

GEPHE SUMMARY

opsin - (SWS1) (<a (sws1)""="" +opsin+"-="" href="https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=">#gephebase-summary-title)	Gephebase Gene	GepheID
	GP00000762	
	Entry Status	Main curator
Published	Courtier	

PHENOTYPIC CHANGE

Physiology (<a +physiology"="" href="https://www.gephebase.org/search-criteria?/and+Trait+Category=">#gephebase-summary-title)		Trait Category		
Color vision (UV-shift) (<a +color+vision+(uv-shift)""="" href="https://www.gephebase.org/search-criteria?/and+Trait=">#gephebase-summary-title)		Trait		
Other birds		Trait State in Taxon A		
Larus spp.		Trait State in Taxon B		
Taxon A		Ancestral State		
Intergeneric or Higher (<a +intergeneric+or+higher"="" href="https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=">#gephebase-summary-title)		Taxonomic Status		
Taxon A		Taxon B		
Aves		Larus		
(https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms="+Aves"#gephebase-summary-title)		(https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms="+Larus"#gephebase-summary-title)		
birds		-		
avian; birds		-		
class		genus		
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Sauropsida; Sauria; Archelosauria; Archosauria; Dinosauria; Saurischia; Theropoda; Coelurosauria		cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Sauropsida; Sauria; Archelosauria; Archosauria; Dinosauria; Saurischia; Theropoda; Coelurosauria; Aves; Neognathae; Charadriiformes; Laridae		
Coelurosauria () - (Rank: no rank)		Laridae (gulls) - (Rank: family)		
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 436492)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8910)		
8782		8911		
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8782)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8911)		
No		No		

GENOTYPIC CHANGE

OPN1SW		Generic Gene Name	UniProtKB Homo sapiens
BCP; BOP; CBT		Synonyms	GenebankID or UniProtKB
9606.ENSPP00000249389		String	AAP23960 (https://www.ncbi.nlm.nih.gov/nuccore/AAP23960)
(http://string-db.org/newstring.cgi/show_network_section.pl?identifier=9606.ENSPP00000249389)		Sequence Similarities	
Belongs to the G-protein coupled receptor 1 family. Opsin subfamily.		GO - Molecular Function	
GO:0038023 : signaling receptor activity			
(https://www.ebi.ac.uk/QuickGO/term/GO:0038023)			
GO:0008020 : G protein-coupled photoreceptor activity			
(https://www.ebi.ac.uk/QuickGO/term/GO:0008020)			
GO:0007165 : signal transduction		GO - Biological Process	
(https://www.ebi.ac.uk/QuickGO/term/GO:0007165)			

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: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>)
GO:0097381 : photoreceptor disc membrane
(<https://www.ebi.ac.uk/QuickGO/term/GO:0097381>)

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

C86I and S90C - C90S has an effect (tested in Carvalho et al 2007) and S86F have an effect (tested in Carvalho et al 2007)

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	Cys	Ile	86

Main Reference

Complex distribution of avian color vision systems revealed by sequencing the SWS1 opsin from total DNA. (2003) (<https://pubmed.ncbi.nlm.nih.gov/12716987>)

Authors

Odeen A; Hastad O

Abstract

To gain insights into the evolution and ecology of visually acute animals such as birds, biologists often need to understand how these animals perceive colors. This poses a problem, since the human eye is of a different design than that of most other animals. The standard solution is to examine the spectral sensitivity properties of animal retinas through microspectrophotometry-a procedure that is rather complicated and therefore only has allowed examinations of a limited number of species to date. We have developed a faster and simpler molecular method, which can be used to estimate the color sensitivities of a bird by sequencing a part of the gene coding for the ultraviolet or violet absorbing opsin in the avian retina. With our method, there is no need to sacrifice the animal, and it thereby facilitates large screenings, including rare and endangered species beyond the reach of microspectrophotometry. Color vision in birds may be categorized into two classes: one with a short-wavelength sensitivity biased toward violet (VS) and the other biased toward ultraviolet (UVS). Using our method on 45 species from 35 families, we demonstrate that the distribution of avian color vision is more complex than has previously been shown. Our data support VS as the ancestral state in birds and show that UVS has evolved independently at least four times. We found species with the UVS type of color vision in the orders Psittaciformes and Passeriformes, in agreement with previous findings. However, species within the families Corvidae and Tyrannidae did not share this character with other passeriforms. We also found UVS type species within the Laridae and Struthionidae families. Raptors (Accipitridae and Falconidae) are of the violet type, giving them a vision system different from their passeriform prey. Intriguing effects on the evolution of color signals can be expected from interactions between predators and prey. Such interactions may explain the presence of UVS in Laridae and Passeriformes.

Additional References

The molecular evolution of avian ultraviolet- and violet-sensitive visual pigments. (2007) (<https://pubmed.ncbi.nlm.nih.gov/17556758>)

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

C86I and S90C - C90S has an effect (tested in Carvalho et al 2007) and S86F have an effect (tested in Carvalho et al 2007)

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	Ser	Cys	90

Main Reference

Complex distribution of avian color vision systems revealed by sequencing the SWS1 opsin from total DNA. (2003) (<https://pubmed.ncbi.nlm.nih.gov/12716987>)

Authors

Odeen A; Hastad O

Abstract

To gain insights into the evolution and ecology of visually acute animals such as birds, biologists often need to understand how these animals perceive colors. This poses a problem, since the human eye is of a different design than that of most other animals. The standard solution is to examine the spectral sensitivity properties of animal retinas through microspectrophotometry-a procedure that is rather complicated and therefore only has allowed examinations of a limited number of species to date. We have developed a faster and simpler molecular method, which can be used to estimate the color sensitivities of a bird by sequencing a part of the gene coding for the ultraviolet or violet absorbing opsin in the avian retina. With our method, there is no need to sacrifice the animal, and it thereby facilitates large screenings, including rare and endangered species beyond the reach of microspectrophotometry. Color vision in birds may be categorized into two classes: one with a short-wavelength sensitivity biased toward violet (VS) and the other biased toward ultraviolet (UVS). Using our method on 45 species from 35 families, we demonstrate that the distribution of avian color vision is more complex than has previously been shown. Our data support VS as the ancestral state in birds and show that UVS has evolved independently at least four times. We found species with the UVS type of color vision in the orders Psittaciformes and Passeriformes, in agreement with previous findings. However, species within the families Corvidae and Tyrannidae did not share this character with other passeriforms. We also found UVS type species within the Laridae and Struthionidae families. Raptors (Accipitridae and Falconidae) are of the violet type, giving them a vision system different from their passeriform prey. Intriguing effects on the evolution of color signals can be expected from interactions between predators and prey. Such interactions may explain the presence of UVS in Laridae and Passeriformes.

Additional References

The molecular evolution of avian ultraviolet- and violet-sensitive visual pigments. (2007) (<https://pubmed.ncbi.nlm.nih.gov/17556758>)

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

5 ([https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=~opsin-\(SWS1\)^/and+Taxon+ID=~8782^/or+Gene+Gephebase=~opsin-\(SWS1\)^/and+Taxon+ID=~8911^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=~opsin-(SWS1)^/and+Taxon+ID=~8782^/or+Gene+Gephebase=~opsin-(SWS1)^/and+Taxon+ID=~8911^#gephebase-summary-title))

EXTERNAL LINKS

COMMENTS

@SeveralMutationsWithEffect