GEPHE SUMMARY

Gephebase Gene

BCO2 = beta-carotene oxygenase 2 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^BCO2 = beta-carotene oxygenase 2^#gephebase-summary-title)

GepheID

GP00002384

Entry Status

Published

Main curator

Santos

PHENOTYPIC CHANGE

Trait Category

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

Trait

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

Trait State in Taxon A

nestling pink beak

Trait State in Taxon B

nestling yellow beak

Ancestral State

Taxon A

Taxonomic Status

Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Intraspecific^#gephebase-summary-title)

Taxon A #1

Latin Name

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

Common Name

-

Synonyms

Cactornis scandens; Cactornis scandens Gould, 1837; Geospiza scadens

Rank

species

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; Thraupidae; Geospiza

Parent

Geospiza () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48881)

NCBI Taxonomy ID

48886 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48886)

is Taxon A an Infraspecies?

No

Taxon B #1

Latin Name

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

Common Name

-

Synonyms

Cactornis scandens; Cactornis scandens Gould, 1837; Geospiza scadens

Rank

species

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; Thraupidae; Geospiza

Parent

Geospiza () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48881)

NCBI Taxonomy ID

48886 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48886)

is Taxon B an Infraspecies?

No

Taxon A #2

Latin Name

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

Common Name

medium ground-finch

Synonyms

medium ground-finch; Geospiza fortis Gould, 1837

Rank

species

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; Thraupidae; Geospiza

Parent

Geospiza () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48881)

NCBI Taxonomy ID

Taxon B #2

Latin Name

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

Common Name

medium ground-finch

Synonyms

medium ground-finch; Geospiza fortis Gould, 1837

Rank

species

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; Thraupidae; Geospiza

Parent

Geospiza () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48881)

NCBI Taxonomy ID

48883
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48883)
is Taxon A an Infraspecies?
No

48883
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48883)
is Taxon B an Infraspecies?
No

Taxon A #3

Latin Name
Geospiza conirostris
(https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Geospiza conirostris^#gephebase-summary-title)
Common Name
-
Synonyms
Geospiza conirostris Ridgway, 1890; Geospiza cornirostris
Rank
species
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; Thraupidae; Geospiza
Parent
Geospiza () - (Rank: genus)
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48881)
NCBI Taxonomy ID
48882
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48882)
is Taxon A an Infraspecies?
No

Taxon B #3

Latin Name
Geospiza conirostris
(https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Geospiza conirostris^#gephebase-summary-title)
Common Name
-
Synonyms
Geospiza conirostris Ridgway, 1890; Geospiza cornirostris
Rank
species
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; Thraupidae; Geospiza
Parent
Geospiza () - (Rank: genus)
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48881)
NCBI Taxonomy ID
48882
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48882)
is Taxon B an Infraspecies?
No

Taxon A #4

Latin Name
Geospiza magnirostris
(https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Geospiza magnirostris^#gephebase-summary-title)
Common Name
-
Synonyms
Geospiza magnirostris Gould, 1837
Rank
species
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; Thraupidae; Geospiza
Parent
Geospiza () - (Rank: genus)
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48881)
NCBI Taxonomy ID
48885
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48885)
is Taxon A an Infraspecies?
No

Taxon B #4

Latin Name
Geospiza magnirostris
(https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Geospiza magnirostris^#gephebase-summary-title)
Common Name
-
Synonyms
Geospiza magnirostris Gould, 1837
Rank
species
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; Thraupidae; Geospiza
Parent
Geospiza () - (Rank: genus)
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48881)
NCBI Taxonomy ID
48885
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48885)
is Taxon B an Infraspecies?
No

Taxon A #5

Latin Name
Geospiza fuliginosa
(https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Geospiza fuliginosa^#gephebase-summary-title)
Common Name
-
Synonyms
Geospiza fuliginosa Gould, 1837; Geospiza fulingosa
Rank
species
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; Thraupidae; Geospiza

Taxon B #5

Latin Name
Geospiza fuliginosa
(https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Geospiza fuliginosa^#gephebase-summary-title)
Common Name
-
Synonyms
Geospiza fuliginosa Gould, 1837; Geospiza fulingosa
Rank
species
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; Thraupidae; Geospiza

Parent

Geospiza () - (Rank: genus)
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48881)

NCBI Taxonomy ID

48884
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48884)

is Taxon A an Infraspecies?

No

Parent

Geospiza () - (Rank: genus)
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48881)

NCBI Taxonomy ID

48884
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48884)

is Taxon B an Infraspecies?

No

Taxon A #6

Latin Name

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

Common Name

-

Synonyms

Geospiza parvula; Geospiza parvula Gould, 1837

Rank

species

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; Thraupidae; Camarhynchus

Parent

Camarhynchus () - (Rank: genus)
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 87174)

NCBI Taxonomy ID

87175
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 87175)

is Taxon A an Infraspecies?

No

Taxon B #6

Latin Name

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

Common Name

-

Synonyms

Geospiza parvula; Geospiza parvula Gould, 1837

Rank

species

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; Thraupidae; Camarhynchus

Parent

Camarhynchus () - (Rank: genus)
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 87174)

NCBI Taxonomy ID

87175
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 87175)

is Taxon B an Infraspecies?

No

Taxon A #7

Latin Name

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

Common Name

-

Synonyms

-

Rank

species

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; Thraupidae; Camarhynchus

Parent

Camarhynchus () - (Rank: genus)
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 87174)

NCBI Taxonomy ID

93066
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 93066)

is Taxon A an Infraspecies?

No

Taxon B #7

Latin Name

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

Common Name

-

Synonyms

-

Rank

species

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; Thraupidae; Camarhynchus

Parent

Camarhynchus () - (Rank: genus)
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 87174)

NCBI Taxonomy ID

93066
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 93066)

is Taxon B an Infraspecies?

No

Taxon A #8

Latin Name

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

Common Name

woodpecker finch

Synonyms

Cactornis pallida; Cactospiza pallida; woodpecker finch; Cactornis pallida Sclater & Salvin, 1870; Camarhynchus pallidus (Sclater & Salvin, 1870)

Rank

species

Lineage

Taxon B #8

Latin Name

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

Common Name

woodpecker finch

Synonyms

Cactornis pallida; Cactospiza pallida; woodpecker finch; Cactornis pallida Sclater & Salvin, 1870; Camarhynchus pallidus (Sclater & Salvin, 1870)

Rank

species

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; Thraupidae; Camarhynchus

Parent

Camarhynchus () - (Rank: genus)
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 87174)

NCBI Taxonomy ID

48878
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48878)

is Taxon A an Infraspecies?

No

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; Thraupidae; Camarhynchus

Parent

Camarhynchus () - (Rank: genus)
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 87174)

NCBI Taxonomy ID

48878
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48878)

is Taxon B an Infraspecies?

No

Taxon A #9

Latin Name

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

Common Name

-

Synonyms

Geospiza difficilis Sharpe, 1888

Rank

species

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; Thraupidae; Geospiza

Parent

Geospiza () - (Rank: genus)
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48881)

NCBI Taxonomy ID

87173
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 87173)

is Taxon A an Infraspecies?

No

Taxon B #9

Latin Name

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

Common Name

-

Synonyms

Geospiza difficilis Sharpe, 1888

Rank

species

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; Thraupidae; Geospiza

Parent

Geospiza () - (Rank: genus)
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 48881)

NCBI Taxonomy ID

87173
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 87173)

is Taxon B an Infraspecies?

No

GENOTYPIC CHANGE

Generic Gene Name

BCO2

Synonyms

BCDO2; B-DIOX-II

String

9606.ENSP00000350314
(http://string-db.org/newstring_cgi/show_network_section.pl?identifier=9606.ENSP00000350314)

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

UniProtKB Homo sapiens

Q9BYV7 (http://www.uniprot.org/uniprot/Q9BYV7)

GenebankID or UniProtKB

()

(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)

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

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

Molecular Details of the Mutation

"By closely inspecting this region in a combined sample of all 456 finches of the two species we identified a single exonic SNP with a likelihood ratio test (LRT) statistic exceeding 166 (Figure 1C). It is also the only consistently elevated SNP in an analysis of each species alone (Figure S1), is the best fit variant under a recessive model (STAR Methods), and occurs on multiple haplotypes (Figure S1C). This SNP (chr24:6,166,878; p6166878 hereafter) leads to a synonymous change 32 bp into exon 4 of BCO2. "

"The functional importance of the observed synonymous change is uncertain, and the presence of an unidentified linked causal variant cannot be completely ruled out (see Conclusions). However, a functional explanation is possible because codon usage can be under strong selection30 and may have functional consequences on translation,30 RNA stability,31 and transcription.32 Notably, p6166878 changes the highest frequency valine codon (Æ'GTG = 27.3%) to the lowest (Æ'GTA = 7.6%) in the reference genome. This is in line with the observed phenotypic effect of the yellow mutation because a lower abundance codon is expected to be associated with lower protein expression.33 In this case, less BCO2 activity results in more carotenoid deposition in the yellow morph. In fact, we found that yellow homozygotes showed significantly lower BCO2 expression compared to pink homozygotes in the upper beak of developing embryos (Figure 1F) that were sourced from a variety of different species and islands (Table S1): small sample sizes prohibit species-specific analysis. Among the six heterozygous individuals, the pink allele was expressed more than the yellow allele in five samples tested using a droplet-digital PCR (Figure S2C). Differences in expression between the two alleles, and in the absence of alternative splice variants (STAR Methods), raise the possibility that the synonymous change alters transcription factor binding affinity in exon 4. Further research into tissue-specific expression and the specific transcription factors that regulate BCO2 is warranted."

Experimental Evidence

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

Main Reference

A multispecies BCO2 beak color polymorphism in the Darwin's finch radiation. (2021) (https://pubmed.ncbi.nlm.nih.gov/34687609)

Authors

Enbody ED; Sprehn CG; Abzhanov A; Bi H; Dobreva MP; Osborne OG; Rubin CJ; Grant PR; Grant BR; Andersson L

Abstract

Carotenoid-based polymorphisms are widespread in populations of birds, fish, and reptiles, but generally little is known about the factors affecting their maintenance in populations. We report a combined field and molecular-genetic investigation of a nestling beak color polymorphism in Darwin's finches. Beaks are pink or yellow, and yellow is recessive. Here we show that the polymorphism arose in the GalÃ¡pagos half a million years ago through a mutation associated with regulatory change in the BCO2 gene and is shared by 14 descendant species. The polymorphism is probably a balanced polymorphism, maintained by ecological selection associated with survival and diet. In cactus finches, the frequency of the yellow genotype is correlated with cactus fruit abundance and greater hatching success and may be altered by introgressive hybridization. Polymorphisms that are hidden as adults, as here, may be far more common than is currently recognized, and contribute to diversification in ways that are yet to be discovered.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

Geospiza propinqua and Geospiza acutirostris should have been included in this entry but they do not have a listed taxonomy ID. Only included species were the phenotype was described. @parallelism