

GEPHE SUMMARY

| | | | |
|--|----------------|------------|--------------|
| | Gephebase Gene | | GepheID |
| BCO2 = beta-carotene oxygenase 2 (https://www.gephebase.org/search-criteria?/and+Gene+Gephebase+BCO2+beta-carotene+oxygenase+2+Gephebase-summary-title) | | GP00002388 | |
| Published | Entry Status | Santos | Main curator |

PHENOTYPIC CHANGE

| | | | |
|---|-----------------------------|---|-----------------------------|
| | Trait Category | | |
| Morphology (https://www.gephebase.org/search-criteria?/and+Trait+Category+Morphology+Gephebase-summary-title) | | | |
| | Trait | | |
| Coloration (feather) (https://www.gephebase.org/search-criteria?/and+Trait+Coloration+feather+Gephebase-summary-title) | | | |
| | Trait State in Taxon A | | |
| less extensive carotenoid pigmentation | | | |
| | Trait State in Taxon B | | |
| more extensive carotenoid pigmentation | | | |
| | Ancestral State | | |
| Taxon A | | | |
| | Taxonomic Status | | |
| Interspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic+Status+Interspecific+Gephebase-summary-title) | | | |
| Taxon A | | Taxon B | |
| | Latin Name | | Latin Name |
| Setophaga ruticilla (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms+Setophaga+ruticilla+Gephebase-summary-title) | | Setophaga citrina (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms+Setophaga+citrina+Gephebase-summary-title) | |
| | Common Name | | Common Name |
| - | | hooded warbler | |
| | Synonyms | | Synonyms |
| - | | Wilsonia citrina; hooded warbler; Setophaga citrina (Boddaert, 1783) | |
| | 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; Parulidae; Setophaga | | 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; Parulidae; Setophaga | |
| | Parent | | Parent |
| Setophaga () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=182948) | | Setophaga () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=182948) | |
| | NCBI Taxonomy ID | | NCBI Taxonomy ID |
| 182949 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=182949) | | 1316271 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=1316271) | |
| | is Taxon A an Intraspecies? | | is Taxon B an Intraspecies? |
| No | | No | |

GENOTYPIC CHANGE

| | | | |
|--|-------------------------|--|-------------------------|
| | Generic Gene Name | | UniProtKB Homo sapiens |
| BCO2 | | Q9BYV7 (http://www.uniprot.org/uniprot/Q9BYV7) | |
| | Synonyms | | GenebankID or UniProtKB |
| BCDO2; B-DIOX-II | | () | |
| | String | | |
| 9606.ENSPO0000350314 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=9606.ENSPO0000350314) | | | |
| | Sequence Similarities | | |
| Belongs to the carotenoid oxygenase family. | | | |
| | GO - Molecular Function | | |
| GO:0046872 : metal ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0046872) | | | |
| GO:0003834 : beta-carotene 15,15'-monooxygenase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0003834) | | | |
| GO:0010436 : carotenoid dioxygenase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0010436) | | | |
| GO:0004744 : retinal isomerase activity | | | |

(<https://www.ebi.ac.uk/QuickGO/term/GO:0004744>)
GO:0102076 : beta,beta-carotene-9',10'-cleaving oxygenase activity
(<https://www.ebi.ac.uk/QuickGO/term/GO:0102076>)
GO:0016702 : oxidoreductase activity, acting on single donors with incorporation of molecular oxygen, incorporation of two atoms of oxygen
(<https://www.ebi.ac.uk/QuickGO/term/GO:0016702>)

GO - Biological Process

GO:0055114 : oxidation-reduction process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0055114>)
GO:0001523 : retinoid metabolic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0001523>)
GO:0016121 : carotene catabolic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0016121>)
GO:0042574 : retinal metabolic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0042574>)
GO:0016119 : carotene metabolic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0016119>)
GO:0016116 : carotenoid metabolic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0016116>)
GO:0051881 : regulation of mitochondrial membrane potential
(<https://www.ebi.ac.uk/QuickGO/term/GO:0051881>)
GO:2000377 : regulation of reactive oxygen species metabolic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:2000377>)
GO:0042573 : retinoic acid metabolic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0042573>)
GO:0016122 : xanthophyll metabolic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0016122>)

GO - Cellular Component

GO:0005739 : mitochondrion (<https://www.ebi.ac.uk/QuickGO/term/GO:0005739>)
GO:0005622 : intracellular (<https://www.ebi.ac.uk/QuickGO/term/GO:0005622>)
GO:0005759 : mitochondrial matrix (<https://www.ebi.ac.uk/QuickGO/term/GO:0005759>)

Unknown (<https://www.gephebase.org/search-criteria?/and+Presumptive Null=^Unknown^#gephebase-summary-title>) Presumptive Null

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

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

- Molecular Details of the Mutation

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

Pigmentation Genes Show Evidence of Repeated Divergence and Multiple Bouts of Introgression in Setophaga Warblers. (2021) (<https://pubmed.ncbi.nlm.nih.gov/33259789>) Main Reference

Baiz MD; Wood AW; Brelsford A; Lovette IJ; Toews DPL Authors

Species radiations have long served as model systems in evolutionary biology. However, it has only recently become possible to study the genetic bases of the traits responsible for diversification and only in a small number of model systems. Here, we use genomes of 36 species of North, Central, and South American warblers to highlight the role of pigmentation genes-involved in melanin and carotenoid processing-in the diversification of this group. We show that agouti signaling protein (ASIP) and beta-carotene oxygenase 2 (BCO2) are predictably divergent between species that differ in the distribution of melanin and carotenoid in their plumages, respectively. Among species, sequence variation at ASIP broadly mirrors the species' phylogenetic history, consistent with repeated, independent mutations generating melanin-based variation. In contrast, BCO2 variation is highly discordant from the species tree, with evidence of cross-lineage introgression among species like the yellow warbler (*Setophaga petechia*) and magnolia warbler (*S. magnolia*) with extensive carotenoid-based coloration. We also detect introgression of a small part of the BCO2 coding region (<3 kb) in *S. discolor* and *S. vitellina*, including an amino acid substitution that is unique to warblers but otherwise highly conserved across birds. Lateral transfer of carotenoid-processing genes has been documented in arthropods, but introgression of BCO2 as demonstrated here-presumably adaptive-represents the first example of carotenoid gene transfer among vertebrates. These contrasting genomic patterns show that both independent evolution in a common set of genes and past hybridization have fueled plumage diversification in this colorful avian radiation. Abstract

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RELATED GEPHE

No matches found.

Related Genes

No matches found.

Related Haplotypes

EXTERNAL LINKS

COMMENTS

@Introgression Different haplotype to the one described in the entry GP00002387