

GEPHE SUMMARY

opsin - rhodopsin (LWS) (https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=^opsin - rhodopsin (LWS)^#gephebase-summary-title)	Gephebase Gene	GP00002353	GepheID
Published	Entry Status	Courtier	Main curator

PHENOTYPIC CHANGE

Physiology (https://www.gephebase.org/search-criteria?/and+Trait+Category=^Physiology^#gephebase-summary-title)	Trait Category
Color vision (https://www.gephebase.org/search-criteria?/and+Trait=^Color+vision^#gephebase-summary-title)	Trait
color vision	Trait State in Taxon A
reduced/lost color vision	Trait State in Taxon B
Taxon A	Ancestral State
Interspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=^Interspecific^#gephebase-summary-title)	Taxonomic Status

Danio rerio (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Danio+rerio^#gephebase-summary-title)	Taxon A	Latin Name
zebrafish	Common Name	
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	Synonyms	
species	Rank	
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Actinopterygii; Actinopteri; Neopterygii; Teleostei; Osteoglossocephalai; Clupecocephala; Otomorpha; Ostariophysi; Otophysi; Cypriniphysae; Cypriniformes; Cyprinoidei; Cyprinidae; Danio	Lineage	
Danio () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7954)	Parent	
7955 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7955)	NCBI Taxonomy ID	
No	is Taxon A an Intraspecies?	

Sinocyclocheilus anshuiensis (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Sinocyclocheilus+anshuiensis^#gephebase-summary-title)	Taxon B #1	Latin Name
-	Common Name	
Sinocyclocheilus anshuiensis Gan, Wu, Wei & Yang, 2013; KIZ 12060239; KIZ 12070271; KIZ 12070276; KIZ 12070277; KIZ 12070280; KIZ:12060239; KIZ:12070271; KIZ:12070276; KIZ:12070277; KIZ:12070280	Synonyms	
species	Rank	
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Actinopterygii; Actinopteri; Neopterygii; Teleostei; Osteoglossocephalai; Clupecocephala; Otomorpha; Ostariophysi; Otophysi; Cypriniphysae; Cypriniformes; Cyprinoidei; Cyprinidae; Cyprininae; Sinocyclocheilus	Lineage	
Sinocyclocheilus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=75365)	Parent	
1608454 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=1608454)	NCBI Taxonomy ID	
No	is Taxon B an Intraspecies?	

Sinocyclocheilus grahami (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Sinocyclocheilus+grahami^#gephebase-summary-title)	Taxon B #2	Latin Name
-	Common Name	
Barbus grahami; Barbus grahami Regan, 1904; Sinocyclocheilus grahami (Regan, 1904); BMNH:1904.1.26.27	Synonyms	
species	Rank	
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Actinopterygii; Actinopteri; Neopterygii; Teleostei; Osteoglossocephalai; Clupecocephala; Otomorpha; Ostariophysi; Otophysi; Cypriniphysae; Cypriniformes; Cyprinoidei; Cyprinidae; Cyprininae; Sinocyclocheilus	Lineage	
Sinocyclocheilus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=75365)	Parent	

Sinocyclocheilus () - (Rank: genus)
 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 75365)
 NCBI Taxonomy ID
 75366
 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 75366)
 is Taxon B an Intraspecies?
 No

Taxon B #3

Latin Name

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

Common Name

-

Synonyms

Sinocyclocheilus rhinoceros Li & Tao, 1994

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; Cyprininae; Sinocyclocheilus

Parent

Sinocyclocheilus () - (Rank: genus)
 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 75365)
 NCBI Taxonomy ID
 307959
 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 307959)
 is Taxon B an Intraspecies?
 No

GENOTYPIC CHANGE

<p>OPN1LW</p> <p>RCP</p> <p>9606.ENSPO0000358967 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=9606.ENSPO0000358967)</p>	<p>Generic Gene Name</p> <p>Synonyms</p> <p>String</p> <p>Sequence Similarities</p> <p>GO - Molecular Function</p> <p>GO - Biological Process</p> <p>GO - Cellular Component</p>	<p>UniProtKB Homo sapiens</p> <p>P04000 (http://www.uniprot.org/uniprot/P04000)</p> <p>0</p>	<p>GenebankID or UniProtKB</p>
---	--	--	--------------------------------

Belongs to the G-protein coupled receptor 1 family. Opsin subfamily.

GO:0008020 : G protein-coupled photoreceptor activity
 (https://www.ebi.ac.uk/QuickGO/term/GO:0008020)

GO:0009881 : photoreceptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0009881)

GO:0007165 : signal transduction (https://www.ebi.ac.uk/QuickGO/term/GO:0007165)

GO:0007186 : G protein-coupled receptor signaling pathway
 (https://www.ebi.ac.uk/QuickGO/term/GO:0007186)

GO:0001523 : retinoid metabolic process
 (https://www.ebi.ac.uk/QuickGO/term/GO:0001523)

GO:0018298 : protein-chromophore linkage
 (https://www.ebi.ac.uk/QuickGO/term/GO:0018298)

GO:0007601 : visual perception (https://www.ebi.ac.uk/QuickGO/term/GO:0007601)

GO:0071482 : cellular response to light stimulus
 (https://www.ebi.ac.uk/QuickGO/term/GO:0071482)

GO:0007602 : phototransduction (https://www.ebi.ac.uk/QuickGO/term/GO:0007602)

GO:0032467 : positive regulation of cytokinesis
 (https://www.ebi.ac.uk/QuickGO/term/GO:0032467)

GO:0005887 : integral component of plasma membrane
 (https://www.ebi.ac.uk/QuickGO/term/GO:0005887)

GO:0001750 : photoreceptor outer segment
 (https://www.ebi.ac.uk/QuickGO/term/GO:0001750)

GO:0097381 : photoreceptor disc membrane
 (https://www.ebi.ac.uk/QuickGO/term/GO:0097381)

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

Presumptive Null

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

Molecular Type

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

Aberration Type

Deletion Size

Lws2 coding sequence absent from the full genome sequence

Molecular Details of the Mutation

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

Experimental Evidence

The *Sinocyclocheilus cavefish* genome provides insights into cave adaptation. (2016) (<https://pubmed.ncbi.nlm.nih.gov/26728391>)

Main Reference

Yang J; Chen X; Bai J; Fang D; Qiu Y; Jiang W; Yuan H; Bian C; Lu J; He S; Pan X; Zhang Y; Wang X; You X; Wang Y; Sun Y; Mao D; Liu Y; Fan G; Zhang H; Chen X; Zhang X; Zheng L; Wang J; Cheng L; Chen J; Ruan Z; Li J; Yu H; Peng C; Ma X; Xu J; He Y; Xu Z; Xu P; Wang J; Yang H; Wang J; Whitten T; Xu X; Shi Q

Authors

An emerging cavefish model, the cyprinid genus *Sinocyclocheilus*, is endemic to the massive southwestern karst area adjacent to the Qinghai-Tibetan Plateau of China. In order to understand whether orogeny influenced the evolution of these species, and how genomes change under isolation, especially in subterranean habitats, we performed whole-genome sequencing and comparative analyses of three species in this genus, *S. grahami*, *S. rhinoceros* and *S. anshuiensis*. These species are surface-dwelling, semi-cave-dwelling and cave-restricted, respectively.

Abstract

The assembled genome sizes of *S. grahami*, *S. rhinoceros* and *S. anshuiensis* are 1.75 Gb, 1.73 Gb and 1.68 Gb, respectively. Divergence time and population history analyses of these species reveal that their speciation and population dynamics are correlated with the different stages of uplifting of the Qinghai-Tibetan Plateau. We carried out comparative analyses of these genomes and found that many genetic changes, such as gene loss (e.g. opsin genes), pseudogenes (e.g. crystallin genes), mutations (e.g. melanogenesis-related genes), deletions (e.g. scale-related genes) and down-regulation (e.g. circadian rhythm pathway genes), are possibly associated with the regressive features (such as eye degeneration, albinism, rudimentary scales and lack of circadian rhythms), and that some gene expansion (e.g. taste-related transcription factor gene) may point to the constructive features (such as enhanced taste buds) which evolved in these cave fishes.

As the first report on cavefish genomes among distinct species in *Sinocyclocheilus*, our work provides not only insights into genetic mechanisms of cave adaptation, but also represents a fundamental resource for a better understanding of cavefish biology.

Additional References

RELATED GEPHE

1 (Green-sensitive opsin (RH2)) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID='7955'/and+Trait=Color+vision/or+Taxon+ID='1608454'/and+Trait=Color+vision/or+Taxon+ID='75366'/and+Trait=Color+vision/or+Taxon+ID='307959'/and+Trait=Color+vision/and+groupHaplotypes=true#gephebase-summary-title>)

Related Genes

No matches found.

Related Haplotypes

EXTERNAL LINKS

COMMENTS