

GEPHE SUMMARY

	Gephebase Gene		GepheID
Doublesex (https://www.gephebase.org/search-criteria?/and+GeneGephebase=~Doublesex~#gephebase-summary-title)		GP00000235	
	Entry Status	Courtier	Main curator
Published			

PHENOTYPIC CHANGE

	Trait Category		
Morphology (https://www.gephebase.org/search-criteria?/and+TraitCategory=~Morphology~#gephebase-summary-title)	Trait		
Bristle number (male sex comb tooth number) (https://www.gephebase.org/search-criteria?/and+Trait=~Bristle number (male sex comb tooth number)~#gephebase-summary-title)	Trait State in Taxon A		
Other Drosophila spp.	Trait State in Taxon B		
Drosophila melanogaster/obscura group - Sex combs	Ancestral State		
Data not curated	Taxonomic Status		
Interspecific (https://www.gephebase.org/search-criteria?/and+TaxonomicStatus=~Interspecific~#gephebase-summary-title)			
	Taxon A	Taxon B	
	Latin Name		Latin Name
Sophophora (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=~Sophophora~#gephebase-summary-title)	obscura group (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=~obscura group~#gephebase-summary-title)		
-	Common Name	-	Common Name
-	Synonyms	-	Synonyms
	Rank		Rank
subgenus	species group		
	Lineage		Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Diptera; Brachycera; Muscomorpha; Eremoneura; Cyclorrhapha; Schizophora; Acalyptratae; Ephydroidea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila	cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Diptera; Brachycera; Muscomorpha; Eremoneura; Cyclorrhapha; Schizophora; Acalyptratae; Ephydroidea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila; Sophophora		
	Parent		Parent
Drosophila (fruit flies) - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7215)	Sophophora () - (Rank: subgenus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 32341)		
32341 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 32341)	32355 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 32355)		
	is Taxon A an Intraspecies?		is Taxon B an Intraspecies?
No	No		

GENOTYPIC CHANGE

	Generic Gene Name	UniProtKB Drosophila melanogaster
dsx	P23023 (http://www.uniprot.org/uniprot/P23023)	
	Synonyms	GenebankID or UniProtKB
CG11094; Dmdsx; DmellCG11094; Dsx; DSX; dsxF; dsxM; Hr; ix-62c	AAB99948 (https://www.ncbi.nlm.nih.gov/nuccore/AAB99948)	
	String	
7227.FBpp0303107 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier= 7227.FBpp0303107)		
	Sequence Similarities	
-		
	GO - Molecular Function	
GO:0042803 : protein homodimerization activity (https://www.ebi.ac.uk/QuickGO/term/GO:0042803)		
GO:0000977 : RNA polymerase II regulatory region sequence-specific DNA binding (https://www.ebi.ac.uk/QuickGO/term/GO:0000977)		
GO:0008270 : zinc ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0008270)		

GO:0001077 : proximal promoter DNA-binding transcription activator activity, RNA polymerase II-specific (<https://www.ebi.ac.uk/QuickGO/term/GO:0001077>)
GO:0001078 : proximal promoter DNA-binding transcription repressor activity, RNA polymerase II-specific (<https://www.ebi.ac.uk/QuickGO/term/GO:0001078>)
GO - Biological Process

GO:0045944 : positive regulation of transcription by RNA polymerase II (<https://www.ebi.ac.uk/QuickGO/term/GO:0045944>)
GO:0006357 : regulation of transcription by RNA polymerase II (<https://www.ebi.ac.uk/QuickGO/term/GO:0006357>)
GO:0007530 : sex determination (<https://www.ebi.ac.uk/QuickGO/term/GO:0007530>)
GO:0045892 : negative regulation of transcription, DNA-templated (<https://www.ebi.ac.uk/QuickGO/term/GO:0045892>)
GO:0045893 : positive regulation of transcription, DNA-templated (<https://www.ebi.ac.uk/QuickGO/term/GO:0045893>)
GO:0046660 : female sex differentiation (<https://www.ebi.ac.uk/QuickGO/term/GO:0046660>)
GO:0048086 : negative regulation of developmental pigmentation (<https://www.ebi.ac.uk/QuickGO/term/GO:0048086>)
GO:0048071 : sex-specific pigmentation (<https://www.ebi.ac.uk/QuickGO/term/GO:0048071>)
GO:0035215 : genital disc development (<https://www.ebi.ac.uk/QuickGO/term/GO:0035215>)
GO:0007485 : imaginal disc-derived male genitalia development (<https://www.ebi.ac.uk/QuickGO/term/GO:0007485>)
GO:0016199 : axon midline choice point recognition (<https://www.ebi.ac.uk/QuickGO/term/GO:0016199>)
GO:0007619 : courtship behavior (<https://www.ebi.ac.uk/QuickGO/term/GO:0007619>)
GO:0045497 : female analia development (<https://www.ebi.ac.uk/QuickGO/term/GO:0045497>)
GO:0019101 : female somatic sex determination (<https://www.ebi.ac.uk/QuickGO/term/GO:0019101>)
GO:0007486 : imaginal disc-derived female genitalia development (<https://www.ebi.ac.uk/QuickGO/term/GO:0007486>)
GO:0045496 : male analia development (<https://www.ebi.ac.uk/QuickGO/term/GO:0045496>)
GO:0008049 : male courtship behavior (<https://www.ebi.ac.uk/QuickGO/term/GO:0008049>)
GO:0045433 : male courtship behavior, veined wing generated song production (<https://www.ebi.ac.uk/QuickGO/term/GO:0045433>)
GO:0046661 : male sex differentiation (<https://www.ebi.ac.uk/QuickGO/term/GO:0046661>)
GO:0045498 : sex comb development (<https://www.ebi.ac.uk/QuickGO/term/GO:0045498>)
GO:0018993 : somatic sex determination (<https://www.ebi.ac.uk/QuickGO/term/GO:0018993>)

GO - Cellular Component

GO:0005634 : nucleus (<https://www.ebi.ac.uk/QuickGO/term/GO:0005634>)

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

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

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

Acquisition of Scr binding sites in enhancer

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

Evolution of sex-specific traits through changes in HOX-dependent doublesex expression. (2011) (<https://pubmed.ncbi.nlm.nih.gov/21886483>)

Tanaka K; Barmina O; Sanders LE; Arbeitman MN; Kopp A

Almost every animal lineage is characterized by unique sex-specific traits, implying that such traits are gained and lost frequently in evolution. However, the genetic mechanisms responsible for these changes are not understood. In *Drosophila*, the activity of the sex determination pathway is restricted to sexually dimorphic tissues, suggesting that spatial regulation of this pathway may contribute to the evolution of sex-specific traits. We examine the regulation and function of doublesex (*dsx*), the main transcriptional effector of the sex determination pathway, in the development and evolution of *Drosophila* sex combs. Sex combs are a recent evolutionary innovation and show dramatic diversity in the relatively few *Drosophila* species that have them. We show that *dsx* expression in the presumptive sex comb region is activated by the HOX gene Sex combs reduced (*Scr*), and that the male isoform of *dsx* up-regulates *Scr* so that both genes become expressed at high levels in this region in males but not in females. Precise spatial regulation of *dsx* is essential for defining sex comb position and morphology. Comparative analysis of *Scr* and *dsx* expression reveals a tight correlation between sex comb morphology and the expression patterns of both genes. In species that primitively lack sex combs, no *dsx* expression is observed in the homologous region, suggesting that the origin and diversification of this structure were linked to the gain of a new *dsx* expression domain. Two other, distantly related fly lineages that independently evolved novel male-specific structures show evolutionary gains of *dsx* expression in the corresponding tissues, where *dsx* may also be controlled by *Scr*. These findings suggest that changes in the spatial regulation of sex-determining genes are a key mechanism that enables the evolution of new sex-specific traits, contributing to some of the most dramatic examples of phenotypic diversification in nature.

Additional References

9 (achaete-scute complex, Delta, Dopa-decarboxylase, hairy (h), poils au dos (pad), scabrous, smooth, Catecholamines up, tartan) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=^32341^/and+Trait=Bristle number/or+Taxon ID=^32355^/and+Trait=Bristle number/and+groupHaplotypes=true#gephebase-summary-title>)

No matches found.

EXTERNAL LINKS

COMMENTS

@SexualTrait Artyom’s unpublished data supports the association between Dsx and sex comb tooth number