GEPHE SUMMARY

Gephebase Gene
arginyl-transfer RNA synthetase (RARS) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^arginyl-transfer RNA synthetase (RARS)^#gephebase-summary-title)

GepheID
GP00002620

Entry Status
Published

Main curator
Courtier

PHENOTYPIC CHANGE

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

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

Trait State in Taxon A
Anolis cristatellus - forest and lower heat tolerance

Trait State in Taxon B
Anolis cristatellus - urban and higher heat tolerance

Ancestral State
Taxon A

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

Taxon A

Latin Name
Anolis cristatellus (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Anolis cristatellus^#gephebase-summary-title)

Common Name
-

Synonyms
Ctenonotus cristatellus; Anolis cristatellus Dumèril & Bibron, 1837; MCZ 8306; MCZ:8306

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Sauropsida; Sauria; Lepidosauria; Squamata; Bifurcata; Unidentata; Episquamata; Toxicofera; Iguania; Dactyloidae; Anolis

Parent
Anolis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 28376)

NCBI Taxonomy ID
38889 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 38889)

is Taxon A an Infraspecies?
No

Taxon B

Latin Name
Anolis cristatellus (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Anolis cristatellus^#gephebase-summary-title)

Common Name
-

Synonyms
Ctenonotus cristatellus; Anolis cristatellus Dumèril & Bibron, 1837; MCZ 8306; MCZ:8306

Rank
species

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Sauropsida; Sauria; Lepidosauria; Squamata; Bifurcata; Unidentata; Episquamata; Toxicofera; Iguania; Dactyloidae; Anolis

Parent
Anolis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 28376)

NCBI Taxonomy ID
38889 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 38889)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
RARS2

Synonyms
PCH6; ArgRS; RARSL; DALRD2; PRO1992

String
9606.ENSP00000358549 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=9606.ENSP00000358549)

Sequence Similarities
Belongs to the class-I aminoacyl-tRNA synthetase family.

GO - Molecular Function
GO:0005524 : ATP binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005524)
GO:0003723 : RNA binding (https://www.ebi.ac.uk/QuickGO/term/GO:0003723)
GO:0004814 : arginine-tRNA ligase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004814)

GO - Biological Process
GO:0032543 : mitochondrial translation

UniProtKB Homo sapiens
Q5T160 (http://www.uniprot.org/uniprot/Q5T160)

GenebankID or UniProtKB
()

(https://www.ebi.ac.uk/QuickGO/term/GO:0032543)
GO:0006420 : arginyl-tRNA aminoacylation
(https://www.ebi.ac.uk/QuickGO/term/GO:0006420)
GO:0006418 : tRNA aminoacylation for protein translation
(https://www.ebi.ac.uk/QuickGO/term/GO:0006418)

GO - Cellular Component

GO:0005739 : mitochondrion (https://www.ebi.ac.uk/QuickGO/term/GO:0005739)
GO:0005759 : mitochondrial matrix (https://www.ebi.ac.uk/QuickGO/term/GO:0005759)

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

C>G threonine>serine at amino acid residue 558 of the RARS gene = adjacent to a predicted protein-binding region22 (AA556â€“557). There are four non-synonymous polymorphic sites within RARS. Only one shows a significant difference in allele frequency between forest and urban habitats across all populations.

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	ACN	AGN	-
Amino-acid	Thr	Ser	558

Main Reference

Parallel selection on thermal physiology facilitates repeated adaptation of city lizards to urban heat islands. (2020) (https://pubmed.ncbi.nlm.nih.gov/32152530)

Authors

Campbell-Staton SC; Winchell KM; Rochette NC; Fredette J; Maayan I; Schweizer RM; Catchen J

Abstract

Only recently have we begun to understand the ecological and evolutionary effects of urbanization on species, with studies revealing drastic impacts on community composition, gene flow, behaviour, morphology and physiology. However, our understanding of how adaptive evolution allows species to persist, and even thrive, in urban landscapes is still nascent. Here, we examine phenotypic, genomic and regulatory impacts of urbanization on a widespread lizard, the Puerto Rican crested anole (Anolis cristatellus). We find that urban lizards endure higher environmental temperatures and display greater heat tolerance than their forest counterparts. A single non-synonymous polymorphism within a protein synthesis gene (RARS) is associated with heat tolerance plasticity within urban heat islands and displays parallel signatures of selection in cities. Additionally, we identify groups of differentially expressed genes between habitats showing elevated genetic divergence in multiple urban-forest comparisons. These genes display evidence of adaptive regulatory evolution within cities and disproportionately cluster within regulatory modules associated with heat tolerance. This study provides evidence of temperature-mediated selection in urban heat islands with repeatable impacts on physiological evolution at multiple levels of biological hierarchy.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS