

GEPHE SUMMARY

<p>Microphthalmia-associated transcription factor a (MITFA) (https://www.gephebase.org/search-criteria?/and+Gene+Gephebase+Microphthalmia-associated+transcription+factor+a+(MITFA)^#gephebase-summary-title)</p> <p>Published</p>	<p>Gephebase Gene</p> <p>GP00002379</p> <p>Santos</p> <p>Entry Status</p>	<p>GepheID</p> <p>Main curator</p>
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PHENOTYPIC CHANGE

<p>Morphology (https://www.gephebase.org/search-criteria?/and+Trait+Category+Morphology^#gephebase-summary-title)</p> <p>Coloration (amelanism) (https://www.gephebase.org/search-criteria?/and+Trait+Coloration+(amelanism)^#gephebase-summary-title)</p> <p>wild-type pigmented fish</p> <p>lack of black pigments in the fins and body</p> <p>Taxon A</p> <p>Domesticated (https://www.gephebase.org/search-criteria?/and+Taxonomic+Status+Domesticated^#gephebase-summary-title)</p>	<p>Trait Category</p> <p>Trait</p> <p>Trait State in Taxon A</p> <p>Trait State in Taxon B</p> <p>Ancestral State</p> <p>Taxonomic Status</p>	<p>Taxon B</p>	
<p>Betta splendens (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms+Betta+splendens^#gephebase-summary-title)</p> <p>Siamese fighting fish</p> <p>Siamese fighting fish; Betta splendens Regan, 1910</p> <p>species</p> <p>cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Actinopterygii; Actinopteri; Neopterygii; Teleostei; Osteoglossocephalai; Clupeocephala; Euteleostei; Neoteleostei; Eurypterygia; Ctenosquamata; Acanthomorpha; Euacanthomorpha; Percormorphaceae; Anabantaria; Anabantiformes; Anabantoidae; Osphronemidae; Macropodinae; Betta</p> <p>Betta () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=158455)</p> <p>158456 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=158456)</p> <p>No</p>	<p>Latin Name</p> <p>Common Name</p> <p>Synonyms</p> <p>Rank</p> <p>Lineage</p> <p>Parent</p> <p>NCBI Taxonomy ID</p> <p>is Taxon A an Intraspecies?</p>	<p>Taxon B</p> <p>Betta splendens (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms+Betta+splendens^#gephebase-summary-title)</p> <p>Siamese fighting fish</p> <p>Siamese fighting fish; Betta splendens Regan, 1910</p> <p>species</p> <p>cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Actinopterygii; Actinopteri; Neopterygii; Teleostei; Osteoglossocephalai; Clupeocephala; Euteleostei; Neoteleostei; Eurypterygia; Ctenosquamata; Acanthomorpha; Euacanthomorpha; Percormorphaceae; Anabantaria; Anabantiformes; Anabantoidae; Osphronemidae; Macropodinae; Betta</p> <p>Betta () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=158455)</p> <p>158456 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=158456)</p> <p>No</p>	<p>Latin Name</p> <p>Common Name</p> <p>Synonyms</p> <p>Rank</p> <p>Lineage</p> <p>Parent</p> <p>NCBI Taxonomy ID</p> <p>is Taxon B an Intraspecies?</p>

GENOTYPIC CHANGE

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Presumptive Null

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

Molecular Type

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

Aberration Type

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

Deletion Size

100-999 bp

Molecular Details of the Mutation

“Comparison between homozygous albino and wild-type pigmented fish revealed a cluster of indels and SNPs about 25â€‰kb upstream of mitfa, including a 366-bp deletion in the albino mutant. Genotyping this deletion in 1,000 fish revealed that this deletion was strictly correlated with the albino phenotype (supplementary fig. S14 and table S9, Supplementary Material online). These data suggest that the 366-bp deletion is a distant cis-regulatory element and could underlie the albino phenotype.”

Experimental Evidence

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

Main Reference

Genomic Basis of Striking Fin Shapes and Colors in the Fighting Fish. (2021) (<https://pubmed.ncbi.nlm.nih.gov/33871625>)

Authors

Wang L; Sun F; Wan ZY; Ye B; Wen Y; Liu H; Yang Z; Pang H; Meng Z; Fan B; Alfiko Y; Shen Y; Bai B; Lee MSQ; Piferer F; Schartl M; Meyer A; Yue GH

Abstract

Resolving the genomic basis underlying phenotypic variations is a question of great importance in evolutionary biology. However, understanding how genotypes determine the phenotypes is still challenging. Centuries of artificial selective breeding for beauty and aggression resulted in a plethora of colors, long-fin varieties, and hyper-aggressive behavior in the air-breathing Siamese fighting fish (*Betta splendens*), supplying an excellent system for studying the genomic basis of phenotypic variations. Combining whole-genome sequencing, quantitative trait loci mapping, genome-wide association studies, and genome editing, we investigated the genomic basis of huge morphological variation in fins and striking differences in coloration in the fighting fish. Results revealed that the double tail, elephant ear, albino, and fin spot mutants each were determined by single major-effect loci. The elephant ear phenotype was likely related to differential expression of a potassium ion channel gene, *kcnh8*. The albinotic phenotype was likely linked to a cis-regulatory element acting on the *mitfa* gene and the double-tail mutant was suggested to be caused by a deletion in a *zic1/zic4* coenhancer. Our data highlight that major loci and cis-regulatory elements play important roles in bringing about phenotypic innovations and establish Bettas as new powerful model to study the genomic basis of evolved changes.

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Additional References

RELATED GEPHE

No matches found.

Related Genes

No matches found.

Related Haplotypes

EXTERNAL LINKS

COMMENTS