutation itself is a transposable element will stimulate further debate about the importance of 'jumping genes' as a source of major phenotypic novelty.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

@TE @Parallelism

