

GEPHE SUMMARY

| | | | |
|---|----------------|------------|--------------|
| | Gephebase Gene | | GepheID |
| Green-sensitive opsin (RH2) (https://www.gephebase.org/search-criteria?/and+Gene) | | GP00002355 | |
| Gephebase="Green-sensitive opsin (RH2)"#gephebase-summary-title) | | | 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 (<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 | | |
| 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 | |
| | Latin Name | | Latin Name |
| Sinocyclocheilus grahami | | Sinocyclocheilus anshuiensis | |
| (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Sinocyclocheilus | | (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Sinocyclocheilus | |
| grahami"#gephebase-summary-title) | | anshuiensis"#gephebase-summary-title) | |
| | Common Name | | Common Name |
| - | | - | |
| | Synonyms | | Synonyms |
| Barbus grahami; Barbus grahami Regan, 1904; Sinocyclocheilus grahami (Regan, 1904); | | Sinocyclocheilus anshuiensis Gan, Wu, Wei & Yang, 2013; KIZ 12060239; KIZ 12070271; KIZ | |
| BMNH:1904.1.26.27 | | 12070276; KIZ 12070277; KIZ 12070280; KIZ:12060239; KIZ:12070271; KIZ:12070276; | |
| | Rank | | Rank |
| species | | KIZ:12070277; KIZ:12070280 | |
| | Lineage | | Lineage |
| cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; | | species | |
| Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Actinopterygii; | | cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; | |
| Actinopteri; Neopterygii; Teleostei; Osteoglossocephalai; Clupeocephala; Otomorpha; | | Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Actinopterygii; | |
| Ostariophysi; Otophysi; Cypriniphysae; Cypriniformes; Cyprinoidei; Cyprinidae; Cyprininae; | | Actinopteri; Neopterygii; Teleostei; Osteoglossocephalai; Clupeocephala; Otomorpha; | |
| Sinocyclocheilus | | Ostariophysi; Otophysi; Cypriniphysae; Cypriniformes; Cyprinoidei; Cyprinidae; Cyprininae; | |
| | Parent | | Parent |
| Sinocyclocheilus () - (Rank: genus) | | Sinocyclocheilus () - (Rank: genus) | |
| (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=75365) | | (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=75365) | |
| | NCBI Taxonomy ID | | NCBI Taxonomy ID |
| 75366 | | 1608454 | |
| (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=75366) | | (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=1608454) | |
| | is Taxon A an Intraspecies? | | is Taxon B an Intraspecies? |
| No | | No | |

GENOTYPIC CHANGE

| | | | |
|---|-------------------------|--|-------------------------|
| | Generic Gene Name | | UniProtKB Danio rerio |
| opn1mw4 | | Q9W6A6 (http://www.uniprot.org/uniprot/Q9W6A6) | |
| | Synonyms | | GenebankID or UniProtKB |
| RH2-4; rh2.4; zfgr2; grops2; wu:fk64b02; rh24 | | 0 | |
| | String | | |
| 7955.ENS DARP00000000979 | | | |
| (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=7955.ENS DARP00000000979) | | | |
| | Sequence Similarities | | |
| Belongs to the G-protein coupled receptor 1 family. Opsin subfamily. | | | |
| | GO - Molecular Function | | |
| 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 - 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 (https://www.gephebase.org/search-criteria?/and+Presumptive Null=^Yes^#gephebase-summary-title)

Molecular Type

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

Aberration Type

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

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 rhinoceros* and *S. grahami*

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=^75366^/and+Trait=Color vision/or+Taxon ID=^1608454^/and+Trait=Color vision/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

2 (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^#gephebase-summary-title)

EXTERNAL LINKS

COMMENTS

