

GEPHE SUMMARY

| | | | |
|--|----------------|------------|--------------|
| para (kdr) (<a +para+(kdr)+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=">https://www.gephebase.org/search-criteria?/and+Gene Gephebase="+para (kdr)+"#gephebase-summary-title) | Gephebase Gene | GP00002500 | GepheID |
| Published | Entry Status | Courtier | Main curator |

PHENOTYPIC CHANGE

| | | | |
|---|-----------------------------|---|-----------------------------|
| Physiology (<a +physiology+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Trait+Category=">https://www.gephebase.org/search-criteria?/and+Trait Category="+Physiology+"#gephebase-summary-title) | Trait Category | | |
| Xenobiotic resistance (insecticide) (<a +xenobiotic+resistance+(insecticide)+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Trait=">https://www.gephebase.org/search-criteria?/and+Trait="+Xenobiotic resistance (insecticide)+"#gephebase-summary-title) | Trait | | |
| Hyalella azteca | Trait State in Taxon A | | |
| Hyalella azteca - resistant individuals in species C | Trait State in Taxon B | | |
| Taxon A | Ancestral State | | |
| Intraspecific (<a +intraspecific+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=">https://www.gephebase.org/search-criteria?/and+Taxonomic Status="+Intraspecific+"#gephebase-summary-title) | Taxonomic Status | | |
| | Taxon A | | Taxon B |
| Hyalella azteca (<a +hyalella+azteca+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="+Hyalella azteca"#gephebase-summary-title) | Latin Name | Hyalella azteca (<a +hyalella+azteca+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="+Hyalella azteca"#gephebase-summary-title) | Latin Name |
| - | Common Name | - | Common Name |
| Hyalella azteca Saussure, 1858 | Synonyms | Hyalella azteca Saussure, 1858 | Synonyms |
| species | Rank | species | Rank |
| cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Crustacea; Multicrustacea; Malacostraca; Eumalacostraca; Peracarida; Amphipoda; Senticaudata; Talitrida; Talitroidea; Hyalellidae; Hyalella | Lineage | cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Crustacea; Multicrustacea; Malacostraca; Eumalacostraca; Peracarida; Amphipoda; Senticaudata; Talitrida; Talitroidea; Hyalellidae; Hyalella | Lineage |
| Hyalella () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=199487) | Parent | Hyalella () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=199487) | Parent |
| 294128 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=294128) | NCBI Taxonomy ID | 294128 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=294128) | NCBI Taxonomy ID |
| No | is Taxon A an Intraspecies? | No | is Taxon B an Intraspecies? |

GENOTYPIC CHANGE

| | | | |
|---|-------------------------|--|-----------------------------------|
| para | Generic Gene Name | P35500 (http://www.uniprot.org/uniprot/P35500) | UniProtKB Drosophila melanogaster |
| bas; bss; CG9907; Dmel\CG9907; DmNav; DmNav1; DmNa[[v]]; DmNa[[V]]; DmNa[[v]]1; l(1)14Da; l(1)ESH548; lincRNA.S9469; Nav1; Occl; olfD; par; sbl; sbl-1; Shu; Shudderer | Synonyms | () | GenebankID or UniProtKB |
| 7227.FBpp0303597 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=7227.FBpp0303597) | String | | |
| Belongs to the sodium channel (TC 1.A.1.10) family. Para subfamily. | Sequence Similarities | | |
| GO:0005509 : calcium ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005509) | GO - Molecular Function | | |
| GO:0005244 : voltage-gated ion channel activity (https://www.ebi.ac.uk/QuickGO/term/GO:0005244) | | | |
| GO:0005248 : voltage-gated sodium channel activity (https://www.ebi.ac.uk/QuickGO/term/GO:0005248) | | | |
| GO:0005272 : sodium channel activity | | | |

(<https://www.ebi.ac.uk/QuickGO/term/GO:0005272>)

GO - Biological Process

GO:0045433 : male courtship behavior, veined wing generated song production

(<https://www.ebi.ac.uk/QuickGO/term/GO:0045433>)

GO:0001666 : response to hypoxia (<https://www.ebi.ac.uk/QuickGO/term/GO:0001666>)

GO:0009612 : response to mechanical stimulus

(<https://www.ebi.ac.uk/QuickGO/term/GO:0009612>)

GO:0034765 : regulation of ion transmembrane transport

(<https://www.ebi.ac.uk/QuickGO/term/GO:0034765>)

GO:0035725 : sodium ion transmembrane transport

(<https://www.ebi.ac.uk/QuickGO/term/GO:0035725>)

GO:0007638 : mechanosensory behavior

(<https://www.ebi.ac.uk/QuickGO/term/GO:0007638>)

GO:0060078 : regulation of postsynaptic membrane potential

(<https://www.ebi.ac.uk/QuickGO/term/GO:0060078>)

GO - Cellular Component

GO:0005887 : integral component of plasma membrane

(<https://www.ebi.ac.uk/QuickGO/term/GO:0005887>)

GO:0001518 : voltage-gated sodium channel complex

(<https://www.ebi.ac.uk/QuickGO/term/GO:0001518>)

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

M918L in species C

Experimental Evidence

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

| | Taxon A | Taxon B | Position |
|------------|---------|---------|----------|
| Codon | ATG | - | - |
| Amino-acid | Met | Leu | 918 |

Main Reference

Unintentional exposure to terrestrial pesticides drives widespread and predictable evolution of resistance in freshwater crustaceans. (2018) (<https://pubmed.ncbi.nlm.nih.gov/29875816>)

Authors

Major KM; Weston DP; Lydy MJ; Wellborn GA; Poynton HC

Abstract

Pesticide runoff from terrestrial environments into waterways is often lethal to freshwater organisms, but exposure may also drive evolution of pesticide resistance. We analyzed the degree of resistance and molecular genetic changes underlying resistance in *Hyalella azteca*, a species complex of freshwater crustaceans inadvertently exposed to pesticide pollution via runoff. We surveyed 16 waterways encompassing most major watersheds throughout California and found that land use patterns are predictive of both pyrethroid presence in aquatic sediments and pyrethroid resistance in *H. azteca*. Nonsynonymous amino acid substitutions in the voltage-gated sodium channel including the M918L, L925I, or L925V confer resistance in *H. azteca*. The most frequently identified mutation, L925I, appears to be preferred within the species complex. The L925V substitution has been associated with pyrethroid resistance in another insect, but is novel in *H. azteca*. We documented a variety of pyrethroid resistance mutations across several species groups within this complex, indicating that pyrethroid resistance has independently arisen in *H. azteca* at least six separate times. Further, the high frequency of resistance alleles indicates that pesticide-mediated selection on *H. azteca* populations in waterways equals or exceeds that of targeted terrestrial pests. Widespread resistance throughout California suggests current practices to mitigate off-site movement of pyrethroids are inadequate to protect aquatic life from negative ecological impacts and implies the likelihood of similar findings globally.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

5 ([https://www.gephebase.org/search-criteria?/or+Gene Gephebase=~para \(kdr\)^/and+Taxon ID=~294128~/or+Gene Gephebase=~para \(kdr\)^/and+Taxon ID=~294128^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene Gephebase=~para (kdr)^/and+Taxon ID=~294128~/or+Gene Gephebase=~para (kdr)^/and+Taxon ID=~294128^#gephebase-summary-title))

EXTERNAL LINKS

COMMENTS

The L925I resistance allele was identified at high frequencies across three different species of *Hyalella azteca* (B, C and D).