Murray River Turtle (*Emydura macquarii*)

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, February 2022
Revised, March 2022
Web Version, 6/15/2023

Organism Type: Reptile
Overall Risk Assessment Category: Uncertain

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1 Native Range and Status in the United States

Native Range

From Turtle Taxonomy Working Group (2021):

"Distribution: Australia (New South Wales, Queensland, South Australia, Victoria)"

From Spencer (2000):

"*Emydura macquarii* is currently recognised as a widespread species inhabiting the Murray-Darling drainage system, west of the Great Dividing Range, and with several forms distributed throughout eastern flowing rivers of coastal NSW [New South Wales, Australia] and Qld [Queensland, Australia] (Cann 1998)."

From Judge (2001):

"*Emydura macquarii* is the only species that is distributed in the south eastern regions of Australia. All other species of *Emydura* are restricted to the northern parts of Australia."

Status in the United States

No records of *Emydura macquarii* in the wild in the United States were found. *E. macquarii* may be for sale in the United States (e.g., Turtles and Tortoises Inc 2022)

Means of Introductions in the United States

No records of *Emydura macquarii* in the wild in the United States were found.

Remarks

According to Uetz (2020), synonymized names for this species are *Chelys macquarii, Emydura macquarii dharra*, and *E. signata*. These names were used for information searches for this screening.

According to ITIS (2022), other common names for this species are eastern short-necked turtle and the southern river turtle.

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

According to Uetz (2020), *Emydura macquarii* (Gray, 1830) is the current accepted name for this species.

From ITIS (2022):

Kingdom Animalia
Subkingdom Bilateria
Infrakingdom Deuterostomia
Phylum Chordata
Subphylum Vertebrata
Infraphylum Gnathostomata
Superclass Tetrapoda
Class Reptilia
Order Testudines
Superorder Pleurodira
Family Chelidae
Subfamily Chelodininae
Genus *Emydura*
Species *Emydura macquarii* (Gray, 1830)

According to ITIS (2022), recognized subspecies include *Emydura macquarii emmotti*, *E.m. krefftii, E.m. macquarii,* and *E.m. nigra*.

Size, Weight, and Age Range

From Turtle Taxonomy Working Group (2021):

"Size (Max SCL) [straight-line carapace length] male 30.0 cm, female 36.8 cm"

From Judge (2001):

"Body size in *E. m. macquarii* differed markedly between populations. Females ranged in maximum sizes (carapace length) of 180 mm in the Macleay River to over 300 mm in the Murray River. *E. m. macquarii* was sexually dimorphic across all populations with females larger than males in all cases. Maximum body size was positively related to the size at which a turtle matures. The size at maturity in turn was positively related to juvenile growth rates. Age was a more important factor for males in terms of timing of maturity whereas in females it was body size."

"Body size is highly variable, with reported maximum sizes for females ranging from 180 mm in the Macleay-Hastings rivers (Cann, 1998) to over 320 mm in the Murray River (Chessman, 1978)."

From Spencer (2000):

"[…] both male and female *E. macquarii* appear to survive beyond 20 years."

Environment

From Chessman (1987):

"Overall, atmospheric basking was seen over the following ranges of environmental conditions: wind velocity 0-3 m/s, water surface temperature 10.1-31.8 C, […] estimated T_e [operative environmental temperatures] 11.0-53.3 C, estimated solar radiation 200- 1400 W/m^2."

Climate

From Chessman (1987):

"[…] air temperature 14.6-43.0 C"

Distribution Outside the United States

Native

From Turtle Taxonomy Working Group (2021):

"Distribution: Australia (New South Wales, Queensland, South Australia, Victoria)"

From Spencer (2000):

"*Emydura macquarii* is currently recognised as a widespread species inhabiting the Murray-Darling drainage system, west of the Great Dividing Range, and with several forms distributed throughout eastern flowing rivers of coastal NSW [New South Wales, Australia] and Qld [Queensland, Australia] (Cann 1998)."

From Judge (2001):

"*Emydura macquarii* is the only species that is distributed in the south eastern regions of Australia. All other species of *Emydura* are restricted to the northern parts of Australia."

Introduced

According to Chessman (2021), *Emydura macquarii* has been introduced to the Bellinger, Gwydir, Kalang, and Manning river systems in southern Australia.

From Judge (2001):

"[…] it is improbable that the low density of turtles in the Nepean River [Australia] is a result of unfavourable environmental conditions. An alternative hypothesis is that *Em. m. macquarii* are not native in the Nepean River but became established from turtles introduced by humans from source populations elsewhere in the range of *Em. macquarii*."

Means of Introduction Outside the United States

From Chessman (2021):

"At least two such species have been widely translocated: […] and the Macquarie turtle, *Emydura macquarii* (Judge, 2001; Georges et al., 2011). The reasons are generally unknown, but the release and escape of pet turtles have been suggested (Georges et al., 2011; Fearn, 2013)."

From Judge (2001):

"Several turtles caught during this study were clearly individuals from other populations of *Em. macquarii*. These were most likely dumped pets."

From Georges et al. (2011):

"While we cannot conclusively eliminate the possibility of natural dispersal events from adjacent drainages, we believe that the most likely scenario is that the *Emydura* have been introduced to the Bellinger drainage [Australia] through a series of independent releases; first in the vicinity of Ralph's Crossing in the early 1990s, and the most recent near the township of Bellingen."

From Fearn (2013):

"Freshwater turtles continue to be illegally imported into Tasmania, either through ignorance of the law (captive bred turtles are legally sold in pet shops throughout mainland Australia) or by

deliberate smuggling for the illegal reptile trade. Since 2006 when accurate records were kept, 26 turtles [including] 1 Macquarie turtle *Emydura macquarii*, […] have been seized by or voluntarily surrendered to Tasmanian Wildlife Management Officers and examined at the Animal Health Laboratories (AHL) in Launceston (AHL 2013; C. Spry pers. comm.)."

Short Description

From Judge (2001):

"*Emydura macquarii* is a short-necked species of turtle with a carapace that is light brown to black in colour. […] Similarly, body shape is also variable, both within and amongst populations. Hatchlings have rounded carapaces in shape tending towards a more oval carapace outline as size increases. Unlike *Em. m. kreffiii*, megacephaly is not present in populations of *Em. m. macquarii*."

"A distinctive feature of *Em. m. macquarii* is a white to creamish band from the mouth along the ventro-lateral margin of the neck […]. Adult males are easily distinguished from adult females by their longer, thicker tail."

Biology

From Chessman (1986):

"In order of decreasing importance the main food types were filamentous algae, vertebrate (mainly fish) carrion, detritus, periphyton (including sponges), mobile aquatic invertebrates, aquatic macrophytes and terrestrial invertebrates. There was a degree of dietary shift with turtle size, small specimens containing more detritus and periphyton and less filamentous algae, macrophytes and carrion than bigger ones. The diets of mature males and females did not differ appreciably. Diel changes in stomach content volumes indicated that *E. macquarii* feeds mainly during the daytime."

From Chessman (1987):

"This [atmospheric basking] took place on shorelines, earthen banks, logs and tree roots, at heights up to 1 m above the water and involved turtles of all sizes including recent hatchlings. The usual atmospheric basking posture was with the limbs spread and the head and neck extended and flexed upward, but sometimes locomotor activity, kicking of the limbs, withdrawal of the head and neck, or pressing of the head to the substratum occurred."

"Turtles emerged to bask in all seasons but apparently did so less during the colder months; only 10 turtles were seen basking out of water from May-September (in a total of 26 h at the lake) compared with 170 from October-April (in 127 h). Winter basking was observed only in 1976 when normal dormancy was disrupted by a dis- ease outbreak that resulted in mortality of over 100 *E. macquarii* at the lake"

From Judge (2001):

"Nesting season began as early as mid-September in the Brisbane River [Australia] and as late as December in the Hunter River [Australia], and continued until early January. […] The majority of females would appear to reproduce every year."

"*Em. macquarii* prefers deep permanent still waterbodies such as rivers and its backwaters (swamps and lagoons) where they are generally the pre-dominant turtle species (Chessman, 1988). The high rate of evaporative water loss under desiccating conditions prevents *Em. macquarii* from migrating overland (Chessman, 1984), thereby restricting them to permanent waterholes."

"*Em. macquarii* may lay one (Murray River-Chessman 1978; Thompson, 1983), three (Fraser island-Georges, 1983), and even five clutches (North Queensland- Legler and Cann, 1978 [1980]) during each spring and early summer. Reported clutch sizes have been as small as four eggs (Fraser Island: Georges, 1983) to as large as 34 (Murray River: Thompson, 1983) and are strongly correlated with maternal body size (Georges, 1983). The hard-shelled eggs vary in size from an average weight of 7.4g on Fraser Island (Georges, 1983) to 10.4 g in Murray River populations (Thompson, 1983). Eggs normally hatch in mid to late summer producing hatchlings ranging from a mean weight of 4.6g on Fraser Island (McNicol & Georges, 1980) to 5.1g in the Murray River (Thompson, 1983). The sex of *Em. macquarii* is genetically determined (Thompson, 1983; Thompson, 1988; Bull et al., 1985) rather than by incubation temperature as in many Northern Hemisphere species of freshwater turtles (reviewed by Bull 1980, 1983; Ewert and Nelson, 1990 [1991]). Males mature at smaller sizes than females and reach smaller maximum sizes (Georges, 1985)."

From Spencer et al. (1998):

"Digestive efficiency of *E. macquarii* was affected little by body temperature, in contrast to consumption rates and rates of passage which were strongly influenced by both temperature and diet. In combination, these responses resulted in a slower rate of digestion at 20°C than at 30°C. Digestive efficiency of *E. macquarii* on a herbivorous diet at 30°C (49%) was about half that of turtles on a carnivorous diet (91%), but they had longer transit times (118 h on the plant diet versus 70 h). Lower consumption rates and longer mean retention times in turtles fed plants compared those fed fish relate to slower digestive processing of the plant. Rapid processing and higher consumption rates of fish by *E. macquarii* resulted in higher energy gains compared to turtles consuming plants (almost 100 times more energy at 30°C). The laboratory results suggest that fish carrion and aquatic and terrestrial invertebrates are probably essential dietary items of E. *macquarii* in the wild, because its metabolic requirements cannot be met from aquatic macrophytes alone."

Human Uses

From Judge (2001):

"Short-neck turtles are a popular pet, and it is likely that pet turtles would escape or be released illegally into local rivers. Some turtles caught during this study were clearly pets that had been dumped."

Diseases

No records of OIE-reportable diseases (OIE 2022) were found for *Emydura macquarii.*

According to Poelen et al. (2014), *Emydura macquarii* hosts the following parasites: *Haemocystidium chelodinae*, *Neopolystoma queenslandensis*, *Haemogregarina clelandi, Neopolystoma cribbi, Uterotrema australospinosa, Neopolystoma macleayi, Neopolystoma kreffti, Lecithochirium parafusiforme, Buckarootrema goodmani, Glossocercus* sp.*, Trypanosoma* sp.*, Polystomoides australiensis, Choanocotyle nematoides, Aptorchis aequalis,* and *Camallanus waelhreow.*

According to Poelen et al. (2014), *Chromobacterium violaceum* is a pathogen of *E. macquarii.*

From Chessman (1987):

"[…] parasitism by leeches (*Glossiphoniidae* and *Bogabdella diversa*)"

From Platt et al. (1994):

"*Uterotrema australispinosa* [a parasite of a freshwater turtle *Emydura macquarii* from southern Queensland, Australia] gen. et sp. nov. from the heart of the Murray River turtle *Emydura macquarii* […] This is the first report of a spirorchid from a member of the family Chelidae and from Australia."

Threat to Humans

From Sheelings et al. (2012):

"*Chromobacterium violaceum* is a Gram-negative bacterium that is an uncommon opportunistic pathogen of humans and animals. Infection is typically associated with exposure to contaminated soil or water in tropical climates. Reports of *Chromobacterium violaceum* infection in reptiles are scarce, and there are no records of infection in chelonians. Here we report the isolation of *Chromobacterium violaceum* from an adult, female, captive Macquarie turtle (*Emydura macquarii*) from temperate Australia. It is not known whether identification of *Chromobacterium violaceum* was incidental or whether infection played a role in disease. The source of the bacteria in this case could not be identified. Clinicians should include this pathogen in a list of differential diagnoses when presented with septicemic reptiles and should be aware of the potential human health risks."

3 Impacts of Introductions

Although there are records of introductions for *Emydura macquarii* in southern Australia outside of its native range, the impacts of these introductions are unknown. The following are potential impacts of introductions discussed in the literature.

From Chessman (2021):

"Introduced *E. macquarii* could compete with native *Myuchelys* spp. for basking places or for food, because both genera have similar omnivorous diets (Spencer et al., 2014). However, riverine populations of *E. macquarii* seldom bask (Manning & Grigg, 1997; Chessman, 2019), and basking appears to be infrequent for riverine *Myuchelys* spp. as well (personal observations). Substantial competition for food also seems unlikely at present, given the low current CPUE of introduced *E. macquarii*. For example, the Bellinger River had the highest CPUE of *E. macquarii* among the four rivers with introduced populations, but population estimates by Chessman et al. (2020) suggest that average densities in Bellinger River turtle habitat are only ~6 ha^{-1} for *E. macquarii* and ~2 ha^{-1} for *M. georgesi*. These densities are about two orders of magnitude below densities at which adverse interactions between freshwater turtle species have been demonstrated in controlled experiments."

"Hybridization between *E. macquarii* and *M.* [*Myuchelys*] *georgesi* has been reported in the Bellinger and Kalang rivers and has been suggested to presage genetic swamping of *M. georgesi* (i.e. its replacement by hybrids; Georges et al., 2018b). However, the incidence of hybrids in the Bellinger River is low (Chessman et al., 2020), with F1 hybrids and backcrosses of F1 hybrids to one of the parental species totalling [sic] only 2% of 474 turtles analysed by Georges et al. (2018b). These authors reported a higher proportion of hybrids in the Kalang River (26%) but analysed only 19 Kalang River turtles. Catches in the present study included only one morphologically identifiable *Emydura–Myuchelys* hybrid (in the Bellinger River), suggesting that hybridization between the two genera is infrequent."

"The lack of evidence of a substantial current impact of introduced *E. macquarii* on *Myuchelys* spp., coupled with a strong potential for future increases in populations of introduced *E. macquarii*, creates a dilemma for policy and management. Leaving invasive *E. macquarii* to proliferate unchecked could make its control more difficult in the future, but precautionary removal or control could be difficult to justify, particularly without firm evidence of an otherwise ineluctable threat to the persistence of *Myuchelys* spp. (Woinarski, 2019)."

4 History of Invasiveness

Emydura macquarii has been introduced to drainages in southern Australia outside of its native range which have led to established populations. Only potential impacts of introductions were discussed in the literature. This species appears to be available in the pet trade, but no information on trade volume and duration was found during this assessment. Due to the lack of information on actual impacts of introduction (rather than potential), and uncertainty regarding the trade history of *E. macquarii*, the History of Invasiveness is classified as Data Deficient.

5 Global Distribution

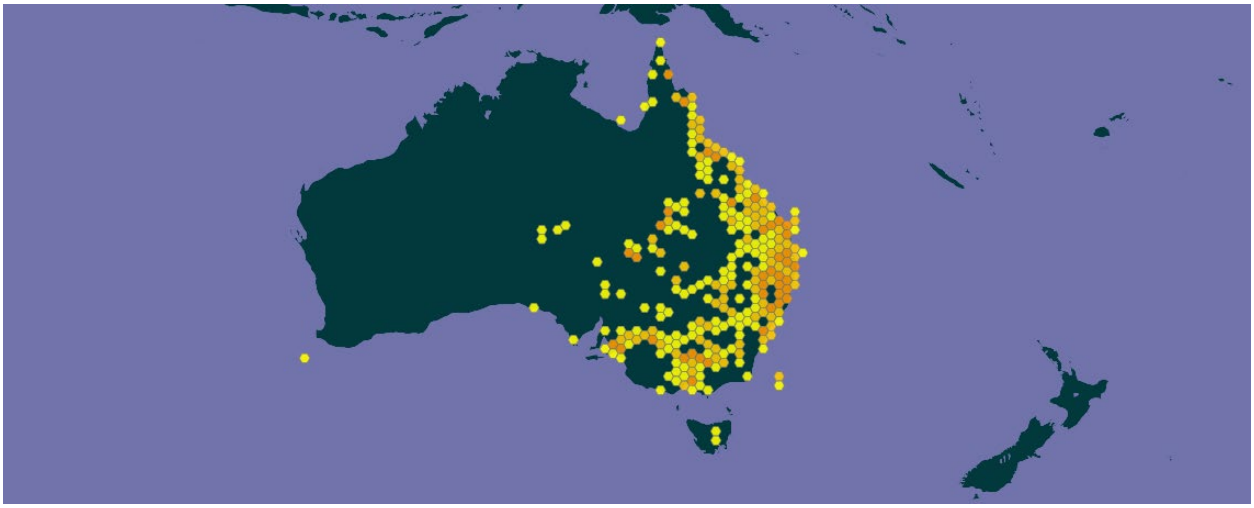

Figure 1. Known global distribution of *Emydura macquarii*. Observations are reported from Australia. Map from GBIF Secretariat (2022). Points from the coastal waters surrounding Australia were excluded from the climate matching analysis as *E. macquarii* is not known from marine environments; these points are assumed to be coordinate errors. Points on Tasmania and Mornington Island were also excluded as these occurrences were not found to represent established populations.

6 Distribution Within the United States

No records of *Emydura macquarii* in the wild in the United States were found.

7 Climate Matching

Summary of Climate Matching Analysis

The climate match for *Emydura macquarii* in the contiguous United States was generally medium. The largest area of high match was found in the Southwest with smaller isolated areas of high match scattered along the Atlantic Coast, in peninsular Florida, central Appalachia, the Great Lakes basin, Midwest, and Northwest. Much of the contiguous United States had a medium match with low matches restricted to the upper Midwest, along Pacific Coast, and in the Cascade-Sierra Mountains. The overall Climate 6 score (Sanders et al. 2021; 16 climate variables; Euclidean distance) for the contiguous United States was 0.539, High (scores equal to or greater than 0.103 are classified as High.). Most States had High individual Climate 6 scores except for Iowa, Mississippi, Nebraska, New Hampshire, Vermont, and Wyoming which had Medium scores; and Minnesota, North Dakota, and South Dakota which had Low individual scores.

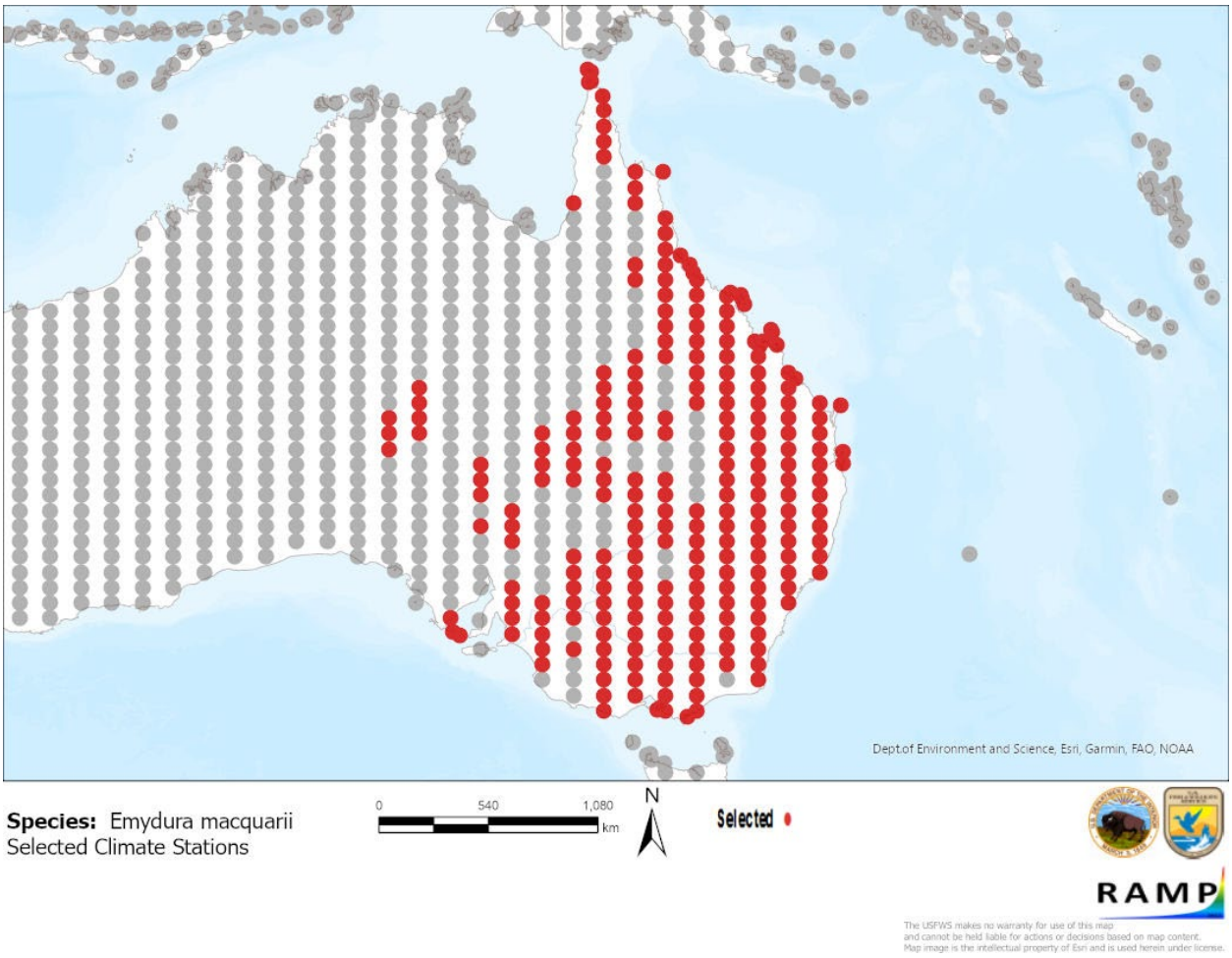

Figure 2. RAMP (Sanders et al. 2021) source map showing weather stations in Australia selected as source locations (red) and non-source locations (gray) for *Emydura macquarii* climate matching. Source locations from GBIF Secretariat (2022). Selected source locations are within 100 km of one or more species occurrences, and do not necessarily represent the locations of occurrences themselves.

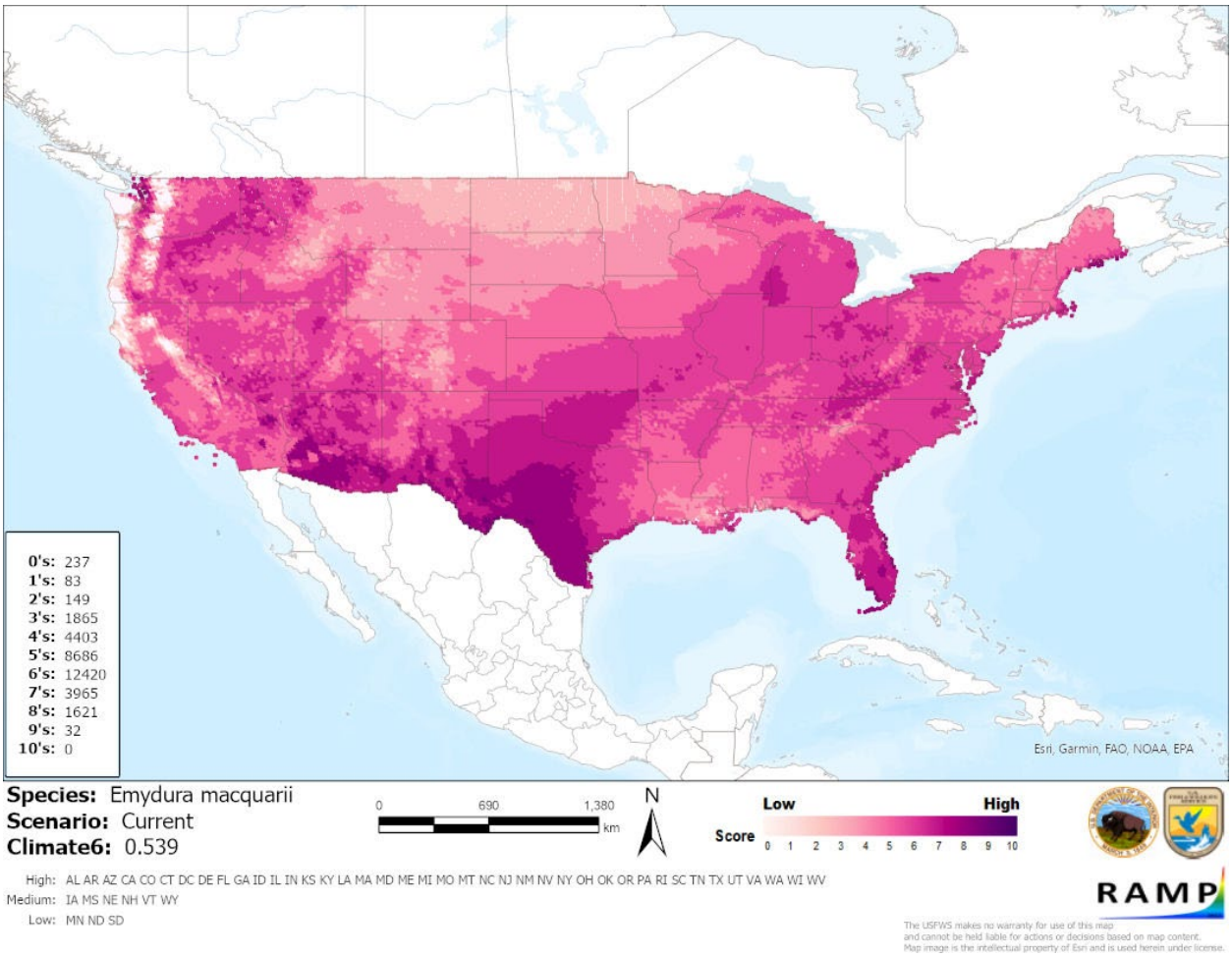

Figure 3. Map of RAMP (Sanders et al. 2021) climate matches for *Emydura macquarii* in the contiguous United States based on source locations reported by GBIF Secretariat (2022). Counts of climate match scores are tabulated on the left. 0/Pale Pink = Lowest match, 10/Dark Purple = Highest match.

The High, Medium, and Low Climate match Categories are based on the following table:

Climate 6: (Count of target points with climate scores 6-10)/ (Count of all target points)	Overall Climate Match Category
0.000≤X≤0.005	Low
0.005<X<0.103	Medium
≥0.103	High

8 Certainty of Assessment

The Certainty of Assessment is Low. There is reasonably complete information regarding the distribution and ecology of *Emydura macquarii*. This species has been introduced beyond its native range but only information regarding the potential impacts of these introduced populations was found. Additionally, this species is found in the pet trade but no data regarding duration or volume was found during this assessment.

9 Risk Assessment

Summary of Risk to the Contiguous United States

The Murray River turtle (*Emydura macquarii*) is a freshwater turtle native to rivers in eastern Australia. This species has been introduced and established populations beyond its native range in southern Australia. Only information regarding the potential impacts of these introduced populations was found. Additionally, *E. macquarii* is available in the pet trade but information regarding volume and duration of trade is unknown. The History of Invasiveness is classified as Data Deficient. The Overall Climate Match for *Emydura macquarii* to the contiguous United States was High. Areas of high match were mainly concentrated in the southwest. The Certainty of Assessment is Low due to a lack of information regarding this species' history of invasiveness. The Overall Risk Assessment Category for *E. macquarii* is Uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 4): Data Deficient**
- **Overall Climate Match Category (Sec. 7): High**
- **Certainty of Assessment (Sec. 8): Low**
- **Remarks, Important additional information: Potential for human exposure to *Chromobacterium violaceum.***
- **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.

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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.

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