U.S. Fish & Wildlife Service

California Roach (*Hesperoleucus symmetricus*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, December 2023
Revised, December 2024
Web Version, 9/24/2025

Organism Type: Fish
Overall Risk Assessment Category: Uncertain

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1 Native Range and Status in the United States

Native Range

From Baumsteiger and Moyle (2019):

"Individuals primarily occupy streams/rivers flowing into California's Central Valley, most of which are isolated to some degree."

From NatureServe (2025):

“The range of this species includes the Sacramento-San Joaquin river drainage in California, including the Pit River and tributaries to Goose Lake in Oregon.”

Status in the United States

From Baumsteiger and Moyle (2019):

“Individuals primarily occupy streams/rivers flowing into California’s Central Valley, most of which are isolated to some degree.”

From NatureServe (2025):

“The range of this species includes the Sacramento-San Joaquin river drainage in California, including the Pit River and tributaries to Goose Lake in Oregon.”

From Nico and Fuller (2023):

“[…] it has declined or disappeared from parts of its native range (the upper San Joaquin, Fresno, and Chowchilla river systems in central California) as a result of a combination of factors, one being predation by the introduced green sunfish *Lepomis cyanellus* (Moyle 1976b).”

From Baumsteiger and Moyle (2019):

“Today CA [California] Roach are absent from many streams as the result of habitat change and invasions of alien predators. For example, Moyle & Nichols (1973) and Brown & Moyle (1993) found they were absent from the Fresno River (Fresno Co.) and other tributaries to the San Joaquin River. They were also once common in the mainstem San Joaquin River but are absent today. Moyle (2002) documented their consistent presence in the river at Friant (Fresno Co.) until the construction of Friant Dam in the 1940s. CA Roach are absent from most of their historic range in the Cosumnes River watershed due to the invasion of piscivorous Redeye Bass, *Micropterus coosae* (Moyle et al. 2003). In the upper Yuba River watershed, they are largely absent as the result of 19th century hydraulic mining, with the exception of one small tributary to the South Fork Yuba, Kentucky Ravine (Gard & Randall 2004).”

“The range of CA Roach has also been expanded, […] For example, Hetch-Hetchy Reservoir (1,162 m) on the upper Tuolumne River, well above a series of natural barriers, supports a large pelagic population [of *Hesperoleucus symmetricus*] (P. Moyle, unpublished observations). This is unusual because CA Roach do not generally live in reservoirs, especially those with predatory fishes. Interestingly, individuals from this location were found to be admixed with Hitch [*Lavinia exilicauda*] (Baumsteiger et al. 2017), a factor which may explain their persistence. Soquel Creek and the Cuyama River in southern California support presumed introduced populations, although their origins are also uncertain (Moyle 2002).”

No records of sale or aquarium trade were found in the United States.

Regulations

No species-specific regulations on possession or trade were found within the United States.

Means of Introductions within the United States

From Baumsteiger and Moyle (2019):

"The range of CA Roach has also been expanded, presumably through 'bait bucket' introductions by anglers."

Remarks

Hesperoleucus symmetricus is part of a species complex. Baumsteiger and Moyle (2019) distinguished four different species with four subspecies based on genetic relationships. This redefinition has been recognized by Fricke et al. (2025), the chosen taxonomic authority for fishes as defined in Ecological Risk Summary Standard Operating Procedure (USFWS 2024). However, the redefinition has resulted in some information published under the name *Hesperoleucus symmetricus* prior to 2019 now pertaining to other, valid species. We have made an effort to distinguish which information is still pertinent to *Hesperoleucus symmetricus* as currently recognized. The historic range of the species complex spanned much of California, but this species as currently understood has a range restricted to part of the eastern Central Valley of California. Populations in coastal drainages belonging to distinct separate species (Baumsteiger and Moyle 2019; see figure 3 below).

From Baumsteiger and Moyle (2019):

"In fact, Baumsteiger *et al.* found every sample location of CA Roach within our study was distinctive, including support for a new subspecies and a distinct population segment (see below). Baumsteiger *et al.* (2017) also found California Roach from the Central Valley to be genomically distinct from those along the coast. All analyses show a clear break between these two species. Our conclusion is CA Roach [*Hesperoleucus symmetricus*] *sensu stricto* should be limited to individuals from Central Valley drainages and the following formal description reflects this new delineation."

An introduction resulting in establishment of a population in the Eel River in northern California was originally reported as *Hesperoleucus symmetricus* (Nico and Fuller 2023) but under the new species delineations, this population is now more appropriately assigned to *H. venustus navarroensis* (Baumsteiger and Moyle 2019). Nico and Fuller (2023) also report a status of 'established' for introduction records in Oregon but these locations are now more appropriately assigned to *Hesperoleucus mitrulus* (Baumsteiger and Moyle 2019; GBIF Secretariat 2023).

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2023):

Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Actinopterygii
Class Teleostei
Superorder Ostariophysi
Order Cypriniformes
Superfamily Cyprinoidea
Family Leuciscidae
Subfamily Laviniinae
Genus *Hesperoleucus*
Species *Hesperoleucus symmetricus* (Baird and Girard in Girard, 1854)

According to Fricke et al. (2025), *Hesperoleucus symmetricus* (Baird & Girard 1854) is the current accepted name for this species.

The following synonyms of *Hesperoleucus symmetricus* from ITIS (2023) and Fricke et al. (2025) were used to search for information for this report: *Lavinia symmetricus* (Baird and Girard, 1854), *Pogonichthys symmetricus* (Baird and Girard in Girard, 1854), and *Hesperoleucus symmetricus symmetricus*.

Size, Weight, and Age Range

From Froese and Pauly (2023):

"Max length : 11.0 cm TL [total length] male/unsexed; [Page and Burr 1991]; common length : 8.3 cm TL male/unsexed; [Hugg 1996]; max. reported age: 5 years [Moyle 1976]"

Environment

From Froese and Pauly (2023):

"Freshwater; demersal."

"Inhabits rocky pools of headwaters, creeks and small to medium rivers [Page and Burr 2011]."

From Baumsteiger and Moyle (2019):

"[…] they are relatively intolerant of saline waters […]"

From Nico and Fuller (2023):

“The California Roach can survive where most other fishes cannot because of their small size and tolerance of low oxygen levels and high temperatures.”

Climate

From Froese and Pauly (2023):

“Temperate; 43°N - 35°N”

Distribution Outside the United States

Native

This species’ native range is wholly within the United States, see section 1.

Introduced

No records were found of introduction of *Hesperoleucus symmetricus* in the wild outside the United States.

Means of Introduction Outside the United States

No records were found of introduction of *Hesperoleucus symmetricus* in the wild outside the United States.

Short Description

From Baumsteiger and Moyle (2019):

“CA Roach (*H. symmetricus*) are small, stout-bodied cyprinids with narrow caudal peduncles and deeply forked tails. Adult individuals usually have total lengths less than 100 mm, although fish up to 150 mm TL have been observed (Moyle 2002). The head is large and conical, with large eyes and a mouth that is slightly sub-terminal and slants downward. Individuals in some locations, especially those in streams of the Sierra Nevada, develop a keratinous plate on the lower jaw, referred to as a “chisel lip”. The dorsal fin is short (8–10 rays) and is positioned behind the insertion point of the pelvic fin while the anal fin is also short, with 7–9 rays. Pharyngeal teeth (0,5,4,0) have curved tips, which overhang grinding surfaces of moderate size. CA Roach are dark on the upper half of their bodies, ranging from a shadowy gray to a steel blue, while the lower half of the body is much lighter, usually a dull white/silver color. Scales are small, numbering 47–62 along the lateral line.”

Biology

From Baumsteiger and Moyle (2019):

“Individuals tend to exhibit general (non-nuptial) sexual dimorphism (Snyder 1908; Murphy 1943). California Roach are highly variable in most of their characteristics across their range. Brown et al. (1992) measured 14 morphometric variables from eight watersheds around the San

Joaquin Valley, including the southern end of the range […]. Using these variables, a discriminant analysis correctly assigned 76% of the individuals to the watershed from which they were collected, suggesting locations were sufficiently isolated from one another to have local adaptations or phenotypic divergence."

From NatureServe (2025):

"Spawns in schools, mainly March-June. Adhesive eggs hatch in 2-3 days. Sexually mature by about the second year, probably earlier in some populations. Lifespan usually 3 years or less."

"Feeds mainly on filamentous algae; also eats aquatic insects and small crustaceans. Winter diet consists of diatoms and other unicellular algae (Moyle et al. 1989). Primarily a bottom feeder but occasionally takes terrestrial insects and water striders from the surface of the water (Moyle 1976)."

Human Uses

From Nico and Fuller (2023):

"Populations in the Cuyama River, California are presumably the result of bait-bucket introduction (Moyle 1976)."

Diseases

No information was found associating *Hesperoleucus symmetricus* with any diseases listed by the World Organisation for Animal Health (2023).

According to Poelen et al. (2014), *Hesperoleucus symmetricus* has been documented as a host of *Gyrodactylus navarroensis*, *Gyrodactylus brevis*, and *Trichodina hesperoleuca*.

Threat to Humans

From Froese and Pauly (2023):

"Harmless"

3 Impacts of Introductions

No information on impacts from introductions was available from introduced populations still assigned to *Hesperoleucus symmetricus*.

The following information, though reported using the name *H. symmetricus*, comes from a population now assigned to *H. venustus navarroensis*. It is presented here as an indication of potential impacts of *H. symmetricus* but was not factored into the classification of the History of Invasiveness (see section 4).

From Power (1992):

"Predation by fish (roach, *Hesperoleucus symmetricus*, and steelhead *Oncorhynchus mykiss*) produced strong cascading effects on biota associated with boulder- bedrock substrates in pools of a northern California river, but not on gravel-dwelling biota. Enclosure-exclosure experiments in the South Fork Eel River of northern California (39044' N, 123039' W) showed that fish, by suppressing densities of damselfly nymphs and other small predators, released algivorous chironomids (*Pseudochironomus richardsoni*) from predation. Chironomids in turn dramatically reduced algal standing crops. In contrast, fish had little effect on algae or invertebrates associated with gravel. Gravel-dwelling heptageniid mayflies were behaviorally inhibited from using tops of stones in fish enclosures, and stone surfaces had more chironomid tubes in fish enclosures than in fish exclosures. However, no effects on epilithic algae or densities of invertebrates comparable to those of biota on boulder-bedrock substrates were detected."

4 History of Invasiveness

The History of Invasiveness for *Hesperoleucus symmetricus* is classified as Data Deficient. Records of at least one introduced population of *H. symmetricus* were found. It was introduced upstream of a natural barrier to fish passage, most likely through bait bucket release. No information on impacts from that introduction were found.

5 Global Distribution

Figure 1. Known global distribution of *Hesperoleucus symmetricus*. Observations are reported from central and northern California. Map from GBIF Secretariat (2023). Observations reported outside the current understanding of the species range (see figure 3) were not used for the climate matching analysis as those populations are now assigned to separate, valid species (Baumsteiger and Moyle 2019).

6 Distribution Within the United States

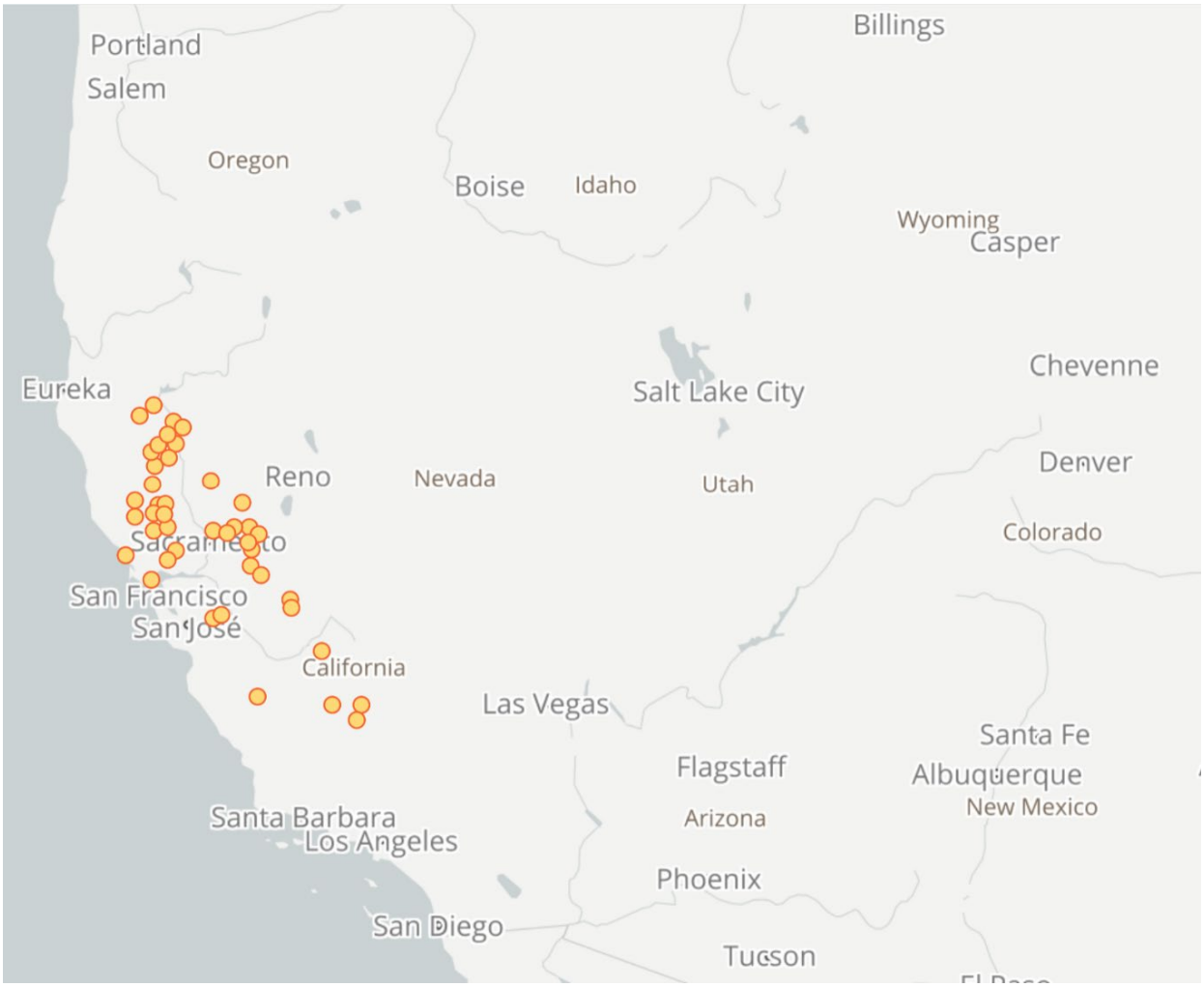

Figure 2. Reported distribution of *Hesperoleucus symmetricus* in the United States. Map from GBIF US (2025). Observations are reported in California. Observations reported outside the current understanding of the species range (see figure 3) were not used for the climate matching analysis as those populations are now assigned to separate, valid species (Baumsteiger and Moyle 2019).

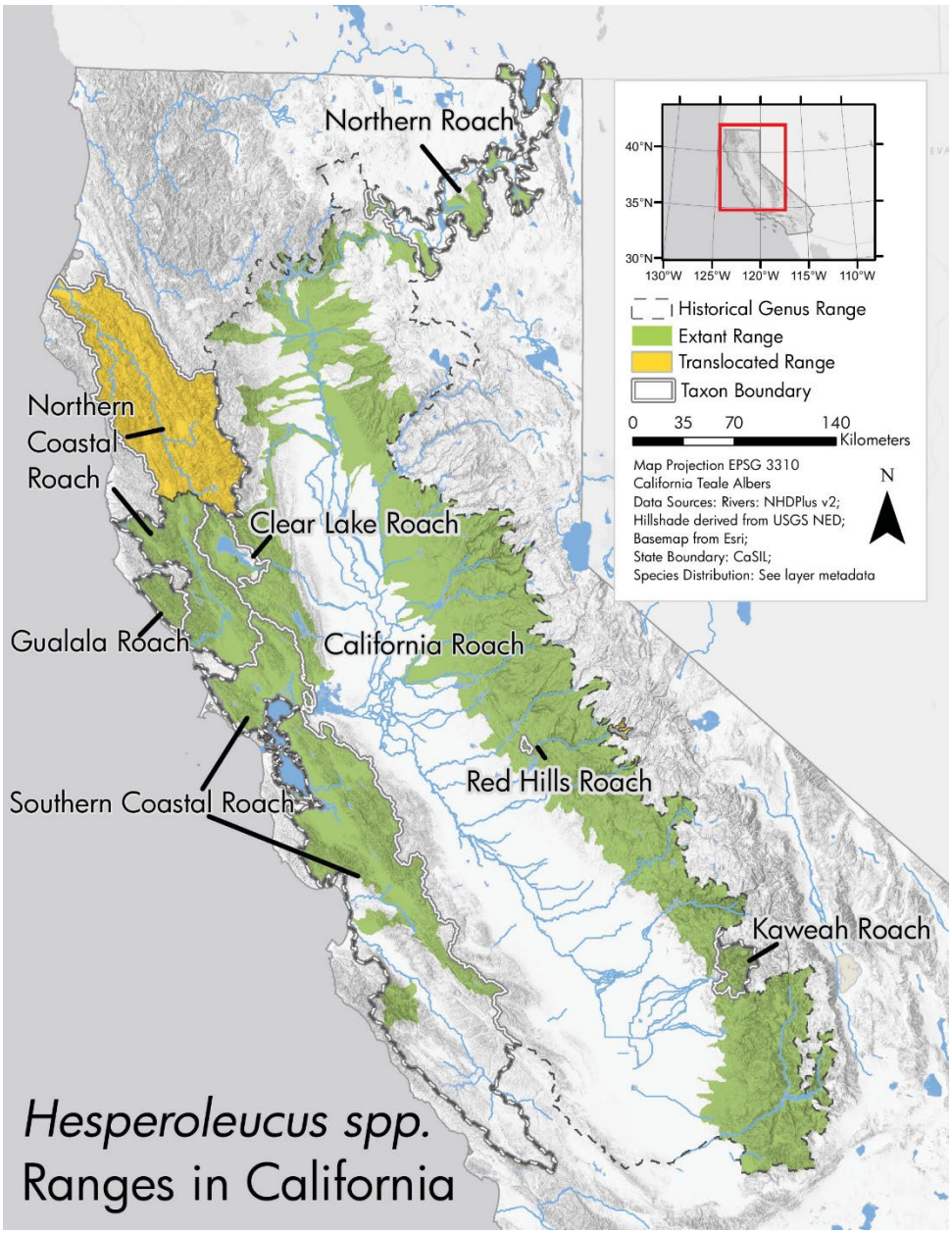

Figure 3. Ranges of species within the *Hesperoleucus* species complex. The range of *Hesperoleucus symmetricus*, California Roach, is indicated along the western edge of the Sierra Nevada Range. Map from Baumsteiger and Moyle (2019; figure 1), licensed under CC BY 3.0.

7 Climate Matching

Summary of Climate Matching Analysis

The climate matching analysis for *Hesperoleucus symmetricus* to the contiguous United States found high match across much of California and the Western Mountains region. This area includes the native range of the species. Areas of low climate match were found across most of the eastern half of the contiguous United States. Areas of medium match were found in the Southwest, the Colorado Plateau and the western Great Plains. The overall Climate 6 score

(Sanders et al. 2023; 16 climate variables; Euclidean distance) for the contiguous United States was 0.158, indicating that Yes, there is establishment concern for this species outside its native range. The Climate 6 score is calculated as: (count of target points with scores ≥ 6)/(count of all target points). Establishment concern is warranted for Climate 6 scores greater than or equal to 0.002 based on an analysis of the establishment success of 356 nonnative aquatic species introduced to the United States (USFWS 2024).

Projected climate matches in the contiguous United States under future climate scenarios are available for *Hesperoleucus symmetricus* (see Appendix). These projected climate matches are provided as additional context for the reader; future climate scenarios are not factored into the Overall Risk Assessment Category.

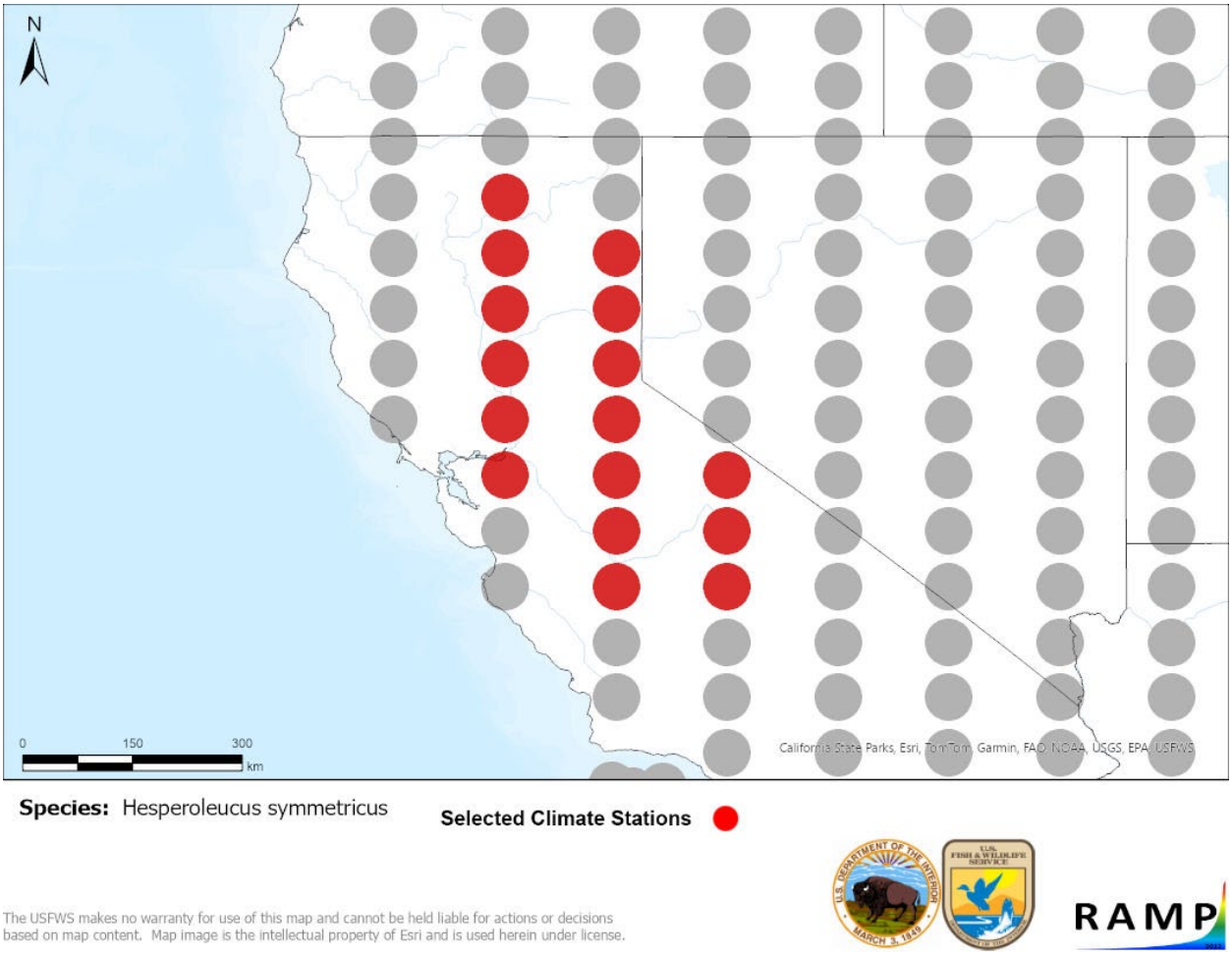

Figure 4. RAMP (Sanders et al. 2023) source map showing weather stations from central and northern California (red; California) and non-source locations (gray) for *Hesperoleucus symmetricus* climate matching. Source locations are from Baumsteiger and Moyle (2019) and GBIF Secretariat (2023). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

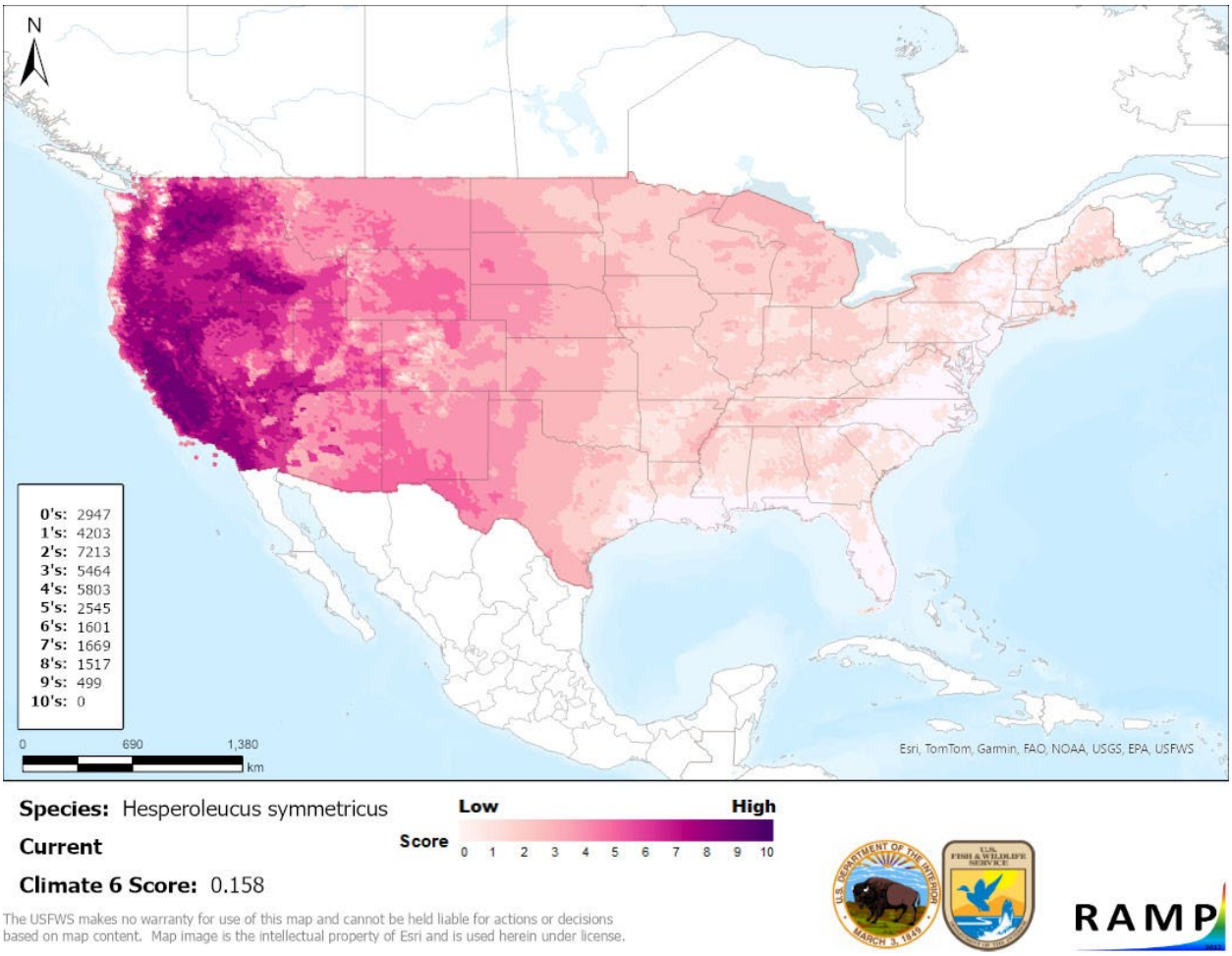

Figure 5. Map of RAMP (Sanders et al. 2023) climate matches for *Hesperoleucus symmetricus* in the contiguous United States based on source locations reported by Baumsteiger and Moyle (2019) and GBIF Secretariat (2023). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

8 Certainty of Assessment

The Certainty of Assessment for *Hesperoleucus symmetricus* is classified as Low. There was information available regarding the biology, distribution, and introduction history of this species. The *Hesperoleucus symmetricus* species complex recently underwent a taxonomic restructuring resulting in four distinct species. Effort was made to identify information that was only pertinent to *Hesperoleucus symmetricus* sensu stricto. However, there may be information in the assessment that is derived from other species in the complex. This may have an impact on known introductions and understanding the current range of the species.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Hesperoleucus symmetricus, California Roach, is a freshwater fish that is native to central California and found in the upper Sacramento-San Joaquin River drainages. *H. symmetricus* is found in small and medium rivers, creeks, and headwaters with rocky bottoms. It may sometimes be used as a bait fish by anglers. No information was found indicating the presence of *H. symmetricus* in the aquarium trade. The History of Invasiveness for *H. symmetricus* is classified as Data Deficient due to record of an established population that is presumed to be introduced but a lack of impact information. The climate matching analysis for the contiguous United States indicates establishment concern for this species outside its native range. The climate matching analysis found high match in the Pacific Coast States, including the native range, and other areas of the Western Mountains. The Certainty of Assessment for this ERSS is classified as Low due to the recent taxonomic restructuring of the species complex to which *H. symmetricus* belongs; some information available on *H. symmetricus* may actually be relevant to one of the newly elevated species and not *H. symmetricus* sensu stricto. The Overall Risk Assessment Category for *Hesperoleucus symmetricus* in the contiguous United States is Uncertain.

Assessment Elements

- **History of Invasiveness (see Section 4): Data Deficient**
- **Establishment Concern (see Section 7): Yes**
- **Certainty of Assessment (see Section 8): Low**
- **Remarks, Important additional information: Part of a species complex with recent taxonomic restructuring.**
- **Overall Risk Assessment Category: Uncertain**

10 Literature Cited

Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in section 11.

Baumsteiger J, Moyle P. 2019. A reappraisal of the California roach/hitch (Cypriniformes, Cyprinidae, *Hesperoleucus*/*Lavinia*) species complex. Zootaxa 4543(2):221.

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11 Literature Cited in Quoted Material

Note: The following references are cited within quoted text within this ERSS, but were not accessed for its preparation. They are included here to provide the reader with more information.

Baumsteiger J, Moyle PB, Aguilar A, O'Rourke SM, Miller MR. 2017. Genomics clarifies taxonomic boundaries in a difficult species complex. PloS One 12(12):e0189417.

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Appendix

Summary of Future Climate Matching Analysis

Future climate projections represent two Shared Socioeconomic Pathways (SSP) developed by the Intergovernmental Panel on Climate Change (IPCC 2021): SSP5, in which emissions triple by the end of the century; and SSP3, in which emissions double by the end of the century. Future climate matches were based on source locations reported by Baumsteiger and Moyle (2019) and GBIF Secretariat (2023).

Under the future climate scenarios (figure A1), on average, high climate match for *Hesperoleucus symmetricus* was projected to occur in California. Areas of low climate match were projected to occur in the Appalachian Range, Great Lakes, Gulf Coast, Mid-Atlantic, Northeast, Southeast, Southern Atlantic Coast, Southern Florida, and Southern Plains regions of the contiguous United States. The Climate 6 scores for the individual future scenario models (figure A2) ranged from a low of 0.065 (model: UKESM1-0-LL, SSP5, 2085) to a high of 0.166 (model: MPI-ESM1-2-HR, SSP5, 2085). All future scenario Climate 6 scores were above the Establishment Concern threshold, indicating that Yes, there is establishment concern for this species under future scenarios. The Climate 6 score for the current climate match (0.158, figure 5) falls within the range of scores for future projections. The time step and climate scenario with the most change relative to current conditions was SSP5, 2085, the most extreme climate change scenario. Under multiple time step and climate scenarios, areas within the Southwest saw moderate to large increases in climate match relative to current conditions. Under one or more time step and climate scenarios, areas within California and the Great Basin saw a large decrease in the climate match relative to current conditions. Additionally, areas within the Appalachian Range, Colorado Plateau, Mid-Atlantic, Northern Pacific Coast, Southeast, Southwest, and Western Mountains saw a moderate decrease in the climate match relative to current conditions. Additional, very small areas of large or moderate change may be visible on the maps (figure A3).

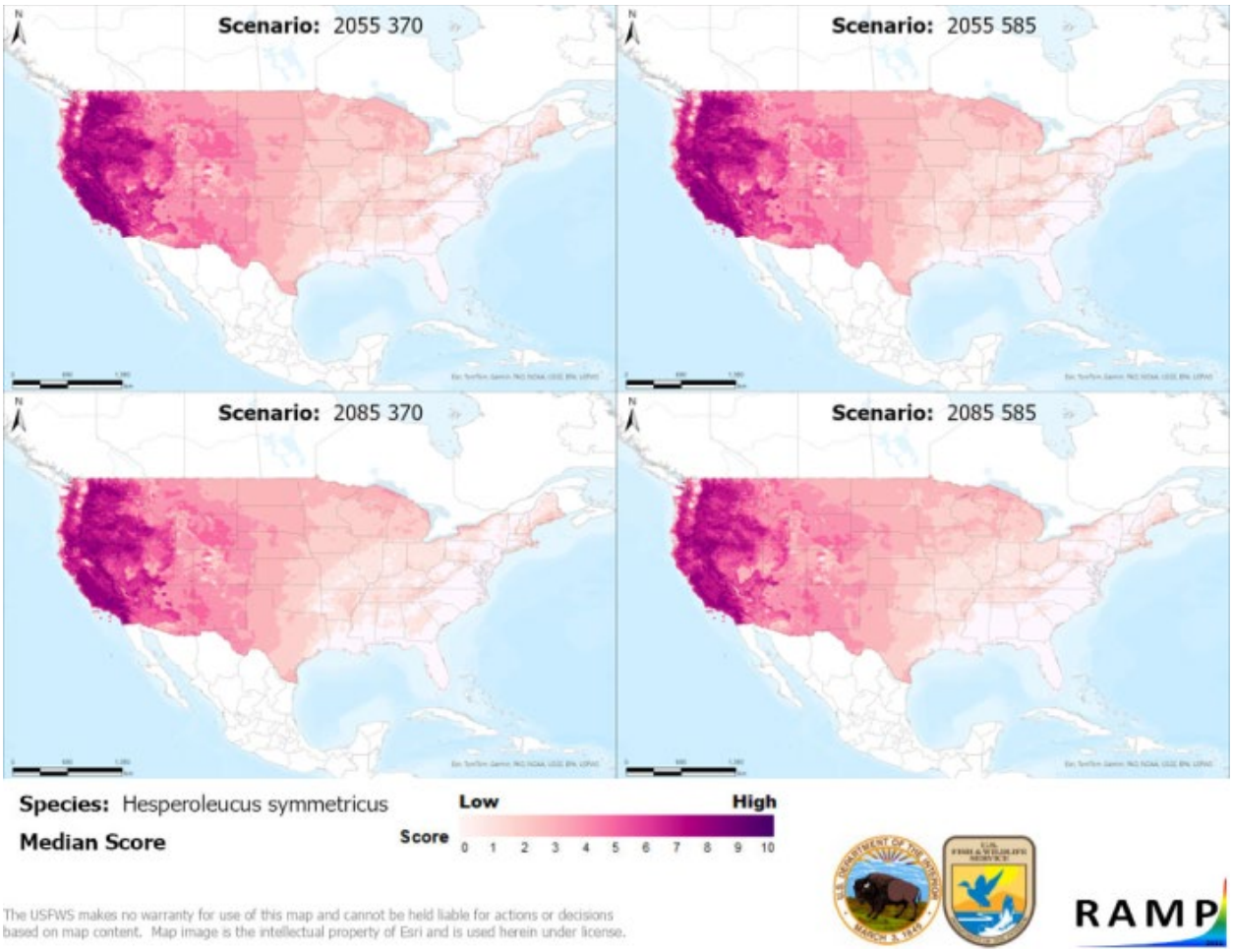

Figure A1. Maps of median RAMP (Sanders et al. 2023) climate matches projected under potential future climate conditions using five global climate models for *Hesperoleucus symmetricus* in the contiguous United States. Climate matching is based on source locations reported by Baumsteiger and Moyle (2019) and GBIF Secretariat (2023). Shared Socioeconomic Pathways (SSPs) used (from left to right): SSP3, SSP5 (IPCC 2021). Time steps: 2055 (top row) and 2085 (bottom row). Climate source data from CHELSA (Karger et al. 2017, 2018); global climate models used: GFDL-ESM4, UKESM1-0-LL, MPI-ESM1-2-HR, IPSL-CM6A-LR, and MRI-ESM2-0. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

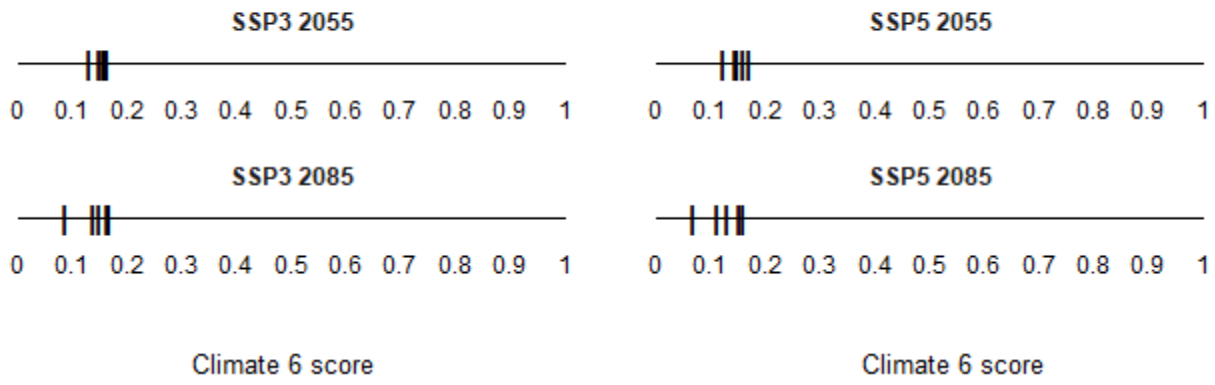

Figure A2. Comparison of projected future Climate 6 scores for *Hesperoleucus symmetricus* in the contiguous United States for each of five global climate models under four combinations of Shared Socioeconomic Pathway (SSP) and time step. SSPs used (from left to right): SSP3, SSP5 (Karger et al. 2017, 2018; IPCC 2021). Time steps: 2055 (top row) and 2085 (bottom row). Climate source data from CHELSA (Karger et al. 2017, 2018); global climate models used: GFDL-ESM4, UKESM1-0-LL, MPI-ESM1-2-HR, IPSL-CM6A-LR, and MRI-ESM2-0.

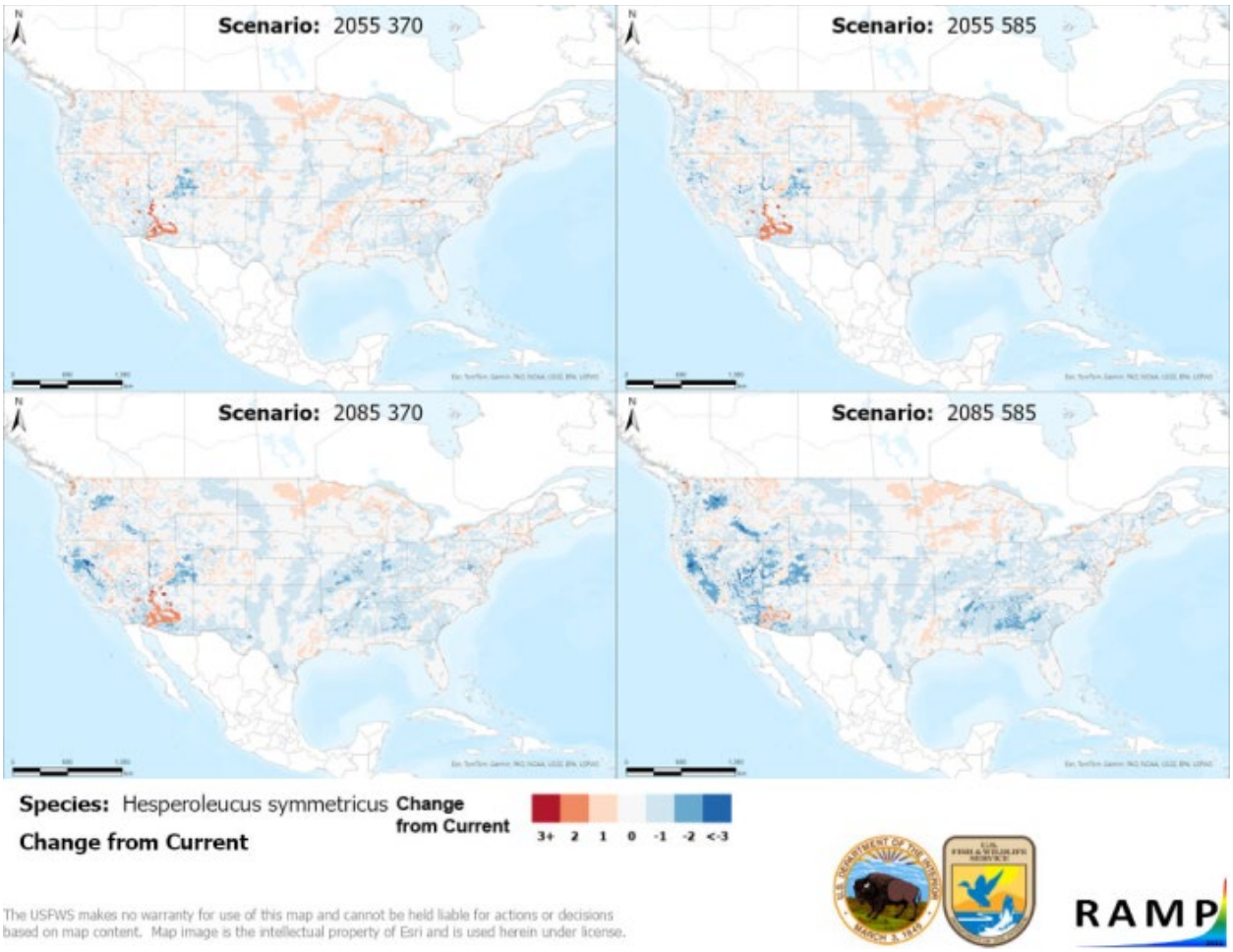

Figure A3. RAMP (Sanders et al. 2023) maps of the contiguous United States showing the difference between the current climate match target point score (figure 5) and the median target point score for future climate scenarios (figure A1) for *Hesperoleucus symmetricus* based on source locations reported by Baumsteiger and Moyle (2019) and GBIF Secretariat (2023). Shared Socioeconomic Pathways (SSPs) used (from left to right): SSP3, SSP5 (IPCC 2021). Time steps: 2055 (top row) and 2085 (bottom row). Climate source data from CHELSA (Karger et al. 2017, 2018); global models used: GFDL-ESM4, UKESM1-0-LL, MPI-ESM1-2-HR, IPSL-CM6A-LR, and MRI-ESM2-0. Shades of blue indicate a lower target point score under future scenarios than under current conditions. Shades of red indicate a higher target point score under future scenarios than under current conditions. Darker shades indicate greater change.

Literature Cited

Baumsteiger J, Moyle P. 2019. A reappraisal of the California Roach/Hitch (Cypriniformes, Cyprinidae, *Hesperoleucus*/*Lavinia*) species complex. Zootaxa 4543(2):221.

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