

## GEPHE SUMMARY

**Gephebase Gene**  
opsin - rhodopsin1 (RH1)

**Entry Status**  
Published

**GepheID**  
GP00000782

**Main curator**  
Courtier

## PHENOTYPIC CHANGE

**Trait Category**  
Physiology

**Trait**  
Color vision (blue shift)

**Trait State in Taxon A**  
Other fishes

**Trait State in Taxon B**  
Sebastolobus altivelis

**Ancestral State**  
Taxon A

**Taxonomic Status**  
Intergeneric or Higher

	Taxon A	Taxon B
<b>Latin Name</b>	<i>Teleostei</i>	<i>Sebastolobus altivelis</i>
<b>Common Name</b>	teleost fishes	-
<b>Synonyms</b>	teleost fishes	-
<b>Rank</b>	infraclass	species
<b>Lineage</b>	cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Actinopterygii; Actinopteri; Neopterygii	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; Scorpaenoidei; Sebastidae; Sebastolobinae; Sebastolobus
<b>Parent</b>	Neopterygii () - (Rank: subclass)	Sebastolobus () - (Rank: genus)
<b>NCBI Taxonomy ID</b>	32443	8110
<b>is Taxon A an Intraspecies?</b>	No	No

## GENOTYPIC CHANGE

**Generic Gene Name**  
RHO

**Synonyms**  
RP4; OPN2; CSNBAD1

**String**  
9606.ENSP00000296271

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

**GO - Molecular Function**  
GO:0046872 : metal ion binding  
GO:0004930 : G protein-coupled receptor activity  
GO:0008020 : G protein-coupled photoreceptor activity  
GO:0005502 : 11-cis retinal binding

**GO - Biological Process**  
GO:0007186 : G protein-coupled receptor signaling pathway  
GO:0001523 : retinoid metabolic process  
GO:0006468 : protein phosphorylation

**UniProtKB Homo sapiens**  
P08100

**GenebankID or UniProtKB**

GO:0018298 : protein-chromophore linkage  
 GO:0007601 : visual perception  
 GO:0071482 : cellular response to light stimulus  
 GO:0007602 : phototransduction  
 GO:0016038 : absorption of visible light  
 GO:0045494 : photoreceptor cell maintenance  
 GO:0007603 : phototransduction, visible light  
 GO:0022400 : regulation of rhodopsin mediated signaling pathway  
 GO:0060041 : retina development in camera-type eye  
 GO:0016056 : rhodopsin mediated signaling pathway

**GO - Cellular Component**

GO:0016021 : integral component of membrane  
 GO:0005886 : plasma membrane  
 GO:0000139 : Golgi membrane  
 GO:0005887 : integral component of plasma membrane  
 GO:0005794 : Golgi apparatus  
 GO:0005911 : cell-cell junction  
 GO:0001750 : photoreceptor outer segment  
 GO:0097381 : photoreceptor disc membrane  
 GO:0060170 : ciliary membrane  
 GO:0030660 : Golgi-associated vesicle membrane  
 GO:0001917 : photoreceptor inner segment  
 GO:0060342 : photoreceptor inner segment membrane  
 GO:0042622 : photoreceptor outer segment membrane

**Mutation #1**

**Presumptive Null**

No

**Molecular Type**

Coding

**Aberration Type**

SNP

**SNP Coding Change**

Nonsynonymous

**Molecular Details of the Mutation**

D83N and A292S

**Experimental Evidence**

**Candidate Gene**

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Asp	Asn	83

**Main Reference**

Modulation of the absorption maximum of rhodopsin by amino acids in the C-terminus. (2007 Mar-Apr)

**Authors**

Yokoyama S; Tada T; Yamato T

**Abstract**

Vision begins when light is absorbed by visual pigments. It is commonly believed that the absorption spectra of visual pigments are modulated by interactions between the retinal and amino acids within or near 4.5 angstroms of the retinal in the transmembrane (TM) segments. However, this dogma has not been rigorously tested. In this study, we show that the retinal-opsin interactions extend well beyond the retinal binding pocket. We found that, although it is positioned outside of TM segments, the C-terminus of the rhodopsin in the rockfish longspine thornyhead (*Sebastolobus altivelis*) modulates its lambda(max) by interacting mainly with the last TM segment. Our results illustrate how amino acids in the C-terminus are likely to interact with the retinal. We anticipate our analyses to be a starting point for viewing the spectral tuning of visual pigments as interactions between the retinal and key amino acids that are distributed throughout the entire pigment.

**Additional References**

Elucidation of phenotypic adaptations: Molecular analyses of dim-light vision proteins in vertebrates. (2008)

**Mutation #2**

**Presumptive Null**

No

**Molecular Type**

Coding

**Aberration Type**

SNP

**SNP Coding Change**

Nonsynonymous

**Molecular Details of the Mutation**

D83N and A292S

**Experimental Evidence**

## Candidate Gene

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Ala	Ser	292

### Main Reference

Modulation of the absorption maximum of rhodopsin by amino acids in the C-terminus. (2007 Mar-Apr)

### Authors

Yokoyama S; Tada T; Yamato T

### Abstract

Vision begins when light is absorbed by visual pigments. It is commonly believed that the absorption spectra of visual pigments are modulated by interactions between the retinal and amino acids within or near 4.5 angstroms of the retinal in the transmembrane (TM) segments. However, this dogma has not been rigorously tested. In this study, we show that the retinal-opsin interactions extend well beyond the retinal binding pocket. We found that, although it is positioned outside of TM segments, the C-terminus of the rhodopsin in the rockfish longspine thornyhead (*Sebastes altivelis*) modulates its  $\lambda_{max}$  by interacting mainly with the last TM segment. Our results illustrate how amino acids in the C-terminus are likely to interact with the retinal. We anticipate our analyses to be a starting point for viewing the spectral tuning of visual pigments as interactions between the retinal and key amino acids that are distributed throughout the entire pigment.

### Additional References

Elucidation of phenotypic adaptations: Molecular analyses of dim-light vision proteins in vertebrates. (2008)

## RELATED GEPHE

### Related Genes

9 (Green-sensitive opsin (RH2), Rhodopsin (RH1), opsin - (SWS1), opsin - (SWS2), opsin - (SWS2B), Rx1, opsin - rhodopsin (LWS), opsin - rhodopsin1-A (RH1-A), opsin - rhodopsin1-B (RH1-B))

### Related Haplotypes

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## EXTERNAL LINKS

## COMMENTS

Sebastes altivelis is the rockfish longspine thornyhead. @SeveralMutationsWithEffect