

GEPHE SUMMARY

	Gephebase Gene		GepheID
CYP2J19 (https://www.gephebase.org/search-criteria?/and+GeneGephebase=~CYP2J19~#gephebase-summary-title)		GP00000201	
	Entry Status	Martin	Main curator
Published			

PHENOTYPIC CHANGE

	Trait Category		
Morphology (https://www.gephebase.org/search-criteria?/and+TraitCategory=~Morphology~#gephebase-summary-title)			
	Trait		
Coloration (feathers) (https://www.gephebase.org/search-criteria?/and+Trait=~Coloration(feathers)~#gephebase-summary-title)			
	Trait State in Taxon A		
Spinus cucullatus - red siskin ; production of carotenoids (liver; skin)			
	Trait State in Taxon B		
Serinus canaria - Yellow common canaries			
	Ancestral State		
Data not curated			
	Taxonomic Status		
Interspecific (https://www.gephebase.org/search-criteria?/and+TaxonomicStatus=~Interspecific~#gephebase-summary-title)			

Taxon A		Taxon B	
	Latin Name		Latin Name
Spinus cucullatus (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=~Spinus+cucullatus~#gephebase-summary-title)		Serinus canaria (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=~Serinus+canaria~#gephebase-summary-title)	
	Common Name		Common Name
red siskin		common canary	
	Synonyms		Synonyms
Carduelis cucullata; red siskin; Spinus cucullatus Swainson, 1820		Serinus canarius; common canary; canary; Serinus canaria (Linnaeus, 1758)	
	Rank		Rank
species		species	
	Lineage		Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Sauropsida; Sauria; Archelosauria; Archosauria; Dinosauria; Saurischia; Theropoda; Coelurosauria; Aves; Neognathae; Passeriformes; Passeroidea; Fringillidae; Carduelinae; Spinus		cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Sauropsida; Sauria; Archelosauria; Archosauria; Dinosauria; Saurischia; Theropoda; Coelurosauria; Aves; Neognathae; Passeriformes; Passeroidea; Fringillidae; Carduelinae; Serinus	
	Parent		Parent
Spinus (siskins) - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=1647189)		Serinus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9134)	
	NCBI Taxonomy ID		NCBI Taxonomy ID
273489 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=273489)		9135 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9135)	
	is Taxon A an Intraspecies?		is Taxon B an Intraspecies?
No		No	

GENOTYPIC CHANGE

	Generic Gene Name		UniProtKB Homo sapiens
CYP2J2		P51589 (http://www.uniprot.org/uniprot/P51589)	
	Synonyms		GenebankID or UniProtKB
CPJ2; CYP11J2		ANH10894 (https://www.ncbi.nlm.nih.gov/nuccore/ANH10894)	
	String		
9606.ENSP00000360247 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=9606.ENSP00000360247)			
	Sequence Similarities		
Belongs to the cytochrome P450 family.			
	GO - Molecular Function		
GO:0020037 : heme binding (https://www.ebi.ac.uk/QuickGO/term/GO:0020037)			
GO:0005506 : iron ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005506)			
GO:0004497 : monooxygenase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004497)			
GO:0070330 : aromatase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0070330)			
GO:0016712 : oxidoreductase activity, acting on paired donors, with incorporation or			

reduction of molecular oxygen, reduced flavin or flavoprotein as one donor, and incorporation of one atom of oxygen (<https://www.ebi.ac.uk/QuickGO/term/GO:0016712>)
GO:0008392 : arachidonic acid epoxygenase activity (<https://www.ebi.ac.uk/QuickGO/term/GO:0008392>)
GO:0008395 : steroid hydroxylase activity (<https://www.ebi.ac.uk/QuickGO/term/GO:0008395>)
GO:0008405 : arachidonic acid 11,12-epoxygenase activity (<https://www.ebi.ac.uk/QuickGO/term/GO:0008405>)
GO:0008404 : arachidonic acid 14,15-epoxygenase activity (<https://www.ebi.ac.uk/QuickGO/term/GO:0008404>)
GO:0071614 : linoleic acid epoxygenase activity (<https://www.ebi.ac.uk/QuickGO/term/GO:0071614>)

GO - Biological Process

GO:0055114 : oxidation-reduction process (<https://www.ebi.ac.uk/QuickGO/term/GO:0055114>)
GO:0019373 : epoxygenase P450 pathway (<https://www.ebi.ac.uk/QuickGO/term/GO:0019373>)
GO:0042738 : exogenous drug catabolic process (<https://www.ebi.ac.uk/QuickGO/term/GO:0042738>)
GO:0006805 : xenobiotic metabolic process (<https://www.ebi.ac.uk/QuickGO/term/GO:0006805>)
GO:0006082 : organic acid metabolic process (<https://www.ebi.ac.uk/QuickGO/term/GO:0006082>)
GO:0006690 : icosanoid metabolic process (<https://www.ebi.ac.uk/QuickGO/term/GO:0006690>)
GO:0043651 : linoleic acid metabolic process (<https://www.ebi.ac.uk/QuickGO/term/GO:0043651>)
GO:0008016 : regulation of heart contraction (<https://www.ebi.ac.uk/QuickGO/term/GO:0008016>)

GO - Cellular Component

GO:0005737 : cytoplasm (<https://www.ebi.ac.uk/QuickGO/term/GO:0005737>)
GO:0070062 : extracellular exosome (<https://www.ebi.ac.uk/QuickGO/term/GO:0070062>)
GO:0043231 : intracellular membrane-bounded organelle (<https://www.ebi.ac.uk/QuickGO/term/GO:0043231>)
GO:0005789 : endoplasmic reticulum membrane (<https://www.ebi.ac.uk/QuickGO/term/GO:0005789>)
GO:0031090 : organelle membrane (<https://www.ebi.ac.uk/QuickGO/term/GO:0031090>)

	Presumptive Null
Unknown (<a +unknown`#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Presumptive Null=">https://www.gephebase.org/search-criteria?/and+Presumptive Null="+Unknown`#gephebase-summary-title)	
Unknown (<a +unknown`#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Molecular Type=">https://www.gephebase.org/search-criteria?/and+Molecular Type="+Unknown`#gephebase-summary-title)	Molecular Type
Unknown (<a +unknown`#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Aberration Type=">https://www.gephebase.org/search-criteria?/and+Aberration Type="+Unknown`#gephebase-summary-title)	Aberration Type
unknown	Molecular Details of the Mutation
Linkage Mapping (<a +linkage="" href="https://www.gephebase.org/search-criteria?/and+Experimental Evidence=" mapping`#gephebase-summary-title"="">https://www.gephebase.org/search-criteria?/and+Experimental Evidence="+Linkage Mapping`#gephebase-summary-title)	Experimental Evidence
Genetic Basis for Red Coloration in Birds. (2016) (https://pubmed.ncbi.nlm.nih.gov/27212400)	Main Reference
Lopes RJ; Johnson JD; Toomey MB; Ferreira MS; Araujo PM; Melo-Ferreira J; Andersson L; Hill GE; Corbo JC; Carneiro M	Authors

Abstract

The yellow and red feather pigmentation of many bird species [1] plays pivotal roles in social signaling and mate choice [2, 3]. To produce red pigments, birds ingest yellow carotenoids and endogenously convert them into red ketocarotenoids via an oxidation reaction catalyzed by a previously unknown ketolase [4-6]. We investigated the genetic basis for red coloration in birds using whole-genome sequencing of red siskins (*Spinus cucullata*), common canaries (*Serinus canaria*), and “red factor” canaries, which are the hybrid product of crossing red siskins with common canaries [7]. We identified two genomic regions introgressed from red siskins into red factor canaries that are required for red coloration. One of these regions contains a gene encoding a cytochrome P450 enzyme, CYP2J19. Transcriptome analysis demonstrates that CYP2J19 is significantly upregulated in the skin and liver of red factor canaries, strongly implicating CYP2J19 as the ketolase that mediates red coloration in birds. Interestingly, a second introgressed region required for red feathers resides within the epidermal differentiation complex, a cluster of genes involved in development of the integument. Lastly, we present evidence that CYP2J19 is involved in ketocarotenoid formation in the retina. The discovery of the carotenoid ketolase has important implications for understanding sensory function and signaling mediated by carotenoid pigmentation.

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Additional References

RELATED GEPHE

	Related Genes
No matches found.	
	Related Haplotypes
No matches found.	

EXTERNAL LINKS

COMMENTS

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