GEPHE SUMMARY

Gephebase Gene
edn3b (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^edn3b^#gephebase-summary-title)

GepheID
GP00002124

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

Trait State in Taxon A
several dark stripes and light interstripes

Trait State in Taxon B
fewer stripes and interstripes overall with spots forming ventrally instead of stripes

Ancestral State
Unknown

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

Taxon A

Latin Name
Danio rerio (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Danio rerio^#gephebase-summary-title)

Common Name
zebrafish

Synonyms
Brachydanio rerio; Brachydanio rerio frankei; Cyprinus rerio; Danio frankei; Danio rerio frankei; zebrafish; leopard danio; zebra danio; zebra fish; Cyprinus rerio Hamilton, 1822; Danio rerio (Hamilton, 1822); Brachidanio rerio

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Actinopterygii; Actinopteri; Neopterygii; Teleostei; Osteoglossocephalai; Clupeocephala; Otomorpha; Ostariophysi; Otophysi; Cypriniphysae; Cypriniformes; Cyprinoidei; Cyprinidae; Danio

Parent
Danio () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7954)

NCBI Taxonomy ID
7955 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7955)

is Taxon A an Infraspecies?
No

Taxon B

Latin Name
Danio nigrofasciatus (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Danio nigrofasciatus^#gephebase-summary-title)

Common Name
dwarf danio

Synonyms
dwarf danio; Danio nigrofasciatus (Day, 1870)

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Actinopterygii; Actinopteri; Neopterygii; Teleostei; Osteoglossocephalai; Clupeocephala; Otomorpha; Ostariophysi; Otophysi; Cypriniphysae; Cypriniformes; Cyprinoidei; Cyprinidae; Danio

Parent
Danio () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7954)

NCBI Taxonomy ID
144739 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 144739)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
edn3b

Synonyms
edn3; si:dkey-211h10.1; EDN3

String
7955.ENSDARP00000115695 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=7955.ENSDARP00000115695)

Sequence Similarities
-

GO - Molecular Function
-

GO - Biological Process
GO:0030318 : melanocyte differentiation (https://www.ebi.ac.uk/QuickGO/term/GO:0030318)
GO:0019229 : regulation of vasoconstriction

UniProtKB Danio rerio
E9QFS0 (http://www.uniprot.org/uniprot/E9QFS0)

GenebankID or UniProtKB
()

(https://www.ebi.ac.uk/QuickGO/term/GO:0019229)
GO:0070285 : pigment cell development
(https://www.ebi.ac.uk/QuickGO/term/GO:0070285)

GO - Cellular Component

GO:0005576 : extracellular region (https://www.ebi.ac.uk/QuickGO/term/GO:0005576)

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

pigment pattern differences between these species are clearly polygenic, and it seems likely that additional loci, of the endothelin pathway or other pathways, will be identified as contributing to attenuated stripes and interstripes of D. nigrofasciatus compared to D. rerio.

Experimental Evidence

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

Main Reference

Evolution of Endothelin signaling and diversification of adult pigment pattern in Danio fishes. (2018) (https://pubmed.ncbi.nlm.nih.gov/30226839)

Authors

Spiewak JE; Bain EJ; Liu J; Kou K; Sturiale SL; Patterson LB; Diba P; Eisen JS; Braasch I; Ganz J; Parichy DM

Abstract

Fishes of the genus Danio exhibit diverse pigment patterns that serve as useful models for understanding the genes and cell behaviors underlying the evolution of adult form. Among these species, zebrafish D. rerio exhibit several dark stripes of melanophores with sparse iridophores that alternate with light interstripes of dense iridophores and xanthophores. By contrast, the closely related species D. nigrofasciatus has an attenuated pattern with fewer melanophores, stripes and interstripes. Here we demonstrate species differences in iridophore development that presage the fully formed patterns. Using genetic and transgenic approaches we identify the secreted peptide Endothelin-3 (Edn3)-a known melanogenic factor of tetrapods-as contributing to reduced iridophore proliferation and fewer stripes and interstripes in D. nigrofasciatus. We further show the locus encoding this factor is expressed at lower levels in D. nigrofasciatus owing to cis-regulatory differences between species. Finally, we show that functions of two paralogous loci encoding Edn3 have been partitioned between skin and non-skin iridophores. Our findings reveal genetic and cellular mechanisms contributing to pattern differences between these species and suggest a model for evolutionary changes in Edn3 requirements for pigment patterning and its diversification across vertebrates.

Additional References

RELATED GEPHE

Related Genes

2 (csf1a, Kcnj13) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^7955^/and+Trait=Coloration/or+Taxon ID=^144739^/and+Trait=Coloration/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS