GEPHE SUMMARY

Gephebase Gene
opsin - rhodopsin1-A (RH1-A) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^opsin - rhodopsin1-A (RH1-A)^#gephebase-summary-title)

Entry Status
Published

GepheID
GP00000793

Main curator
Courtier

PHENOTYPIC CHANGE

Trait Category
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Physiology^#gephebase-summary-title)

Trait
Color vision (blue shift) (https://www.gephebase.org/search-criteria?/and+Trait=^Color vision (blue shift)^#gephebase-summary-title)

Trait State in Taxon A
Anguilla japonica

Trait State in Taxon B
Conger myriaster

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

Latin Name
Anguilla japonica (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Anguilla japonica^#gephebase-summary-title)

Common Name
Japanese eel

Synonyms
Japanese eel; Anguilla japonica Temminck & Schlegel, 1846

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Actinopterygii; Actinopteri; Neopterygii; Teleostei; Elopocephalai; Elopocephala; Elopomorpha; Anguilliformes; Anguillidae; Anguilla

Parent
Anguilla () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7935)

NCBI Taxonomy ID
7937 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7937)

is Taxon A an Infraspecies?
No

Taxon B

Latin Name
Conger myriaster (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Conger myriaster^#gephebase-summary-title)

Common Name
whitespotted conger

Synonyms
Anguilla myriaster; Astroconger myriaster; whitespotted conger; conger eel; Anguilla myriaster Brevoort, 1856; Conger myriaster (Brevoort, 1856)

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Actinopterygii; Actinopteri; Neopterygii; Teleostei; Elopocephalai; Elopocephala; Elopomorpha; Anguilliformes; Congridae; Congrinae; Conger

Parent
Conger () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7942)

NCBI Taxonomy ID
7943 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7943)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
RHO

Synonyms
RP4; OPN2; CSNBAD1

String
9606.ENSP00000296271 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=9606.ENSP00000296271)

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

GO - Molecular Function
GO:0046872 : metal ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0046872)
GO:0004930 : G protein-coupled receptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004930)
GO:0008020 : G protein-coupled photoreceptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0008020)
GO:0005502 : 11-cis retinal binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005502)

UniProtKB Homo sapiens
P08100 (http://www.uniprot.org/uniprot/P08100)

GenebankID or UniProtKB
BAB21487 (https://www.ncbi.nlm.nih.gov/nuccore/BAB21487)

GO - Biological Process

GO:0007186 : G protein-coupled receptor signaling pathway
(https://www.ebi.ac.uk/QuickGO/term/GO:0007186)
GO:0001523 : retinoid metabolic process
(https://www.ebi.ac.uk/QuickGO/term/GO:0001523)
GO:0006468 : protein phosphorylation
(https://www.ebi.ac.uk/QuickGO/term/GO:0006468)
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:0016038 : absorption of visible light
(https://www.ebi.ac.uk/QuickGO/term/GO:0016038)
GO:0045494 : photoreceptor cell maintenance
(https://www.ebi.ac.uk/QuickGO/term/GO:0045494)
GO:0007603 : phototransduction, visible light
(https://www.ebi.ac.uk/QuickGO/term/GO:0007603)
GO:0022400 : regulation of rhodopsin mediated signaling pathway
(https://www.ebi.ac.uk/QuickGO/term/GO:0022400)
GO:0060041 : retina development in camera-type eye
(https://www.ebi.ac.uk/QuickGO/term/GO:0060041)
GO:0016056 : rhodopsin mediated signaling pathway
(https://www.ebi.ac.uk/QuickGO/term/GO:0016056)

GO - Cellular Component

GO:0016021 : integral component of membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0016021)
GO:0005886 : plasma membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0005886)
GO:0000139 : Golgi membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0000139)
GO:0005887 : integral component of plasma membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0005887)
GO:0005794 : Golgi apparatus (https://www.ebi.ac.uk/QuickGO/term/GO:0005794)
GO:0005911 : cell-cell junction (https://www.ebi.ac.uk/QuickGO/term/GO:0005911)
GO:0001750 : photoreceptor outer segment
(https://www.ebi.ac.uk/QuickGO/term/GO:0001750)
GO:0097381 : photoreceptor disc membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0097381)
GO:0060170 : ciliary membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0060170)
GO:0030660 : Golgi-associated vesicle membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0030660)
GO:0001917 : photoreceptor inner segment
(https://www.ebi.ac.uk/QuickGO/term/GO:0001917)
GO:0060342 : photoreceptor inner segment membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0060342)
GO:0042622 : photoreceptor outer segment membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0042622)

Mutation #1

Presumptive Null

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

Molecular Type

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

Aberration Type

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

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

P194N and N195A and A292S

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Pro	Asn	194

Main Reference

Elucidation of phenotypic adaptations: Molecular analyses of dim-light vision proteins in vertebrates. (2008) (https://pubmed.ncbi.nlm.nih.gov/18768804)

Authors

Yokoyama S; Tada T; Zhang H; Britt L

Abstract

Vertebrate ancestors appeared in a uniform, shallow water environment, but modern species flourish in highly variable niches. A striking array of phenotypes exhibited by contemporary animals is assumed to have evolved by accumulating a series of selectively advantageous mutations. However, the experimental test of such adaptive events at the molecular level is remarkably difficult. One testable phenotype, dim-light vision, is mediated by rhodopsins. Here, we engineered 11 ancestral rhodopsins and show that those in early ancestors absorbed light maximally (lambda(max)) at 500 nm, from which contemporary rhodopsins with variable lambda(max)s of 480-525 nm evolved on at least 18 separate occasions. These highly

environment-specific adaptations seem to have occurred largely by amino acid replacements at 12 sites, and most of those at the remaining 191 (approximately 94%) sites have undergone neutral evolution. The comparison between these results and those inferred by commonly-used parsimony and Bayesian methods demonstrates that statistical tests of positive selection can be misleading without experimental support and that the molecular basis of spectral tuning in rhodopsins should be elucidated by mutagenesis analyses using ancestral pigments.

Additional References

Mutation #2

Presumptive Null

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

Molecular Type

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

Aberration Type

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

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

P194N and N195A and A292S

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Asn	Ala	195

Main Reference

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Authors

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Additional References

Mutation #3

Presumptive Null

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

Molecular Type

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

Aberration Type

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

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

P194N and N195A and A292S

Experimental Evidence

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

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

Main Reference

Elucidation of phenotypic adaptations: Molecular analyses of dim-light vision proteins in vertebrates. (2008) (https://pubmed.ncbi.nlm.nih.gov/18768804)

Authors

Yokoyama S; Tada T; Zhang H; Britt L

Abstract

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undergone neutral evolution. The comparison between these results and those inferred by commonly-used parsimony and Bayesian methods demonstrates that statistical tests of positive selection can be misleading without experimental support and that the molecular basis of spectral tuning in rhodopsins should be elucidated by mutagenesis analyses using ancestral pigments.

Additional References

RELATED GEPHE

Related Genes

1 (opsin - rhodopsin1-B (RH1-B)) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^7937^/and+Trait=Color vision/or+Taxon ID=^7943^/and+Trait=Color vision/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

@SeveralMutationsWithEffect