GEPHE SUMMARY

Gephebase Gene

MC4R (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^MC4R^#gephebase-summary-title)

GepheID

GP00000638

Entry Status

Published

Main curator

Martin

PHENOTYPIC CHANGE

Trait Category

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

Trait

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

Trait State in Taxon A

Xiphophorus maculatus

Trait State in Taxon B

Xiphophorus maculatus

Ancestral State

Data not curated

Taxonomic Status

Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Intraspecific^#gephebase-summary-title)

Taxon A

Latin Name

Xiphophorus maculatus (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Xiphophorus maculatus^#gephebase-summary-title)

Common Name

southern platyfish

Synonyms

Platypoecilus maculatus; southern platyfish; Platypoecilus maculatus Guenther, 1866; Xiphophorus maculatus (Guenther, 1866)

Rank

species

Lineage

cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Actinopterygii; Actinopteri; Neopterygii; Teleostei; Osteoglossocephalai; Clupeocephala; Euteleosteomorpha; Neoteleostei; Eurypterygia; Ctenosquamata; Acanthomorphata; Euacanthomorphacea; Percomorphaceae; Ovalentaria; Atherinomorphae; Cyprinodontiformes; Cyprinodontoidei; Poeciliidae; Poeciliinae; Xiphophorus

Parent

Xiphophorus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8082)

NCBI Taxonomy ID

8083 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8083)

is Taxon A an Infraspecies?

No

Taxon B

Latin Name

Xiphophorus maculatus (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Xiphophorus maculatus^#gephebase-summary-title)

Common Name

southern platyfish

Synonyms

Platypoecilus maculatus; southern platyfish; Platypoecilus maculatus Guenther, 1866; Xiphophorus maculatus (Guenther, 1866)

Rank

species

Lineage

cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Actinopterygii; Actinopteri; Neopterygii; Teleostei; Osteoglossocephalai; Clupeocephala; Euteleosteomorpha; Neoteleostei; Eurypterygia; Ctenosquamata; Acanthomorphata; Euacanthomorphacea; Percomorphaceae; Ovalentaria; Atherinomorphae; Cyprinodontiformes; Cyprinodontoidei; Poeciliidae; Poeciliinae; Xiphophorus

Parent

Xiphophorus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8082)

NCBI Taxonomy ID

8083 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8083)

is Taxon B an Infraspecies?

No

GENOTYPIC CHANGE

Generic Gene Name

mc4r

Synonyms

zMC4; MC4-R; si:dkey-151m6.62

String

7955.ENSDARP00000027547 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=7955.ENSDARP00000027547)

Sequence Similarities

Belongs to the G-protein coupled receptor 1 family.

GO - Molecular Function

GO:0004977 : melanocortin receptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004977)

GO - Biological Process

GO:0040008 : regulation of growth (https://www.ebi.ac.uk/QuickGO/term/GO:0040008)

UniProtKB Danio rerio

B0V1P1 (http://www.uniprot.org/uniprot/B0V1P1)

GenebankID or UniProtKB

AHC02893 (https://www.ncbi.nlm.nih.gov/nuccore/AHC02893)

GO:0007189 : adenylate cyclase-activating G protein-coupled receptor signaling pathway (https://www.ebi.ac.uk/QuickGO/term/GO:0007189)
GO:2000252 : negative regulation of feeding behavior (https://www.ebi.ac.uk/QuickGO/term/GO:2000252)
GO:0097009 : energy homeostasis (https://www.ebi.ac.uk/QuickGO/term/GO:0097009)
GO:0006112 : energy reserve metabolic process (https://www.ebi.ac.uk/QuickGO/term/GO:0006112)

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)

Presumptive Null

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

Molecular Type

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

Aberration Type

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

Molecular Details of the Mutation

unknown in the species used in crosses but a strong coreelation of gene copy number is found with the phenotype in two closely related species

Experimental Evidence

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

Main Reference

Determination of onset of sexual maturation and mating behavior by melanocortin receptor 4 polymorphisms. (2010) (https://pubmed.ncbi.nlm.nih.gov/20869245)

Authors

Lampert KP; Schmidt C; Fischer P; Volff JN; Hoffmann C; Muck J; Lohse MJ; Ryan MJ; Schartl M

Abstract

Polymorphisms in reproductive strategies are among the most extreme and complex in nature. A prominent example is male body size and the correlated reproductive strategies in some species of platyfish and swordtails of the genus Xiphophorus. This polymorphism is controlled by a single Mendelian locus (P) that determines the onset of sexual maturity of males. Because males cease growth after reaching puberty, this results in a marked size polymorphism. The different male size classes show pronounced behavioral differences (e.g., courtship versus sneak mating), and females prefer large over small males. We show that sequence polymorphisms of the melanocortin receptor 4 gene (mc4r) comprise both functional and non-signal-transducing versions and that variation in copy number of mc4r genes on the Y chromosome underlies the P locus polymorphism. Nonfunctional Y-linked mc4r copies in larger males act as dominant-negative mutations and delay the onset of puberty. Copy number variation, as a regulating mechanism, endows this system with extreme genetic flexibility that generates extreme variation in phenotype. Because Mc4r is critically involved in regulation of body weight and appetite, a novel link between the physiological system controlling energy balance and the regulation of reproduction becomes apparent.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

@SexualTrait