Assassin Snail (*Anentome helena)*

Ecological Risk Screening Summary

U.S. Fish and Wildlife Service, March 2011
Revised, July 2018
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Photo: RSX (2010). Licensed under Creative Commons (CC BY-SA 3.0). Available: https://commons.wikimedia.org/wiki/File:Anentome_Helena_2010.jpg. (July 2018).

1 Native Range and Status in the United States

Native Range

From CABI (2018):

"*C. helena* [*Anentome helena*] is a tropical species with a wide distribution across South-East Asia; it has been recorded from Cambodia, Indonesia, Laos and Malaysia."

From Ng et al. (2016a):

"It was first described from Java, Indonesia (Philippi 1847), and has since also been recorded from Cambodia (Crosse and Fischer 1876; Fischer 1891), Thailand (Fischer 1891; Brandt 1974), Vietnam (Fischer 1891; Madsen and Hung 2014), Laos (Dautzenberg and Fischer 1908; Vongsombath et al. 2009; Sri-Aroon et al. 2015; Attwood and Cottet 2015), Sumatra in Indonesia (van Benthem Jutting 1956, 1959), and northern Peninsular Malaysia (Chan 1997)."

Status in the United States

This species has not been reported as introduced or established in the United States, but is available via aquarium trade. For example, LiveAquaria (2018) lists *Clea helena* (a synonym of *Anentome helena*) for purchase at $4.49, shipping from California.

Means of Introductions in the United States

This species has not been reported as introduced or established in the United States.

Remarks

MolluscaBase (2018) lists *Clea helena* as a synonym for *Anentome helena*, while CABI (2018) treats *C. helena* as the accepted scientific name and *A. helena* as a synonym. MolluscaBase (2018) lists the following additional synonyms: *Canidia bocourti*, *Canidia fusiformis*, *Canidia harmandiana*, *Canidia helena*, *Canidia stomatodonta*, *Canidia tenuicostata*, *Clea theminckiana*, *Hemisinus baudonianus*, *Hemisinus helena*, *Hemisinus theminckianus*, *Melania helena*, and *Melania theminckiana*. This ERSS follows the guidance of MolluscaBase (2018), using *A. helena* as the accepted scientific name. Information searches for this ERSS were conducted with the accepted scientific name and each synonym listed above.

From CABI (2018):

"*Clea helena* was originaly [*sic*] described as *Anentome helena* and both names are widely used for this species; *Anentome* is frequently used as a subgenus, i.e., as *Clea (Anentome) helena*. This organism does not have any significant commercial value outside the aquarium industry, hence the prevalence of common names featured in the aquarium literature. The names 'assassin snail' and 'snail-eating snail' both refer to this snail's predatory nature and tendency to consume small snails of the sorts found in home aquaria."

From Strong et al. (2017):

"The genus *Clea* from SE [Southeast] Asia is from one of only two unrelated families among the megadiverse predatory marine Neogastropoda to have successfully conquered continental waters. […] Differences in shell, operculum and radula characters support separation of *Clea* as presently defined into two distinct genera: *Clea*, for the type species *Clea nigricans* and its allies, and *Anentome* for *Clea helena* and allies."

"The assassin snail *Anentome helena* […] is found to comprise a complex of at least four species."

"The discovery that *Anentome "helena"* comprises a cryptic complex of at least four species substantially complicates the issue. One sample from the US aquarium industry analyzed here has proven to be the same species as that introduced in Singapore, and based on shell morphology, these appear conspecific with samples in the US Department of Agriculture Animal and Plant Health Inspection Service Plant Protection and Quarantine (USDA APHIS PPQ) reference collection intercepted since May 2009 at several ports of entry (Houston, San Francisco, Los Angeles) from Thailand and Hong Kong. However, at present it is unknown if this species is the source for all specimens marketed under this name. It is also possible that other closely related species of *Anentome* may be marketed indiscriminately as "assassin snails." More comparative work is necessary to clarify this issue."

2 Biology and Ecology

Taxonomic Hierarchy and Taxonomic Standing

From MolluscaBase (2018):

"Biota > Animalia (Kingdom) > Mollusca (Phylum) > Gastropoda (Class) > Caenogastropoda (Subclass) > Neogastropoda (Order) > Buccinoidea (Superfamily) > Nassariidae (Family) > Anentominae (Subfamily) > *Anentome* (Genus) > *Anentome helena* (Species)"

"Status accepted"

Size, Weight, and Age Range

From CABI (2018):

"Maximum length is around 30 mm but usually smaller; in particular, the apical part of the shell is often worn away on older individuals."

Environment

From CABI (2018):

"Little is known about the ecology of *C. helena* in the wild, but it is known to occur in a range of freshwater habitats including streams, rivers, lakes and reservoirs, typically in places with a soft substrate such as mud."

From Ng et al. (2016a):

"The sites from which *Anentome helena* were collected had the following environmental characteristics: temperatures 30.5-31.6 ºC; pH 7.11-7.29; dissolved oxygen 1.17-2.75 mgL^{-1}; conductivity 0.2555-0.2610 $mScm^{-1}$; and total dissolved solids 0.1475-0.1534 gL^{-1}."

Climate/Range

CABI (2018) lists tropical rainforest and tropical monsoon climates as preferred climates for *Clea helena*.

Distribution Outside the United States

Native

From CABI (2018):

"*C. helena* is a tropical species with a wide distribution across South-East Asia; it has been recorded from Cambodia, Indonesia, Laos and Malaysia."

From Ng et al. (2016a):

"It was first described from Java, Indonesia (Philippi 1847), and has since also been recorded from Cambodia (Crosse and Fischer 1876; Fischer 1891), Thailand (Fischer 1891; Brandt 1974), Vietnam (Fischer 1891; Madsen and Hung 2014), Laos (Dautzenberg and Fischer 1908; Vongsombath et al. 2009; Sri-Aroon et al. 2015; Attwood and Cottet 2015), Sumatra in Indonesia (van Benthem Jutting 1956, 1959), and northern Peninsular Malaysia (Chan 1997)."

Introduced

From Ng et al. (2016a):

"We report the first record of *Anentome helena* in Singapore, which is also the first record of the species in a non-native habitat."

"*Anentome helena* was collected from Kranji Reservoir, a coastal reservoir formed in 1975 by the damming of the mouth of the Kranji River (Ng et al. 2011) on the north coast of Singapore […] Specimens were first found on 24 March 2016 among the roots and stems of water spinach, *Ipomoea aquatica* Forsskål 1775, which grows along the banks of the reservoir […] On 27 March 2016, *Anentome helena* was recorded from another location in the reservoir, approximately 2.5 km away from the first site […] An empty shell was collected from the same site on 3 May 2016."

Ng et al. (2016a) consider *A. helena* to be established in Kranji Reservoir.

Means of Introduction Outside the United States

From Ng et al. (2016a):

"Given that the catchment area of Kranji Reservoir includes housing estates and farms (including major ornamental pet distributors), it is highly likely that *Anentome helena* was introduced into the reservoir as escapees from the ornamental pet trade, or via improper disposal of aquarium water or plants."

Short Description

From Ng et al. (2016a):

"Shell elongately conic, to more than 20 mm in shell height, dextral. Whorls 7-8, somewhat convex, sculptured with axial ribs that become indistinct at the anterior part of the body whorl.

Aperture oval, outer lip slightly thickened in mature specimens; siphonal canal short and wide. Shell straw-coloured with dark brown bands, usually 3 on body whorl […]"

Biology

From CABI (2018):

"*C. helena* feeds predominantly on decaying protein, but has been observed to attack living snails and worms (Brandt, 1974)."

From Ng et al. (2016a):

"*Anentome helena* appears to be the only species of its genus that is found in both lotic habitats (rivers and streams) as well as lentic habitats (freshwater ponds and lakes) in the Indo-Burmese region and Indonesia (van Benthem Jutting 1956; Brandt 1974)."

Human Uses

From CABI (2018):

"Pet/aquarium trade"

"While there are other *Clea* species known, none has so far been as widely traded within the aquarium industry. The distinctive shape of this species, its yellowy shell with brown spiral markings, and its predatory habits make it easily distinguished from all other aquarium snails. Nonetheless, Ng et al. (2016b) have *Clea bockii* as another species available in the aquarium trade. This species is similar in shape and size, but its shell is more or less uniformly brown."

From Strong et al. (2017):

"[…] *Clea helena* has been touted as a possible model for developmental and environmental physiology (Newel & Bourne, 2013)."

Diseases

Tesana et al. (2009) report *Clea helena* as a carrier of *Angiostrongylus cantonensis* in Thailand.

From Tesana et al. (2009):

"*Angiostrongylus cantonensis* is a rodent nematode, the adult worms living inside pulmonary arteries. Humans may become infected and migrating larvae and young adults may produce lesions mainly in the central nervous system."

No OIE-reportable diseases have been documented for *A. helena*.

Threat to Humans

From CABI (2018):

"Trematodes pose a public health problem across large parts of the world, and many of these have a life cycle that involves freshwater snails. Although Anucherngchai et al. (2016) collected *Clea helena* from the Chao-Phraya Basin in Thailand and didn't find any carrying trematodes, specimens from other parts of their range have not so far been examined."

Tesana et al. (2009) report *Clea helena* as a carrier of *Angiostrongylus cantonensis* in Thailand.

From Tesana et al. (2009):

"*Angiostrongylus cantonensis* is a rodent nematode, the adult worms living inside pulmonary arteries. Humans may become infected and migrating larvae and young adults may produce lesions mainly in the central nervous system."

3 Impacts of Introductions

No impacts have been reported, but CABI (2018) mentions *Clea helena* as "a potential predator on small aquatic snails." Further, CABI (2018) lists modification of natural benthic communities, reduced native biodiversity, loss of endangered species, and loss of native species as potential impact outcomes.

From Strong et al. (2017):

"Given their voracious but non-selective appetite for living snails as well as carrion, their introduction and spread constitute a significant threat to native aquatic snail faunas (Mienis, 2011; Bogan & Hanneman, 2013) which are often highly imperiled (Lydeard et al., 2004; Strong et al., 2008; Johnson et al., 2013). Given the record of both deliberate and inadvertent introductions of non-native snails through the aquarium industry (Cowie & Robinson, 2003; Padilla & Williams, 2004; Strecker, Campbell & Olden, 2011), particularly in freshwater, this danger is all too real and already becoming a reality."

4 Global Distribution

Figure 1. Known global established locations of *Anentome helena*, reported from Southeast Asia. Map from GBIF Secretariat (2017). The location on the island of New Guinea is the result of a coordinate error, so this occurrence was excluded from the climate matching analysis.

5 Distribution Within the United States

This species has not been reported as introduced or established in the United States.

6 Climate Matching

Summary of Climate Matching Analysis

The Climate 6 score (Sanders et al. 2018; 16 climate variables; Euclidean distance) for the contiguous United States was 0.0, which indicates a low climate match overall. The range of proportions classified as low match is from 0.0 to 0.005, inclusive. There were medium matches in southern Florida and southern Texas; the remainder of the contiguous United States had a low match. Locally, no State scored above the low match category within the contiguous United States.

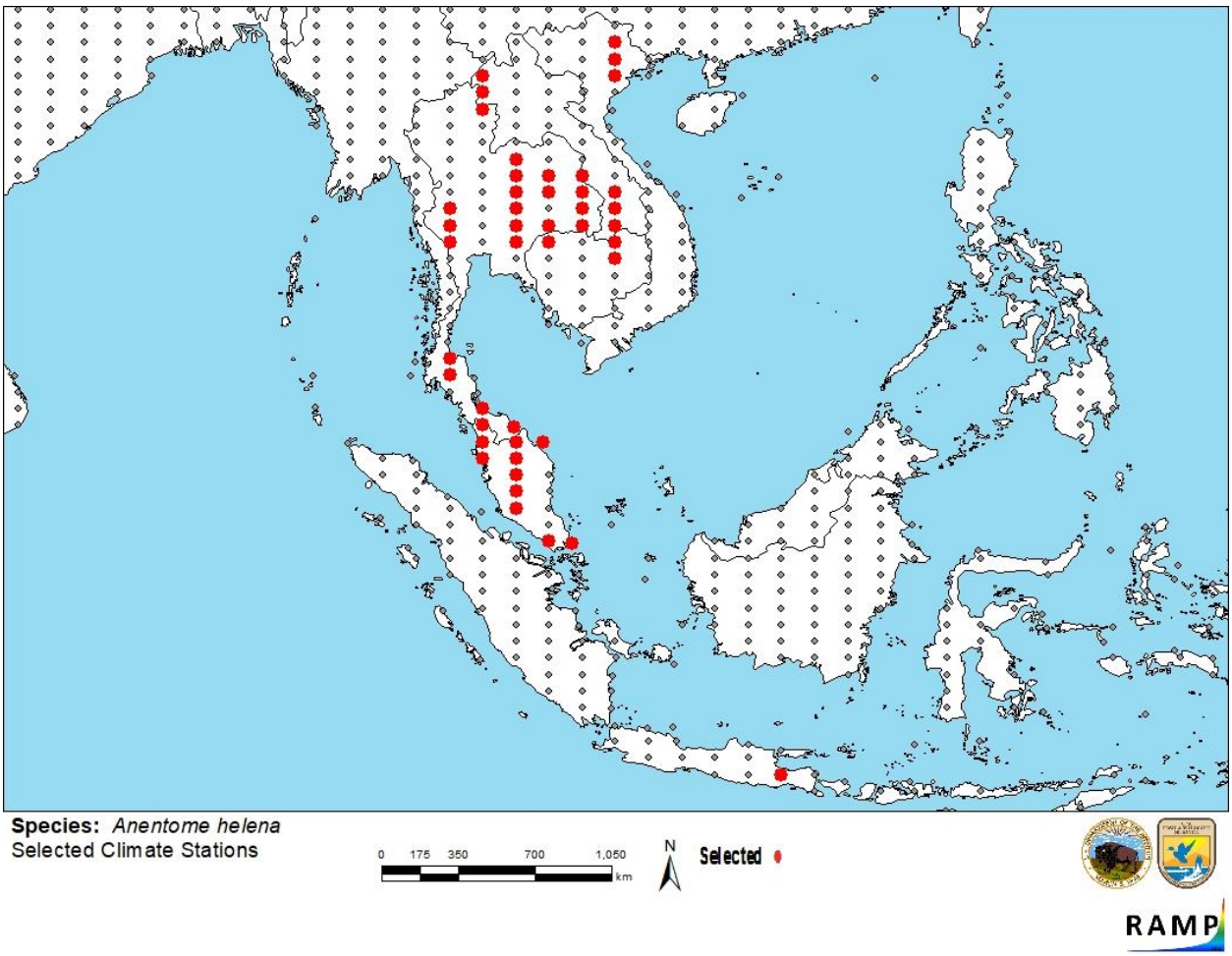

Figure 2. RAMP (Sanders et al. 2018) source map showing weather stations selected as source locations (red; Vietnam, Laos, Cambodia, Thailand, Malaysia, Indonesia) and non-source locations (gray) for *Anentome helena* climate matching. Source locations from GBIF Secretariat (2017). Additional source location from Ng et al. (2016a; Singapore).

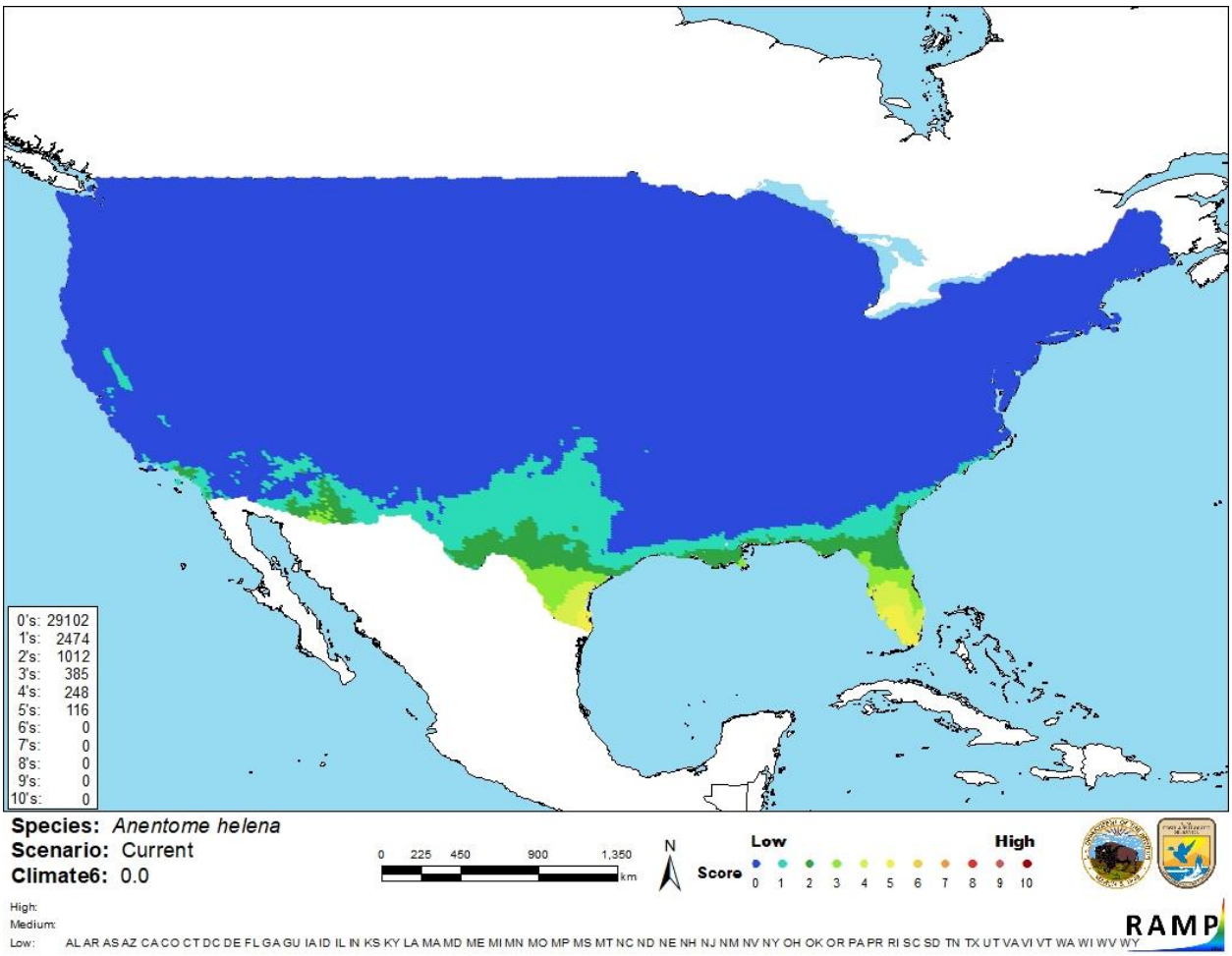

Figure 3. Map of RAMP (Sanders et al. 2018) climate matches for *Anentome helena* in the contiguous United States based on source locations reported by GBIF Secretariat (2017) and Ng et al. (2016a). 0= Lowest match, 10= Highest match.

The "High", "Medium", and "Low" climate match categories are based on the following table:

Climate 6: Proportion of (Sum of Climate Scores 6-10) / (Sum of total Climate Scores)	Climate Match Category
0.000≤X≤0.005	Low
0.005<X<0.103	Medium
≥0.103	High

7 Certainty of Assessment

Limited information currently exists regarding the ecology, biology, distribution, and impacts of *Anentome helena*. Much of what is currently known about the species is based on aquarium observations. Although this context provides useful insights, research of the species in its natural and introduced habitat is needed to better understand and assess it. Although the species has become established in Singapore, no studies of the impacts are available. Therefore, certainty of assessment for *Anentome helena* is low.

8 Risk Assessment

Summary of Risk to the Contiguous United States

Assassin snail (*Anentome helena*), also commonly known as *Clea helena*, is a small freshwater predatory snail that feeds on live and decaying prey. In Thailand, *Clea helena* is a carrier of *Angiostrongylus cantonensis*, a rodent nematode that can infect humans. *A. helena* is widely available in North America, Europe and Asia via the aquarium trade. Much of what is currently known about *A. helena* is limited to aquarium observations, indicating a need for more research of the species in its natural habitat. It has been introduced to a reservoir in Singapore, where it has become established, but there are no studies of its impacts available. However, multiple authors have expressed concern about potential impacts to native snails based on the predatory nature of *A. helena*. Given the absence of scientifically credible studies of impacts where *A. helena* is established, history of invasiveness is classified as "None Documented" and the certainty of assessment is low. The climate match for *A. helena* with the contiguous United States is low, with areas of medium match in south Florida and south Texas. Given all factors, the overall risk assessment for *Anentome helena* is uncertain.

Assessment Elements

- **History of Invasiveness (Sec. 3): None Documented**
- **Climate Match (Sec. 6): Low**
- **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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