

GEPHE SUMMARY

	Gephebase Gene		GepheID
Green-sensitive opsin (RH2) (https://www.gephebase.org/search-criteria?/and+Gene)		GP00002354	
Gephebase="Green-sensitive opsin (RH2)"#gephebase-summary-title)			Main curator
	Entry Status	Courtier	
Published			

PHENOTYPIC CHANGE

	Trait Category
Physiology (https://www.gephebase.org/search-criteria?/and+Trait)	
Category="Physiology"#gephebase-summary-title)	Trait
Color vision (<a color"="" href="https://www.gephebase.org/search-criteria?/and+Trait=">https://www.gephebase.org/search-criteria?/and+Trait="Color)	
vision"#gephebase-summary-title)	Trait State in Taxon A
color vision	
	Trait State in Taxon B
reduced or loss of color vision	
	Ancestral State
Taxon A	
	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)	
zebrafish	Common Name
	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)	
7955 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7955)	NCBI Taxonomy ID
No	is Taxon A an Intraspecies?

Taxon B #1	Latin Name
Sinocyclocheilus anshuiensis (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Sinocyclocheilus anshuiensis"#gephebase-summary-title)	
-	Common Name
	Synonyms
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	
	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)	
1608454 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=1608454)	NCBI Taxonomy ID
No	is Taxon B an Intraspecies?

Taxon B #2	Latin Name
Sinocyclocheilus grahami (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Sinocyclocheilus grahami"#gephebase-summary-title)	
-	Common Name
	Synonyms
Barbus grahami; Barbus grahami Regan, 1904; Sinocyclocheilus grahami (Regan, 1904); BMNH:1904.1.26.27	
	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
 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;
 Osteoglossocephala; 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>opn1mw1</p> <p>RH2-1; rh2.1; zfg1; grops1; rh21</p> <p>7955.ENSDDARP0000001158 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=7955.ENSDDARP0000001158)</p> <p>Sequence Similarities</p> <p>Belongs to the G-protein coupled receptor 1 family. Opsin subfamily.</p> <p>GO:0008020 : G protein-coupled photoreceptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0008020)</p> <p>GO:0009881 : photoreceptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0009881)</p> <p>GO:0007186 : G protein-coupled receptor signaling pathway (https://www.ebi.ac.uk/QuickGO/term/GO:0007186)</p> <p>GO:0018298 : protein-chromophore linkage (https://www.ebi.ac.uk/QuickGO/term/GO:0018298)</p> <p>GO:0007601 : visual perception (https://www.ebi.ac.uk/QuickGO/term/GO:0007601)</p> <p>GO:0071482 : cellular response to light stimulus (https://www.ebi.ac.uk/QuickGO/term/GO:0071482)</p> <p>GO:0007602 : phototransduction (https://www.ebi.ac.uk/QuickGO/term/GO:0007602)</p> <p>GO:0005887 : integral component of plasma membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0005887)</p> <p>GO:0001750 : photoreceptor outer segment (https://www.ebi.ac.uk/QuickGO/term/GO:0001750)</p> <p>Yes (https://www.gephebase.org/search-criteria?/and+Presumptive Null=^Yes^#gephebase-summary-title)</p> <p>Gene Loss (https://www.gephebase.org/search-criteria?/and+Molecular Type=^Gene Loss^#gephebase-summary-title)</p> <p>Deletion (https://www.gephebase.org/search-criteria?/and+Aberration Type=^Deletion^#gephebase-summary-title)</p> <p>-</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>Q9W6A5 (http://www.uniprot.org/uniprot/Q9W6A5)</p> <p>0</p>	<p>UniProtKB Danio rerio</p> <p>GenebankID or UniProtKB</p> <p>Presumptive Null</p> <p>Molecular Type</p> <p>Aberration Type</p> <p>Deletion Size</p> <p>Molecular Details of the Mutation</p>
--	--	--	--

Rh2-1 coding sequence absent from the full genome sequence of the three *Sinocyclocheilus* species

Experimental Evidence

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

Main Reference

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

Authors

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

Abstract

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.

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

Related Genes

1 (opsin - rhodopsin (LWS)) (<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 Haplotypes

1 ([https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=^Green-sensitive+opsin+\(RH2\)^/and+Taxon+ID=^7955^/or+Gene+Gephebase=^Green-sensitive+opsin+\(RH2\)^/and+Taxon+ID=^1608454^/or+Gene+Gephebase=^Green-sensitive+opsin+\(RH2\)^/and+Taxon+ID=^75366^/or+Gene+Gephebase=^Green-sensitive+opsin+\(RH2\)^/and+Taxon+ID=^307959^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=^Green-sensitive+opsin+(RH2)^/and+Taxon+ID=^7955^/or+Gene+Gephebase=^Green-sensitive+opsin+(RH2)^/and+Taxon+ID=^1608454^/or+Gene+Gephebase=^Green-sensitive+opsin+(RH2)^/and+Taxon+ID=^75366^/or+Gene+Gephebase=^Green-sensitive+opsin+(RH2)^/and+Taxon+ID=^307959^#gephebase-summary-title))

EXTERNAL LINKS

COMMENTS