

GEPHE SUMMARY

	Gephebase Gene		GepheID
Hox gene cluster (#gephebase-summary-title)		GP00001946	
	Entry Status	Courtier	Main curator
Published			

PHENOTYPIC CHANGE

	Trait Category
Morphology (#gephebase-summary-title)	
	Trait
Body plan (number of segments) (https://www.gephebase.org/search-criteria?/and+Trait+Body plan (number of segments)#gephebase-summary-title)	
-	Trait State in Taxon A
loss of segments	Trait State in Taxon B
	Ancestral State
Taxon A	
	Taxonomic Status
Intergeneric or Higher (#gephebase-summary-title)	

Taxon A	Latin Name
Drosophila melanogaster (#gephebase-summary-title)	
fruit fly	Common Name
Sophophora melanogaster; fruit fly; Drosophila melanogaster Meigen, 1830; Sophophora melanogaster (Meigen, 1830); Drosophila melangaster	Synonyms
species	Rank
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; Acalypratae; Ephydroidea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila; Sophophora; melanogaster group; melanogaster subgroup	Lineage
melanogaster subgroup () - (Rank: species subgroup) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 32351)	Parent
7227 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7227)	NCBI Taxonomy ID
No	is Taxon A an Intraspecies?

Taxon B #1	Latin Name
Hypsibius dujardini (#gephebase-summary-title)	
-	Common Name
Hypsibius dujardini (Doyere, 1840); Hypsibius dujardini	Synonyms
species	Rank
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Tardigrada; Eutardigrada; Parachela; Hypsibioidea; Hypsibiidae; Hypsibius	Lineage
Hypsibius () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 58670)	Parent
232323 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 232323)	NCBI Taxonomy ID
No	is Taxon B an Intraspecies?

Taxon B #2	Latin Name
Paramacrobotus richtersi (#gephebase-summary-title)	
-	Common Name
Macrobiotus richtersi; Macrobiotus schultzei; Paramacrobotus richtersi (Murray, 1911)	Synonyms
species	Rank
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Tardigrada; Eutardigrada; Parachela; Macrobiotioidea; Macrobiotidae; Paramacrobotus; Paramacrobotus richtersi group	Lineage
Paramacrobotus richtersi group () - (Rank: species group) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 578131)	Parent
697321 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 697321)	NCBI Taxonomy ID
No	is Taxon B an Intraspecies?

Taxon B #3	
Milnesium tardigradum (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Milnesium tardigradum"#gephebase-summary-title)	Latin Name
-	Common Name
Milnesium tardigradum Doyere, 1840	Synonyms
species	Rank
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Tardigrada; Eutardigrada; Apochela; Milnesiidae; Milnesium	Lineage
Milnesium () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=46459)	Parent
46460 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=46460)	NCBI Taxonomy ID
No	is Taxon B an Infrappecies?

GENOTYPIC CHANGE

Antp	Generic Gene Name	P02833 (http://www.uniprot.org/uniprot/P02833)	UniProtKB Drosophila melanogaster
3.4; Ant; ANT-C; ANT-P; ANTC; antp; AntP; ANTP; Antp P1; Antp P2; Antp1; AntP1; Aus; BG:DS07700.1; CG1028; DmAntp; DMANTPE1; Dmel\CG1028; DRO15DC96Z; Hu; I(3)84Ba; Ns; Scx	Synonyms	()	GenebankID or UniProtKB
7227.FBpp0081161 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=7227.FBpp0081161)	String		
Belongs to the Antp homeobox family.	Sequence Similarities		
GO:0043565 : sequence-specific DNA binding (https://www.ebi.ac.uk/QuickGO/term/GO:0043565)	GO - Molecular Function		
GO:0003677 : DNA binding (https://www.ebi.ac.uk/QuickGO/term/GO:0003677)			
GO:0000981 : DNA-binding transcription factor activity, RNA polymerase II-specific (https://www.ebi.ac.uk/QuickGO/term/GO:0000981)			
GO:0007419 : ventral cord development (https://www.ebi.ac.uk/QuickGO/term/GO:0007419)	GO - Biological Process		
GO:0045944 : positive regulation of transcription by RNA polymerase II (https://www.ebi.ac.uk/QuickGO/term/GO:0045944)			
GO:0050767 : regulation of neurogenesis (https://www.ebi.ac.uk/QuickGO/term/GO:0050767)			
GO:0007507 : heart development (https://www.ebi.ac.uk/QuickGO/term/GO:0007507)			
GO:0009948 : anterior/posterior axis specification (https://www.ebi.ac.uk/QuickGO/term/GO:0009948)			
GO:0007494 : midgut development (https://www.ebi.ac.uk/QuickGO/term/GO:0007494)			
GO:0042694 : muscle cell fate specification (https://www.ebi.ac.uk/QuickGO/term/GO:0042694)			
GO:0007384 : specification of segmental identity, thorax (https://www.ebi.ac.uk/QuickGO/term/GO:0007384)			
GO:0048542 : lymph gland development (https://www.ebi.ac.uk/QuickGO/term/GO:0048542)			
GO:0014019 : neuroblast development (https://www.ebi.ac.uk/QuickGO/term/GO:0014019)			
GO:0007383 : specification of segmental identity, antennal segment (https://www.ebi.ac.uk/QuickGO/term/GO:0007383)			
GO:0005737 : cytoplasm (https://www.ebi.ac.uk/QuickGO/term/GO:0005737)	GO - Cellular Component		
GO:0005634 : nucleus (https://www.ebi.ac.uk/QuickGO/term/GO:0005634)			
Yes (https://www.gephebase.org/search-criteria?/and+Presumptive Null="Yes"#gephebase-summary-title)	Presumptive Null		
Gene Loss (https://www.gephebase.org/search-criteria?/and+Molecular Type="Gene Loss"#gephebase-summary-title)	Molecular Type		
Deletion (<a deletion"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Aberration Type=">https://www.gephebase.org/search-criteria?/and+Aberration Type="Deletion"#gephebase-summary-title)	Aberration Type		
	Deletion Size		

The three genes Antp Ubx AbdA are missing in the genome sequences of the three tardigrades. This loss is ancient so difficult to evaluate whether the three genes were lost due to a single mutational event or due to successive mutations. The Hox cluster is disorganized in the H. dujardini genome.

Experimental Evidence

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

Main Reference

The Compact Body Plan of Tardigrades Evolved by the Loss of a Large Body Region. (2016) (<https://pubmed.ncbi.nlm.nih.gov/26776737>)

Authors

Smith FW; Boothby TC; Giovannini I; Rebecchi L; Jockusch EL; Goldstein B

Abstract

The superphylum Panarthropoda (Arthropoda, Onychophora, and Tardigrada) exhibits a remarkable diversity of segment morphologies, enabling these animals to occupy diverse ecological niches. The molecular identities of these segments are specified by Hox genes and other axis patterning genes during development [1, 2]. Comparisons of molecular segment identities between arthropod and onychophoran species have yielded important insights into the origins and diversification of their body plans [3-9]. However, the relationship of the segments of tardigrades to those of arthropods and onychophorans has remained enigmatic [10, 11], limiting our understanding of early panarthropod body plan diversification. Here, we reveal molecular identities for all of the segments of a tardigrade. Based on our analysis, we conclude that tardigrades have lost a large intermediate region of the body axis—a region corresponding to the entire thorax and most of the abdomen of insects—and that they have lost the Hox genes that originally specified this region. Our data suggest that nearly the entire tardigrade body axis is homologous to just the head region of arthropods. Based on our results, we reconstruct a last common ancestor of Panarthropoda that had a relatively elongate body plan like most arthropods and onychophorans, rather than a compact, tardigrade-like body plan. These results demonstrate that the body plan of an animal phylum can originate by the loss of a large part of the body.

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Additional References

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No matches found.

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EXTERNAL LINKS

COMMENTS