

GEPHE SUMMARY

opsin - (SWS2) (https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=^opsin-(SWS2)^#gephebase-summary-title)	Gephebase Gene	GP00001771	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		
blue-sensitive cone pigments SWS2 with lambda-max = 430-450 nm	Trait State in Taxon A		
blue-sensitive cone pigments SWS2 with lambda-max = 467 nm	Trait State in Taxon B		
Taxon A	Ancestral State		
Intergenic or Higher (https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=^Intergenic+or+Higher^#gephebase-summary-title)	Taxonomic Status		

Taxon A	Latin Name	Taxon B	Latin Name
Cottidae (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Cottidae^#gephebase-summary-title)	Cottus gobio (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Cottus+gobio^#gephebase-summary-title)	Cottus gobio (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Cottus+gobio^#gephebase-summary-title)	Cottus gobio (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Cottus+gobio^#gephebase-summary-title)
sculpins	Common Name	bullhead	Common Name
Abyssocottidae; Comephoridae; Cottocomephoridae; sculpins; Baikal oilfishes	Synonyms	bullhead; Cottus gobio Linnaeus, 1758	Synonyms
family	Rank	species	Rank
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Actinopterygii; Actinopteri; Neopterygii; Teleostei; Osteoglossocephalai; Clupecocephala; Euteleostomorpha; Neoteleostei; Eurypterygia; Ctenosquamata; Acanthomorpha; Euacanthomorpha; Percormorphaceae; Eupercaria; Perciformes; Cottioidei; Cottales	Lineage	cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Actinopterygii; Actinopteri; Neopterygii; Teleostei; Osteoglossocephalai; Clupecocephala; Euteleostomorpha; Neoteleostei; Eurypterygia; Ctenosquamata; Acanthomorpha; Euacanthomorpha; Percormorphaceae; Eupercaria; Perciformes; Cottioidei; Cottales	Lineage
Cottales () - (Rank: infraorder) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=1490021)	Parent	Cottus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=8098)	Parent
8092 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=8092)	NCBI Taxonomy ID	100952 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=100952)	NCBI Taxonomy ID
No	is Taxon A an Intraspecies?	No	is Taxon B an Intraspecies?

GENOTYPIC CHANGE

opn1sw2	Generic Gene Name	Q9W6A8 (http://www.uniprot.org/uniprot/Q9W6A8)	UniProtKB Danio rerio
SWS2; bluops; zflblue; Sl:zK13A21.5; opn1sw1; sws2	Synonyms	0	GenebankID or UniProtKB
7955.ENS DARP00000019477 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=7955.ENS DARP00000019477)	String		
Belongs to the G-protein coupled receptor 1 family. Opsin subfamily.	Sequence Similarities		
GO:0009882 : blue light photoreceptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0009882)	GO - Molecular Function		
GO:0008020 : G protein-coupled photoreceptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0008020)	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)

Mutation #1

No (https://www.gephebase.org/search-criteria?/and+Presumptive Null=^No^#gephebase-summary-title) Presumptive Null
 Coding (https://www.gephebase.org/search-criteria?/and+Molecular Type=^Coding^#gephebase-summary-title) Molecular Type
 SNP (https://www.gephebase.org/search-criteria?/and+Aberration Type=^SNP^#gephebase-summary-title) Aberration Type
 Nonsynonymous SNP Coding Change
 Ala118Thr Molecular Details of the Mutation
 Candidate Gene (https://www.gephebase.org/search-criteria?/and+Experimental Evidence=^Candidate Gene^#gephebase-summary-title) Experimental Evidence

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Ala	Thr	118

Spectral tuning and evolution of short wave-sensitive cone pigments in cottoid fish from Lake Baikal. (2002) (https://pubmed.ncbi.nlm.nih.gov/11993996) Main Reference
 Cowing JA; Poopalasundaram S; Wilkie SE; Bowmaker JK; Hunt DM Authors

The cottoid fishes of Lake Baikal in eastern Siberia provide a unique opportunity to study the evolution of visual pigments in a group of closely related species exposed to different photic environments. Members of this species flock are adapted to different depth habitats down to >1000 m, and both the rod and cone visual pigments display short wave shifts as depth increases. The blue-sensitive cone pigments of the SWS2 class cluster into two species groups with lambda(max) values of 450 and 430 nm, with the pigment in Cottus gobio, a cottoid fish native to Britain, forming a third group with a lambda(max) of 467 nm. The sequences of the SWS2 opsin gene from C. gobio and from two representatives of the 450 and 430 nm Baikal groups are presented. Approximately 6 nm of the spectral difference between C. gobio and the 450 nm Baikal group can be ascribed to the presence of a porphyropsin/rhodopin mixture in C. gobio. Subsequent analysis of amino acid substitutions by site-directed mutagenesis demonstrates that the remainder of the shift from 461 to 450 nm arises from a Thr269Ala substitution and the shift from 450 to 430 nm at least partly from Thr118Ala and Thr118Gly substitutions. The underlying adaptive significance of these substitutions in terms of spectral tuning and signal-to-noise ratio is discussed. Abstract
 Additional References

Mutation #2

No (https://www.gephebase.org/search-criteria?/and+Presumptive Null=^No^#gephebase-summary-title) Presumptive Null
 Coding (https://www.gephebase.org/search-criteria?/and+Molecular Type=^Coding^#gephebase-summary-title) Molecular Type
 SNP (https://www.gephebase.org/search-criteria?/and+Aberration Type=^SNP^#gephebase-summary-title) Aberration Type
 Nonsynonymous SNP Coding Change
 Gly215Pro Molecular Details of the Mutation
 Candidate Gene (https://www.gephebase.org/search-criteria?/and+Experimental Evidence=^Candidate Gene^#gephebase-summary-title) Experimental Evidence

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Gly	Pro	215

Spectral tuning and evolution of short wave-sensitive cone pigments in cottoid fish from Lake Baikal. (2002) (https://pubmed.ncbi.nlm.nih.gov/11993996) Main Reference
 Cowing JA; Poopalasundaram S; Wilkie SE; Bowmaker JK; Hunt DM Authors

The cottoid fishes of Lake Baikal in eastern Siberia provide a unique opportunity to study the evolution of visual pigments in a group of closely related species exposed to different photic environments. Members of this species flock are adapted to different depth habitats down to >1000 m, and both the rod and cone visual pigments display short wave shifts as depth increases. The blue-sensitive cone pigments of the SWS2 class cluster into two species groups with $\lambda(\max)$ values of 450 and 430 nm, with the pigment in *Cottus gobio*, a cottoid fish native to Britain, forming a third group with a $\lambda(\max)$ of 467 nm. The sequences of the SWS2 opsin gene from *C. gobio* and from two representatives of the 450 and 430 nm Baikal groups are presented. Approximately 6 nm of the spectral difference between *C. gobio* and the 450 nm Baikal group can be ascribed to the presence of a porphyropsin/rhodopin mixture in *C. gobio*. Subsequent analysis of amino acid substitutions by site-directed mutagenesis demonstrates that the remainder of the shift from 461 to 450 nm arises from a Thr269Ala substitution and the shift from 450 to 430 nm at least partly from Thr118Ala and Thr118Gly substitutions. The underlying adaptive significance of these substitutions in terms of spectral tuning and signal-to-noise ratio is discussed.

Additional References

Mutation #3

No (<https://www.gephebase.org/search-criteria?/and+Presumptive Null=`No`#gephebase-summary-title>)

Presumptive Null

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

Molecular Type

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

Aberration Type

Nonsynonymous

SNP Coding Change

Ala269Pro

Molecular Details of the Mutation

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

Experimental Evidence

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Ala	Thr	269

Spectral tuning and evolution of short wave-sensitive cone pigments in cottoid fish from Lake Baikal. (2002) (<https://pubmed.ncbi.nlm.nih.gov/11993996>)

Main Reference

Cowing JA; Poopalasundaram S; Wilkie SE; Bowmaker JK; Hunt DM

Authors

The cottoid fishes of Lake Baikal in eastern Siberia provide a unique opportunity to study the evolution of visual pigments in a group of closely related species exposed to different photic environments. Members of this species flock are adapted to different depth habitats down to >1000 m, and both the rod and cone visual pigments display short wave shifts as depth increases. The blue-sensitive cone pigments of the SWS2 class cluster into two species groups with $\lambda(\max)$ values of 450 and 430 nm, with the pigment in *Cottus gobio*, a cottoid fish native to Britain, forming a third group with a $\lambda(\max)$ of 467 nm. The sequences of the SWS2 opsin gene from *C. gobio* and from two representatives of the 450 and 430 nm Baikal groups are presented. Approximately 6 nm of the spectral difference between *C. gobio* and the 450 nm Baikal group can be ascribed to the presence of a porphyropsin/rhodopin mixture in *C. gobio*. Subsequent analysis of amino acid substitutions by site-directed mutagenesis demonstrates that the remainder of the shift from 461 to 450 nm arises from a Thr269Ala substitution and the shift from 450 to 430 nm at least partly from Thr118Ala and Thr118Gly substitutions. The underlying adaptive significance of these substitutions in terms of spectral tuning and signal-to-noise ratio is discussed.

Abstract

Additional References

RELATED GEPHE

No matches found.

Related Genes

No matches found.

Related Haplotypes

EXTERNAL LINKS

COMMENTS

@SeveralMutationsWithEffect

