

GEPHE SUMMARY

	Gephebase Gene	GephelD
Green-sensitive opsin (RH2) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^Green-sensitive opsin (RH2)^#gephebase-summary-title)	GP00002355	Main curator
Published	Entry Status	Courtier

PHENOTYPIC CHANGE

Trait Category		
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Physiology^#gephebase-summary-title)	Trait	
Color vision (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	
loss of vision, no external eyeballs and no lens, degenerated retina	Ancestral State	
Taxon A	Taxonomic Status	
Interspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Interspecific^#gephebase-summary-title)		
Taxon A		Taxon B
Sinocyclocheilus grahami (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Sinocyclocheilus+grahami^#gephebase-summary-title)	Latin Name	Latin Name
-	Common Name	Common Name
Barbus grahami; Barbus grahami Regan, 1904; Sinocyclocheilus grahami (Regan, 1904); BMNH:1904.1.26.27	Synonyms	Synonyms
species	Rank	Rank
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Actinopterygii; Actinopteri; Neopterygii; Teleoste; Osteoglossocephalai; Clupeocephala; Otomorpha; Ostariophysi; Otophysi; Cypriniphysae; Cypriniformes; Cyprinoidei; Cyprinidae; Cyprininae; Sinocyclocheilus	Lineage	Lineage
Sinocyclocheilus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 75365)	Parent	Parent
75366 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 75366)	NCBI Taxonomy ID	NCBI Taxonomy ID
No	is Taxon A an Infraspecies?	is Taxon B an Infraspecies?

GENOTYPIC CHANGE

opn1mw4	Generic Gene Name	UniProtKB Danio rerio
RH2-4; rh2.4; zfg2; grops2; wu:fk64b02; rh24	Synonyms	GenebankID or UniProtKB
7955.ENSDARP00000000979 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=7955.ENSDARP00000000979)	String	0
Belongs to the G-protein coupled receptor 1 family. Opsin subfamily.	Sequence Similarities	
GO:0008020 : G protein-coupled photoreceptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0008020)	GO - Molecular Function	
GO:0009881 : photoreceptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0009881)	GO - Biological Process	

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

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>)

Presumptive Null

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

Molecular Type

Gene Loss ([#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Molecular Type=^Gene Loss))

Aberration Type

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

Deletion Size

-

Molecular Details of the Mutation

Rh2-4 coding sequence absent from the full genome sequence of *S. anshuiensis* but present in the genome of *Sinocyclocheilus rhinocerous* and *S. grahami*

Experimental Evidence

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

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. rhinocerous* and *S. anshuiensis*. These species are surface-dwelling, semi-cave-dwelling and cave-restricted, respectively.

The assembled genome sizes of *S. grahami*, *S. rhinocerous* 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 (opsin - rhodopsin (LWS)) ([#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Taxon ID=^75366#/and+Trait=Color vision/or+Taxon ID=^1608454#/and+Trait=Color vision/and+groupHaplotypes=true))

Related Genes

Related Haplotypes

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

EXTERNAL LINKS

COMMENTS

