Crested Ramshorn (*Drepanotrema kermatoides*)
Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, February 2023
Revised, May 2023
Web Version, 5/22/2024

Organism Type: Mollusk
Overall Risk Assessment Category: Uncertain

Image: Rumi A, Gutiérrez Gregoric DE, Andrea Roche M. Used under CC BY-NC 3.0. Available: https://www.scielo.sa.cr/scielo.php?pid=S0034-77442007000200017&script=sci_arttext&tlng=en#fig1 (February 2023).

1 Native Range and Status in the United States

Native Range

From Daniel and Morningstar (2023):

"Caribbean region, Central America and South America"

From Cózatl-Manzano and Naranjo-García (2007):

"*Drepanotrema kermatoides* inhabits […] Mexico, Central America, Venezuela, Peru, Brazil and Lesser Antilles (Burch, 1989) at Brazil from Rio Grande do Sul and Matto Grosso (Paraense, 1975), it is also found in Peru (Paredes et al., 1999), Uruguay (Scarabino, 2004) and Argentina (Paraense, 2005; Gutiérrez Gregoric et al., 2006)."

Status in the United States

From Daniel and Morningstar (2023):

"South Laguna Madre, Texas (Turgeon et al. 1998) and Lower Aransas River, Texas (Ohio State University Mollusk specimen-20353)"

"The current status of the introduced populations are unknown."

No records of *Drepanotrema kermatoides* in trade in the United States were found.

Regulations

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

Means of Introductions within the United States

From Daniel and Morningstar (2023):

"Unknown, but likely a hitchhiker with aquatic plants (macrophytes)."

Remarks

From Paraense (2003):

"[…] the presence of D. *kermatoides* outside South America needs confirmation on anatomical grounds."

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From ITIS (2023):

Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Protostomia
Superphylum Lophozoa
Phylum Mollusca
Class Gastropoda
Order Basommatophora
Family Planorbidae
Genus *Drepanotrema*
Species *Drepanotrema kermatoides* (d'Orbigny, 1835)

According to MolluscaBase editors (2023), *Drepanotrema kermatoides* is the current valid name for this species.

The following synonyms of *Drepanotrema kermatoides* from MolluscaBase editors (2023) were used to search for information for this report: *Planorbis kermatoides.*

Size, Weight, and Age Range

From Paraense and Deslandes (1958):

"The greatest dimensions so far recorded […] (diameter X height): [*Drepanotrema*] *kermatoides*, 13 X 1.75 mm.; […]."

Environment

From Daniel and Morningstar (2023):

"Most often found in streams and rivers (Rumi et al. 2004), the species shows a high tolerance to environmental stress, including low dissolved oxygen environments (Rumi et al. 2007). *Drepanotrema kermatoides* are limited by saltwater (Vivar et al. 1996)."

Climate

No information was found on climate used by *Drepanotrema kermatoides*.

Distribution Outside the United States

Native

From Daniel and Morningstar (2023):

"Caribbean region, Central America and South America"

From Cózatl-Manzano and Naranjo-García (2007):

"*Drepanotrema kermatoides* inhabits […] Mexico, Central America, Venezuela, Peru, Brazil and Lesser Antilles (Burch, 1989) at Brazil from Rio Grande do Sul and Matto Grosso (Paraense, 1975), it is also found in Peru (Paredes et al., 1999), Uruguay (Scarabino, 2004) and Argentina (Paraense, 2005; Gutiérrez Gregoric et al., 2006)."

Introduced

No records were found of introduction of *Drepanotrema kermatoides* in the wild outside the United States.

Means of Introduction Outside the United States

No records were found of introduction of *Drepanotrema kermatoides* in the wild outside the United States.

Short Description

From Daniel and Morningstar (2023):

"*Drepanotrema kermatoides*' shell is extremely flat with multiple whorls making a spiral. The shell has numerous close-set, low spiral ridges (lirae) (Thorp and Covich 2010)."

From Ovando and Marchi (2021):

“Shell with 5½–6 whorls; basal side slightly convex; periphery of the body whorl with carina, tending to be on the left side. Aperture falciform, longer than wide; inner peristomal lip convex, slightly depressed, and oblique; external peristomal lip almost straight […]. Reproductive system: penis complex with two very short flagella in proportion to the sheath at the insertion of the vas deferens […].”

Biology

From Daniel and Morningstar (2023):

“*Drepanotrema kermatoides* are pulmonate snails, which means that they have lungs rather than gills, and they are hermaphroditic. They become mature at year one for 60-80% of the population (Rumi et al. 2007). Reproduction occurs over most of the year in the snail's native range (Rumi et al. 2004, Rumi et al. 2007).”

“*Drepanotrema kermatoides* have been observed to have an affinity for free-floating macrophytes (Rumi et al. 2007).”

From Negrete et al. (2007):

“[*Drepanotrema kermatoides* and *Biomphalaria peregrina*] are associated with macrophytes of lentic or semilentic environments. They are more frequently observed in semipermanent low-depth environments with vegetation and abundant organic matter (Bonetto et al., 1990).”

Human Uses

No information was found on human uses of *Drepanotrema kermatoides*.

Diseases

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

From Veitenheimer-Mendes and Marques de Almeida Caon (1989):

“*Drepanotrema kermatoides* (Orbigny, 1835) (Mollusca, Planorbidae), host of a paramphistomid (Trematoda), in Rio Grande do Sul, Brazil - Morphological descriptions and illustrations of the redia, the imature cercaria and mature cercaria, and encysted metacercaria, found in a [sic] infected specimen of *Drepanotrema kermatoides* (Orbigny, 1835) are presented. […] These larval stages probably are part of a cycle of a rumen parasite of the genus *Paramphistomum* (Fischoeder, 1901).”

Threat to Humans

No information was found on threats to humans from *Drepanotrema kermatoides*.

3 Impacts of Introductions

No information available on impacts of introductions.

4 History of Invasiveness

The History of Invasiveness for *Drepanotrema kermatoides* is classified as No Known Nonnative Population. While this species has been reported from Texas, it could not be determined if these reports resulted in an established population. No impacts of this species' introduction have been reported. No information could be found pertaining to trade of *D. kermatoides.*

5 Global Distribution

Figure 1. Reported global distribution of *Drepanotrema kermatoides*. Map from GBIF Secretariat (2022). Observations are reported from Argentina, Peru, Bolivia, and Brazil. The locations in Bolivia could not be confirmed as established populations and were not used to select source locations for the climate matching analysis.

An additional occurrence of *D. kermatoides* in Mexico, provided by Cózatl-Manzano and Naranjo-García (2007) was used in selecting source locations for the climate matching analysis. No georeferenced occurrences were available for portions of the native range of *D. kermatoides* in Central America and the Caribbean.

6 Distribution Within the United States

Figure 2. Reported distribution of *Drepanotrema kermatoides* in the United States. Map from Daniel and Morningstar (2023). Observations are reported from South Laguna Madre and the Lower Aransas River, Texas. No information is available about whether the occurrences of *Drepanotrema kermatoides* in Texas represents established populations and therefore these occurrences were not used to select source locations for the climate matching analysis.

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Drepanotrema kermatoides* was highest in the southern and eastern contiguous United States. An area of high match stretched from Texas, along the Gulf Coast, and up the Atlantic Coast as far north as New Jersey. Smaller areas of high match were also found in the Southwest along the border with Mexico, in the central Appalachian Mountains, and in a band stretching from southwestern Missouri through Oklahoma into central Texas. The climate match was low in most areas of the northern and western States. The overall Climate 6 score (Sanders et al. 2023; 16 climate variables; Euclidean distance) for the contiguous United States was 0.373, indicating that Yes, there is establishment concern for this species. 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).

The climate matching analysis for *D. kermatoides* may underestimate the climate match to the contiguous United States because georeferenced occurrences were missing for significant portions of the native range as described by Daniel and Morningstar (2023). However, there is also uncertainty within the literature about the actual extent of the native range (see Remarks).

Projected climate matches in the contiguous United States under future climate scenarios are available for *Drepanotrema kermatoides* (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.

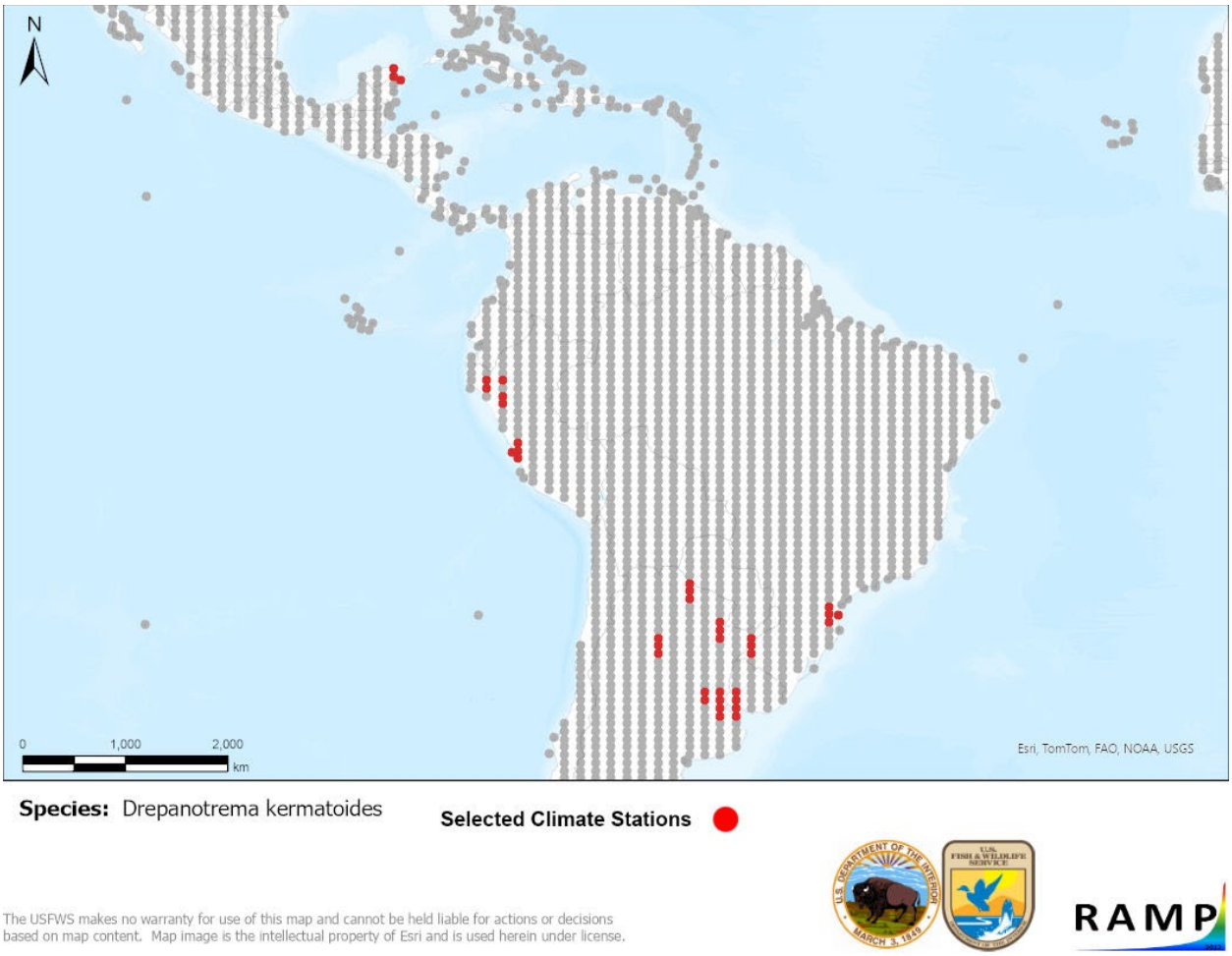

Figure 3. RAMP (Sanders et al. 2023) source map showing weather stations in North and South America selected as source locations (red; Mexico, Argentina, Uruguay, Peru, Brazil) and non-source locations (gray) for *Drepanotrema kermatoides* climate matching. Source locations from GBIF Secretariat (2022) and Cózatl-Manzano and Naranjo-García (2007). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

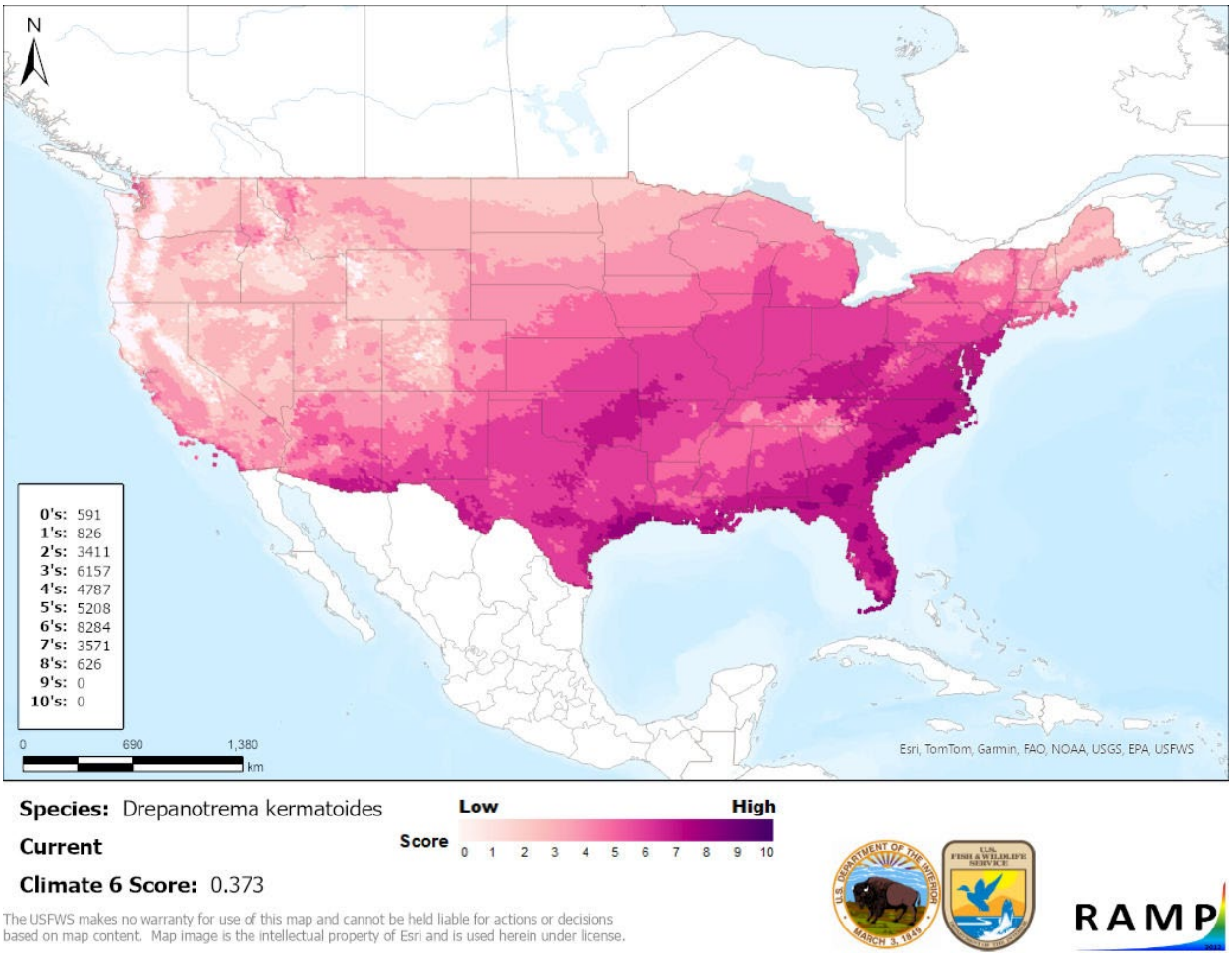

Figure 4. Map of RAMP (Sanders et al. 2023) climate matches for *Drepanotrema kermatoides* in the contiguous United States based on source locations reported by GBIF Secretariat (2022) and Cózatl-Manzano and Naranjo-García (2007). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

8 Certainty of Assessment

The Certainty of Assessment for *Drepanotrema kermatoides* is classified as Low. This species has been reported as introduced outside of its native range, but no information on negative impacts of its introduction have been reported; therefore, there is limited information on which an assessment of risk can be based. The status of the population of *D. kermatoides* in Texas in unknown. The relatively small number of species occurrence points are an incomplete representation of the species' range and add uncertainty to the climate match, as does the suggestion in the literature that the native range may not extend as far north as commonly described.

9 Risk Assessment

Summary of Risk to the Contiguous United States

Drepanotrema kermatoides, the Crested Ramshorn, is a snail that is native to South America, Central America, and the Caribbean, although its native status outside of South America has been questioned. This is a small aquatic snail species that lives in association with aquatic macrophytes in lentic environments. This species is not available in trade, and no regulations on its trade could be found. There are two records of *D. kermatoides* in Texas from 1949 and 1968, but the status of its population in the United States is unknown, and more recent records of its presence could not be found. The History of Invasiveness for *D. kermatoides* is classified as No Known Nonnative Population due to the lack of confirmed introductions, information on impacts of introduction, and trade history. The climate matching analysis for the contiguous United States indicates establishment concern for this species, with high matching being located in Southern and Eastern States. The Certainty of Assessment for this ERSS is classified as Low due to a lack of information on introductions, impacts, and trade, and uncertainty around the source points for the climate matching analysis. The Overall Risk Assessment Category for *D. kermatoides* in the contiguous United States is Uncertain.

Assessment Elements

- **History of Invasiveness (see section 4): No Known Nonnative Population**
- **Establishment Concern (see section 7): Yes**
- **Certainty of Assessment (see section 8): Low**
- **Remarks, Important additional information: None**
- **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.

Cózatl-Manzano R, Naranjo-García E. 2007. First records of freshwater molluscs from the ecological reserve El Edén, Quintana Roo, Mexico. Revista Mexicana de Biodiversidad 78:303–310.

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World Organisation for Animal Health. 2023. Animal diseases. Paris: World Organisation for Animal Health. Available: https://www.woah.org/en/what-we-do/animal-health-and-welfare/animal-diseases/ (February 2023).

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.

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Gutiérrez Gregoric DE, Núñez V, Rumi A, Roche MA. 2006. Freshwater gastropods from Del Plata Basin, Argentina. Checklist and new locality records. Comunicaciones de la Sociedad Malacológica del Uruguay 9:51–60.

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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 GBIF Secretariat (2022) and Cózatl-Manzano and Naranjo-García (2007).

Under the future climate scenarios (figure A1), on average, high climate match for *Drepanotrema kermatoides* was projected to occur in southern Florida. High climate match also extended up to the Mid-Atlantic and Great Lakes regions under less extreme scenarios (SSP3 or 2055 time step). Areas of low climate match were projected to occur in the Great Basin, Northern Pacific Coast, and Western Mountains, and into the Northern Plains and California in all scenarios. The Climate 6 scores for the individual future scenario models (figure A2) ranged from a low of 0.221 (model: UKESM1-0-LL, SSP5, 2085) to a high of 0.473 (model: MRI-ESM2-0, SSP3, 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 (0.373, figure 4) 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 one or more time step and climate scenarios, areas within the Great Lakes and Northeast saw a large increase in the climate match relative to current conditions. These large increases were particularly pronounced in the northern Great Lakes under the SSP5, 2085 scenario. Additionally, areas within the Colorado Plateau, Northern Plains, and Western Mountains saw a moderate increase in the climate match relative to current conditions. Under one or more time step and climate scenarios, areas within the Appalachian Range, Gulf Coast, Mid-Atlantic, Southeast, Southern Atlantic Coast, Southern Plains, and Southwest saw a moderate decrease in the climate match relative to current conditions. These projected decreases in climate match were more widespread for the 2085 time step than the 2055 time step, especially under SSP5 in 2085. No large decreases were observed regardless of time step and climate scenarios. Additional, very small areas of large or moderate change may be visible on the maps (figure A3).

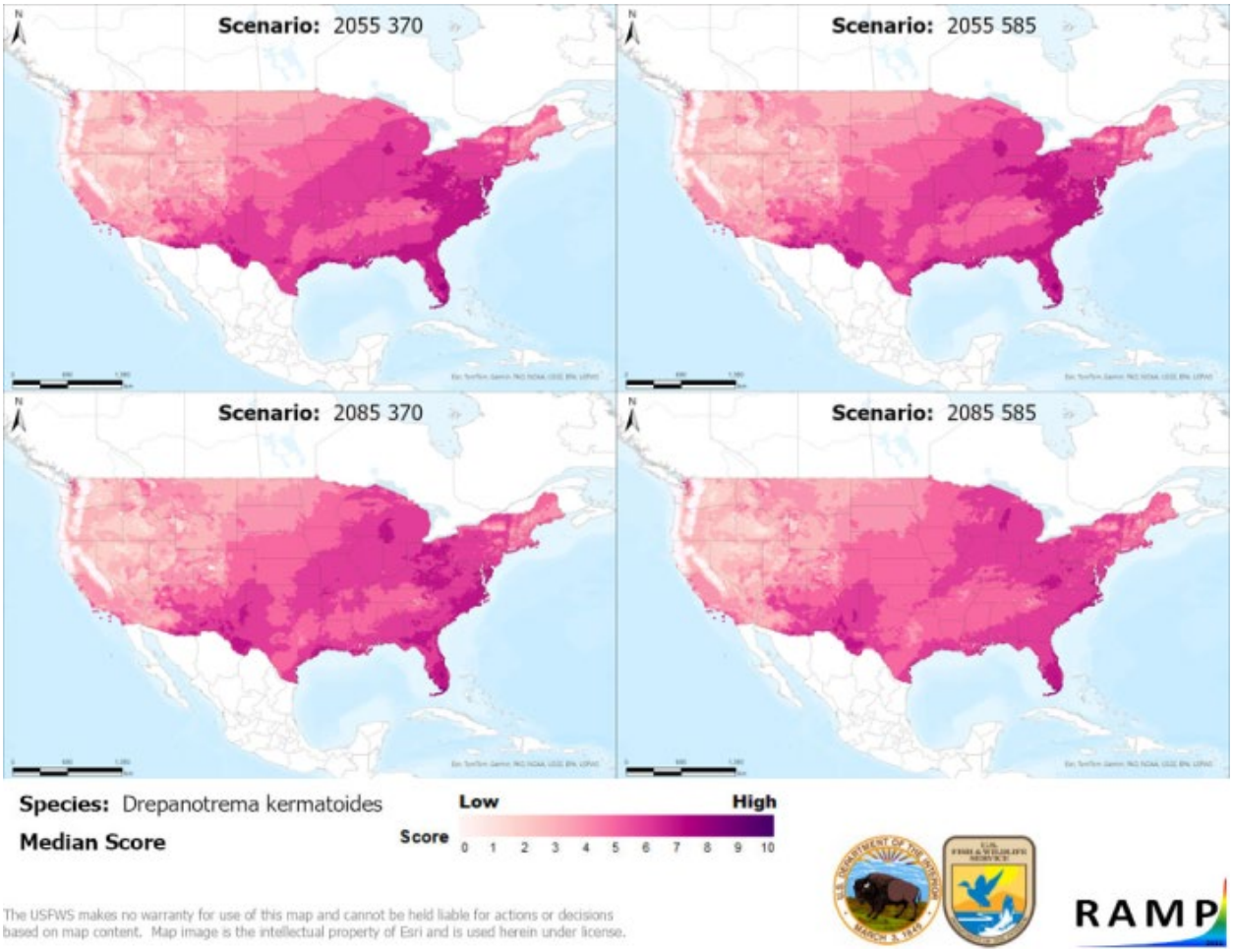

Figure A1. Maps of median RAMP (Sanders et al. 2023) climate matches projected under potential future climate conditions using five global climate models for *Drepanotrema kermatoides* in the contiguous United States. Climate matching is based on source locations reported by GBIF Secretariat (2022) and Cózatl-Manzano and Naranjo-García (2007). 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.

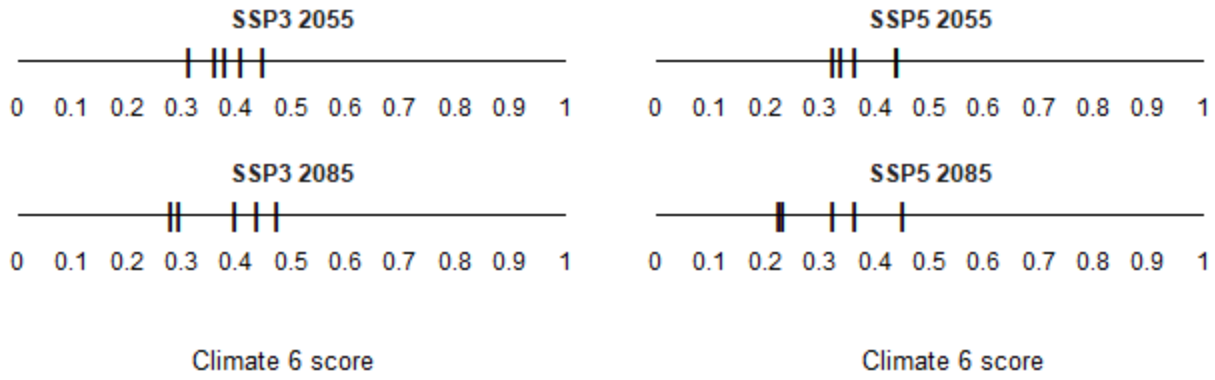

Figure A2. Comparison of projected future Climate 6 scores for *Drepanotrema kermatoides* in the contiguous United States for each of five global climate models under four combinations of Shared Socioeconomic Pathway (SSP) and time step. SSPs used (from left to right): SSP3, SSP5 (Karger et al. 2017, 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.

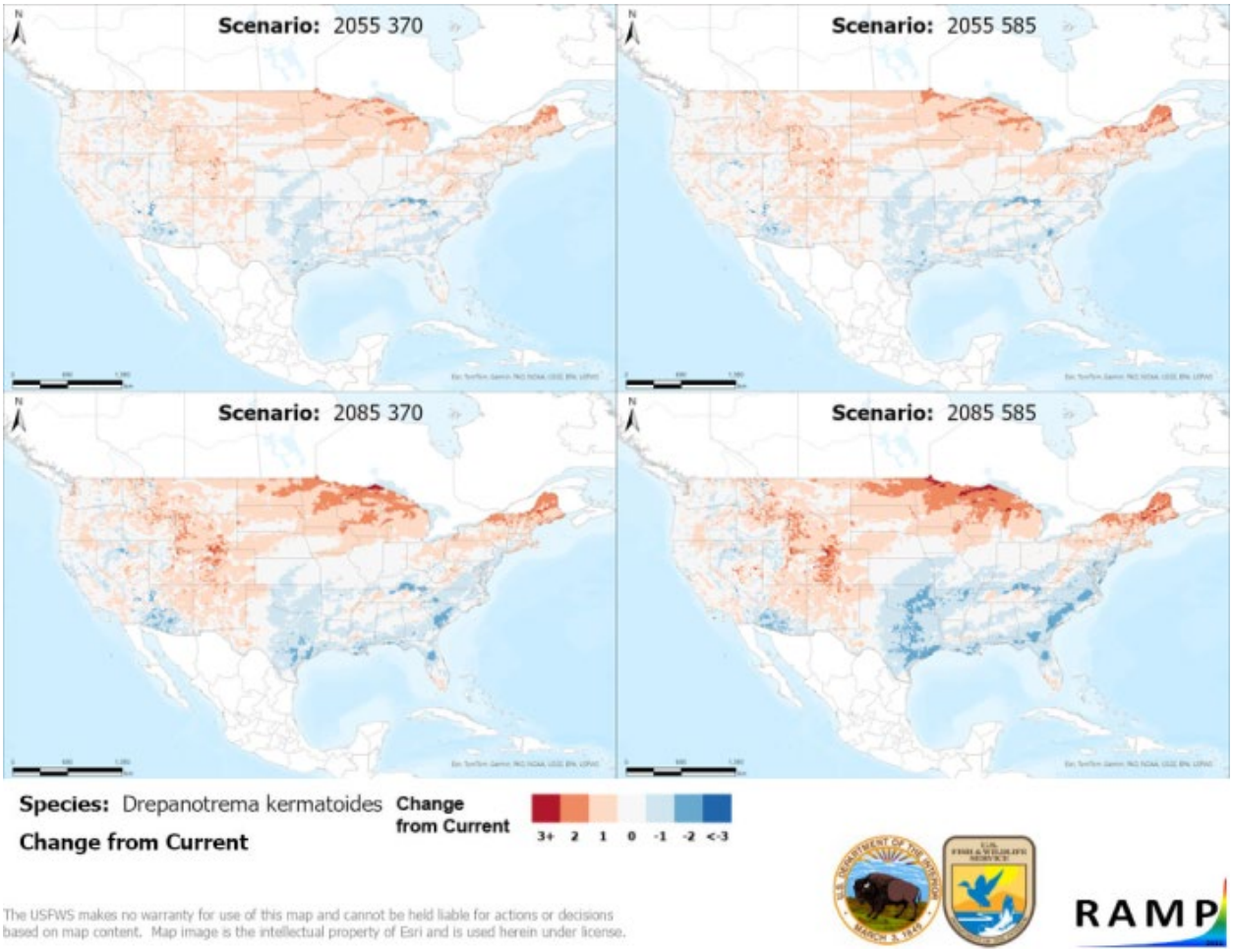

Figure A3. RAMP (Sanders et al. 2023) maps of the contiguous United States showing the difference between the current climate match target point score (figure 4) and the median target point score for future climate scenarios (figure A1) for *Drepanotrema kermatoides* based on source locations reported by GBIF Secretariat (2022) and Cózatl-Manzano and Naranjo-García (2007). 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

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