

GEPHE SUMMARY

Gephebase Gene		GepheID
Green-sensitive opsin (RH2) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase="Green-sensitive opsin (RH2)"#gephebase-summary-title)		GP00001469
Entry Status		Prigent
Published		Main curator

PHENOTYPIC CHANGE

Trait Category			
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category="Physiology"#gephebase-summary-title)		Trait	
Color vision (blue shift) (<a color"="" href="https://www.gephebase.org/search-criteria?/and+Trait=">https://www.gephebase.org/search-criteria?/and+Trait="Color vision (blue shift)"#gephebase-summary-title)		Trait State in Taxon A	
other teleost Percomorphaceae fishes (fugu & stickleback)		Trait State in Taxon B	
Pacific bluefin tuna		Ancestral State	
Taxon A		Taxonomic Status	
Intergeneric or Higher (https://www.gephebase.org/search-criteria?/and+Taxonomic Status="Intergeneric or Higher"#gephebase-summary-title)			
Taxon A		Taxon B	
Latin Name		Latin Name	
Percomorphaceae (https://www.gephebase.org/search-criteria?/and+Taxon Synonyms="Percomorphaceae"#gephebase-summary-title)		Thunnus orientalis (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Thunnus orientalis"#gephebase-summary-title)	
Common Name		Common Name	
-		Pacific bluefin tuna	
Synonyms		Synonyms	
-		Thunnus orientalis orientalis; Thunnus thynnus orientalis; Pacific bluefin tuna; North Pacific bluefin tuna; northern bluefin tuna; Thunnus orientalis (Temminck & Schlegel, 1844)	
Rank		Rank	
no rank		species	
Lineage		Lineage	
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Actinopterygii; Actinopteri; Neopterygii; Teleostei; Osteoglossocephalai; Clupeocephala; Euteleosteomorpha; Neoteleostei; Eurypterygia; Ctenosquamata; Acanthomorpha; Euacanthomorphacea		cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Actinopterygii; Actinopteri; Neopterygii; Teleostei; Osteoglossocephalai; Clupeocephala; Euteleosteomorpha; Neoteleostei; Eurypterygia; Ctenosquamata; Acanthomorpha; Euacanthomorphacea; Percomorphaceae; Pelagiaria; Scombriformes; Scombridae; Scombrinae; Thunnini; Thunnus	
Parent		Parent	
Euacanthomorphacea () - (Rank: no rank) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=123369)		Thunnus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=8234)	
NCBI Taxonomy ID		NCBI Taxonomy ID	
1489872 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=1489872)		8238 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=8238)	
is Taxon A an Intraspecies?		is Taxon B an Intraspecies?	
No		No	

GENOTYPIC CHANGE

Generic Gene Name		UniProtKB Danio rerio
opn1mw1		Q9W6A5 (http://www.uniprot.org/uniprot/Q9W6A5)
Synonyms		GenebankID or UniProtKB
RH2-1; rh2.1; zfgr1; grops1; rh21		AB290451 (https://www.ncbi.nlm.nih.gov/nucleotide/AB290451)
String		
7955.ENSADARP00000001158 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=7955.ENSADARP00000001158)		
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>)

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

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

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

Nonsynonymous

p.E122Q (G>C) in four of five genes

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

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	-	-	-

Evolutionary changes of multiple visual pigment genes in the complete genome of Pacific bluefin tuna. (2013) (<https://pubmed.ncbi.nlm.nih.gov/23781100>)

Nakamura Y; Mori K; Saitoh K; Oshima K; Mekuchi M; Sugaya T; Shigenobu Y; Ojima N; Muta S; Fujiwara A; Yasuike M; Oohara I; Hirakawa H; Chowdhury VS; Kobayashi T; Nakajima K; Sano M; Wada T; Tashiro K; Ikeo K; Hattori M; Kuhara S; Gojobori T; Inouye K

Tunas are migratory fishes in offshore habitats and top predators with unique features. Despite their ecological importance and high market values, the open-ocean lifestyle of tuna, in which effective sensing systems such as color vision are required for capture of prey, has been poorly understood. To elucidate the genetic and evolutionary basis of optic adaptation of tuna, we determined the genome sequence of the Pacific bluefin tuna (*Thunnus orientalis*), using next-generation sequencing technology. A total of 26,433 protein-coding genes were predicted from 16,802 assembled scaffolds. From these, we identified five common fish visual pigment genes: red-sensitive (middle/long-wavelength sensitive; M/LWS), UV-sensitive (short-wavelength sensitive 1; SWS1), blue-sensitive (SWS2), rhodopsin (RH1), and green-sensitive (RH2) opsin genes. Sequence comparison revealed that tuna’s RH1 gene has an amino acid substitution that causes a short-wave shift in the absorption spectrum (i.e., blue shift). Pacific bluefin tuna has at least five RH2 paralogs, the most among studied fishes; four of the proteins encoded may be tuned to blue light at the amino acid level. Moreover, phylogenetic analysis suggested that gene conversions have occurred in each of the SWS2 and RH2 loci in a short period. Thus, Pacific bluefin tuna has undergone evolutionary changes in three genes (RH1, RH2, and SWS2), which may have contributed to detecting blue-green contrast and measuring the distance to prey in the blue-pelagic ocean. These findings provide basic information on behavioral traits of predatory fish and, thereby, could help to improve the technology to culture such fish in captivity for resource management.

RELATED GEPHE

7 (Rhodopsin (RH1), opsin - (SWS1), opsin - (SWS2), opsin - (SWS2B), Rx1, opsin - rhodopsin (LWS), opsin - rhodopsin1 (RH1)) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=~1489872^/and+Trait=Color vision/or+Taxon ID=~8238^/and+Trait=Color vision/and+groupHaplotypes=true#gephebase-summary-title>)

No matches found.

EXTERNAL LINKS

COMMENTS

by gene duplication and conversion there are 5 RH2 genes in tuna and four of which have the same substitution

