# Atlantic Rangia (*Rangia cuneata*)
## Ecological Risk Screening Summary

**Web Version – 10/1/2012**

Photo: USGS

## 1 Native Range and Nonindigenous Occurrences

### Native Range
Gulf of Mexico (Benson 2012)

From GISD (2011):

"*Rangia cuneata* is considered to be native to the Gulf of Mexico and introduced to the NW Atlantic, where it is predominantly found in estuaries. "

### Nonindigenous Occurrences
From Benson (2012):

"East coast of Florida to the Chesapeake Bay; James River and Potomac River in Virginia, lower portion of the Hudson River in New York."

From GISD (2011):

"Known introduced range: lower portion of the Hudson River, New York …"

## Means of Introductions

From Benson (2012):

"Not seen on the Atlantic coast before 1956. Could have been an accidental release with oyster mariculture or perhaps with intracoastal ballast water."

Corroborated by Carlton (1992):

"Ballast water or the movement of commercial oysters may have transported the clam *Rangia cuneata* from the Gulf of Mexico to Chesapeake Bay, from where it may have spread down the coast to Florida, and from where it may have been carried in ballast water to the Hudson River."

## Remarks

There has been some confusion over whether or not *R. cuneata* is a native species on the east coast of the United States. The current thinking by Fofonoff et al. (2003) is described on the National Exotic Marine and Estuarine Species Information System (NEMESIS) web site managed by the Smithsonian Environmental Research Center (SERC):

"Conrad (1840) described *Rangia cuneata* (Gulf Wedge Clam) as 'an inhabitant of the estuaries of the Gulf of Mexico and occurring in the upper Tertiary formation in the bank of the Potomac River in Maryland and on the Neuse River, North Carolina '. *Rangia cuneata* is found in Pleistocene deposits ranging from NJ southward through the entire northern Gulf coast and northern South America (Hopkins and Andrews 1970). No living specimens were reported from the East Coast until about 1955 (Hopkins and Andrews 1970; Wells 1961). Prior to its discovery on the Atlantic Coast, *R. cuneata* was considered to range from the Gulf Coast of northern FL to TX (Fairbanks 1963). In the 1960s, it became abundant north to the Chesapeake Bay, and by 1988, it had colonized the Hudson River estuary (Carlton 1992)."

"A major question about this rapid range extension is whether it represents the result of anthropogenic introductions or represents the resurgence of small, previously unnoticed relict populations (Foltz et al. 1995, Hopkins and Andrews 1970, Pfitzenmeyer and Drobeck 1964), perhaps sparked by 'some unknown ecological change' (Hopkins and Andrews 1970). Given the relatively large size of this clam and the abundance of collectors on the Atlantic Coast, it seems much more likely that it was transported north by human vectors. Possible modes of introduction include transplanted seed oysters, oyster shipments, or ballast water (Carlton 1992; Pfitzenmeyer and Drobeck 1964). Gulf and Atlantic Coast populations appear to be genetically distinct at some loci, with an apparent boundary near Ocklochonee Bay (NE Gulf of Mexico) FL (Foltz et al. 1995). These data would appear to support the 'resurgence' model rather than an introduction from the Gulf of Mexico. However, the authors point out that the genetic data do not rule out other introduction scenarios, including introductions from the Gulf or Atlantic coasts of FL."

# 2 Biology and Ecology

## Taxonomic Hierarchy

From ITIS (2012):

Kingdom Animalia
    Phylum Mollusca
        Class Bivalvia
            Subclass Heterodonta
                Order Veneroida
                    Superfamily Mactroidea
                        Family Mactridae
                            Genus Rangia
                                Species *Rangia cuneata*

Taxonomic Status: Valid

## Size, Weight, Age

From LaSalle and de la Cruz (1985):

- "Adults range from 2.5 to 6.0 cm in length."
- "The average lifespan is about 4 to 5 years."
- "A clam of the maximum expected length of 75 mm, reported by Wolfe and Petteway (1968) in Chesapeake Bay, would be 10 years old. Hopkins e t al. (1973) estimated a maximum life span of 15 years."

## Environment

From GISD (2011):

"*Rangia cuneata* clams inhabit low salinity estuarine habitats and are, as such, most commonly found in areas with salinities from 5-15 PSU." "A combination of low salinity, high turbidity and a soft substrate of sand, mud and vegetation appears to be the most favourable habitat for *Rangia cuneata*.

From Benson (2012):

"Prefers estuarine, brackish waters (0-18 ppt salinity) with soft sand bottoms, can tolerate mud and mixtures of sand and clay bottoms."

## Climate/Range

*R. cuneata* is a Subtropical species due to its native range in the Gulf of Mexico.

## Distribution Outside the United States

From GISD (2011):

"[Introduced to] harbour of Antwerp, Belgium, Europe"

# Short description

From GISD (2011):

"The valves of *Rangia cuneata* are thick and heavy, with a strong, rather smooth pale brown periostracum. The shells are equivalve, but inequilateral with the prominent umbo curved anteriorly. An external ligament is absent or invisible, but the dark brown internal ligament lies in a deep, triangular pit immediately below and behind the beaks. Both valves have two cardinal teeth, forming an inverted V-shaped projection. The upper surface of the long posterior lateral teeth (LaSalle and de la Cruz 1985) is serrated. The inside of the shell is glossy white, with a distinct, small pallial sinus, reaching to a point halfway below the posterior lateral. The pallial line is tenuous ([Rogers and] Garcia-Cubas 1981)."

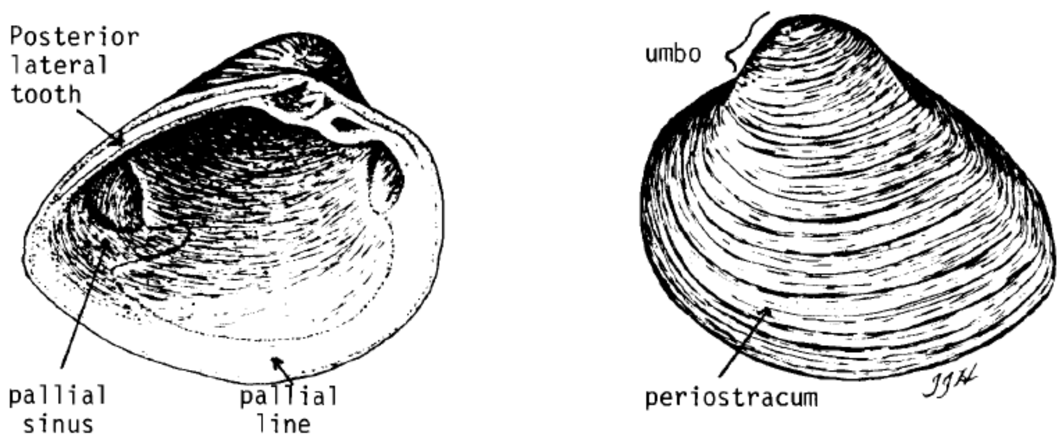


**Figure 1 (above).** Illustration of *Rangia cuneata* by Jeanne J. Hartley (from a U.S. Fish and Wildlife publication: LaSalle and de la Cruz 1985).

# Biology

From GISD (2011):

"*R. cuneata* inhabits low salinity estuarine habitats (Parker 1966) and is most commonly found in areas with salinities from 5-15 PSU (Swingle and Bland 1974). *R. cuneata* possess both extracellular and intracellular mechanisms of osmoregulation, which enables them to respond to sudden salinity changes in many estuaries (Bedford and Anderson 1972). They can cross the 'horohalinicum', the 5-8 PSU salinity boundary which usually divides fresh and salt-water invertebrates, making them one of the few freshwater clams to become established in brackish water (Ladd 1951) as such thriving in a zone unfavorable for many animals. Competition and predation may explain its scarcity in high salinity environments (Cooper 1981). Larvae prefer coarser sediment for settlement, adults are often found in muddy sediments (Fairbanks 1963; Cain 1975; Jordan and Sutton 1984)."

### Human uses
N/A

### Diseases
None reported

### Threat to humans
None reported other than potential safety hazards associated with biofouling of pipes in industrial settings (see Sec. 3 below).

## 3 Impacts of Introductions

Verween et al. (2006) describe *R. cuneata* as a biofouling species, causing problems in industrial cooling water systems.

*R. cuneata* has been reported to be causing biofouling problems in pipes (clogged hoses) in an oil refinery in Delaware (Counts 1980).

*R. cuneata* are known to concentrate chemicals such as kepone. Lunsford (1981) reported that peak kepone levels in *R. cuneata* during summer, in the James River Estuary, were re1ated to increased metabolism and feeding rate. The concentration of kepone was 2 to 4 times greater in *R. cuneata* than in the water column.

## 4 Global Distribution

**Figure 2 (below).** Global distribution of *R. cuneata*. Map from GBIF (2010).

# 5 Distribution within the United States

**Figure 3 (below).** Distribution of *R. cuneata's* native range along the northern coast of the Gulf of Mexico (adapted from LaSalle and de la Cruz 1985).

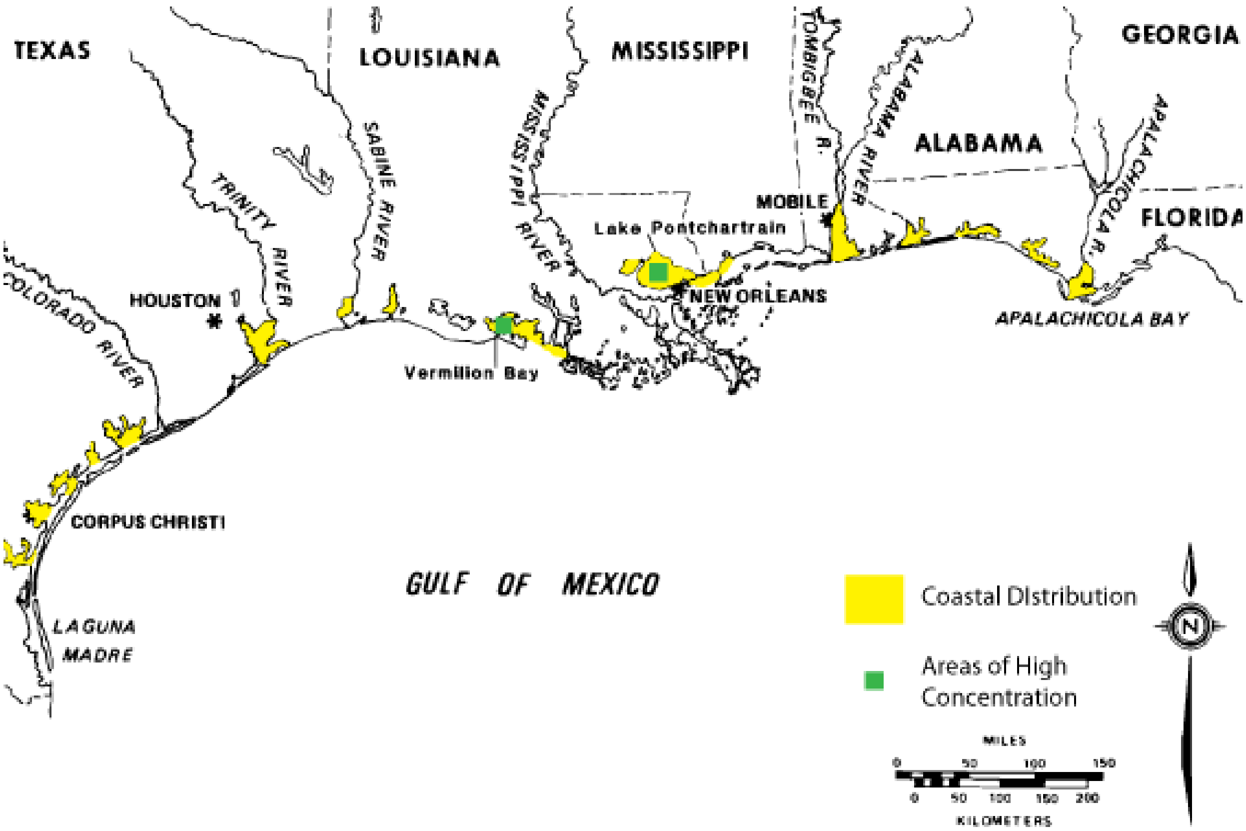


**Figure 4 (above).** Distribution of *R. cuneata* in the United States. Map from Benson (2010). See the remarks from the SERC database NEMESIS under Section 1 of this report for the current theory on *R. cuneata* distribution.

# 6 CLIMATCH

## Summary of Climate Matching Analysis

The climate match (Australian Bureau of Rural Sciences 2010; 16 climate variables; Euclidean Distance) was high for all of the Eastern United States. Medium matches continued into the Great Plains and in the West. Low matches elsewhere. Climate 6 match indicated that the United States has a high climate match. The range for a high climate match is 0.103 and greater; the climate match of *R. cuneata* is 0.503.

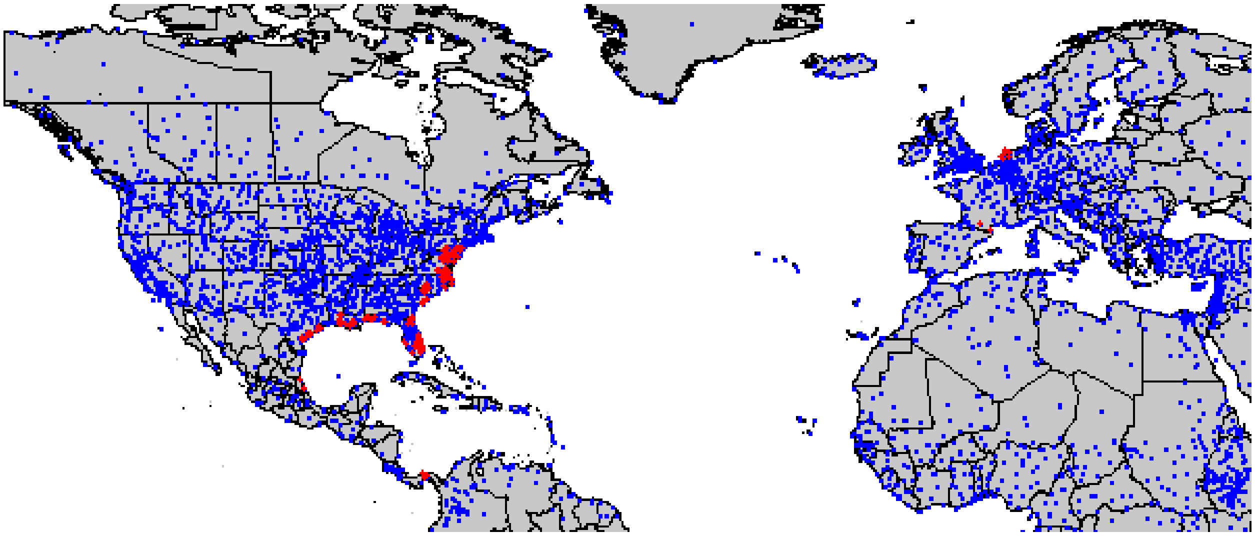

**Figure 5 (above).** CLIMATCH (Australian Bureau of Rural Sciences 2010) source map showing weather stations selected as source locations (red) and non-source locations (blue) for *R. cuneata* climate matching. Source locations from GBIF (2010) and Benson (2010).

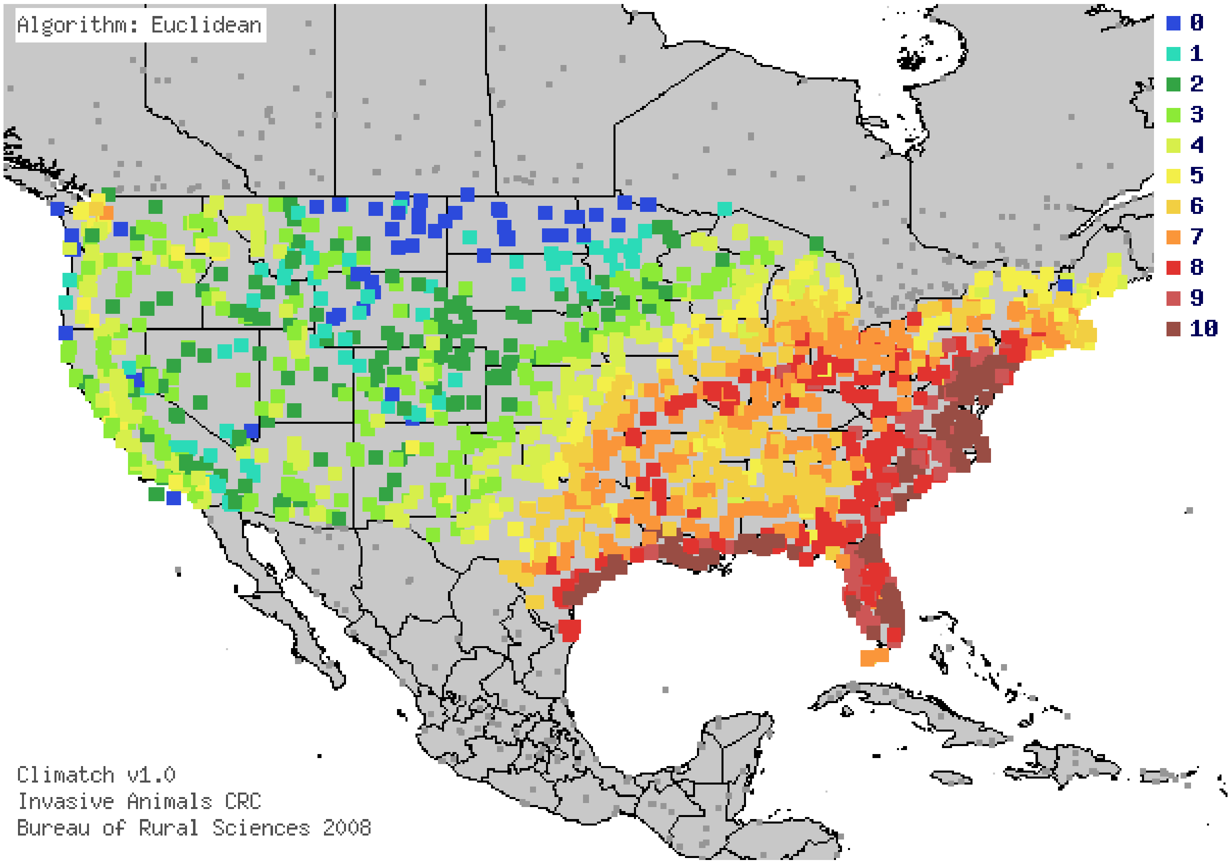


**Figure 6 (above).** Map of CLIMATCH (Australian Bureau of Rural Sciences 2010) climate matches for *R. cuneata* in the continental United States based on source locations reported by GBIF.org and USGS.gov. 0= Lowest match, 10=Highest match.

**Table 1 (below).** CLIMATCH climate match scores

| CLIMATCH Score | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Count | 60 | 73 | 166 | 269 | 240 | 156 | 261 | 255 | 215 | 79 | 167 |
| | | | | | | | | | | | |
| Climate 6 Proportion = | | | 0.503 | (High) | | | | | | | |

# 7 Certainty of Assessment

Information is lacking regarding the native range of *R cuneata* and its potential invasive impacts lending this assessment a low level of certainty. To achieve a higher degree of certainty, additional research confirming the native versus non-native distribution of *R. cuneata* is needed as well as greater documentation of its impacts. Certainty of this assessment is low.

# 8 Risk Assessment

## Summary of Risk to the Continental United States

It is not entirely clear whether *R. cuneata* is a native species along the east coast of the United States (see Remarks under section 1) which renders its status as an invasive species along the east coast uncertain as well. Although one report of bio-fouling in Delaware does exist, it occurred over 30 years ago. If the species isn't native to the east coast and is indeed an invasive species, one can't help but wonder why this species has not become more of a problem since it was first reported in the 1960's. Despite a high climate match in the United States, questions on the native range of R. cuneata and its invasiveness cause this assessment to be uncertain.

## Assessment Elements

- **History of Invasiveness (Sec.3):** Uncertain
- **Climate Match (Sec. 6):** High
- **Certainty of Assessment (Sec. 7):** Low
- **Overall Risk Assessment Category:** Uncertain

# 9 References

**Note: The following references were accessed for this ERSS. References cited within quoted text but not accessed are included below in Section 10.**

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# 10 References Quoted But Not Accessed

**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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