Cochlicella spp.*

*Information for specific species within the genus is included when known and relevant. Other species may occur in the genus and are still reportable at the genus level.

Scientific Name

Cochlicella acuta Muller
Cochlicella barbara Linné 1758
Coclicella conoidea Kerney and Cameron

Synonyms:

Cochlicella acuta
Bulimus acustus Zelebor, 1865
Helix acuta O. F. Müller,
Longaeva turrita Menke,
Xerophila cochleolina Monterosato

Cochlicella barbara
Cochlicella ventricosa (Draparnaud),
Cochlicella ventrosa (Férussac),
Helix barbara Linneaus, 1758,
Helix bulimoides Moquin-Tandon,
Helix ventrosa Férussac
Prietocella barbara (Linnaeus, 1758)

Figure 1. Color forms of *Cochlicella acuta* (David Robinson).

Figure 2. Color forms of *Cochlicella barbara* (David Robinson).

Common Name

Pointed snail, conical snail, banded conical snail, small pointed snail, Mediterranean land snail, potbellied helicellid

Type of Pest

Mollusk

Taxonomic Position

Class: Gastropoda, **Order:** Stylommatophora, **Family:** Cochlicellidae

Reason for Inclusion in Manual

CAPS Target: AHP Prioritized Pest List – 2009 & 2010

Pest Description

The genus *Cochlicella* has traditionally been referred to either the Helicidae or Hygromiidae; however, morphological and molecular evidence suggest that the genus is somewhat distinct from other clades within the Hygromiidae and the Cochlicellidae is now recognized as a separate family level entity (Reviewed in Herbert, 2010).

Cochlicella acuta

Adults: "10-20 (rarely 30) x 4-7 mm [approx. $^{3}/_{8}$ to 1 $^{3}/_{16}$ in by $^{1}/_{8}$ to $^{1}/_{4}$ in]. Shell a very elongated cone, with 8-10 slightly convex whorls with moderate sutures. Umbilicus minute, obscured by reflected columellar lip. Mouth elliptical, taller than broad, lacking internal rib. Shell white or ginger, often with darker bands and blotches, color and pattern very variable. Growth ridges irregular and rather weak. Prefers maritime habitat, usually in dunes and coastal grassland, occasionally calcareous ground inland" (Kerney and Cameron, 1979).

Cochlicella barbara

Adults: "8 to 12 x 5 to 8 mm [approx. $^{5}/_{16}$ to $^{1}/_{2}$ by $^{3}/_{16}$ to $^{5}/_{16}$ in]. Shell is elongated cone of 7 to 8 very slightly convex whorls with shallow sutures. Umbilicus minute and partly obscured by columellar lip. Mouth elliptical and lacking internal rib. Shell thick and white, with some variation in color and banding as in *C. acuta*. Growth-ridges slightly more pronounced than in *C. acuta*, especially on last whorl. Prefers dry exposed sites near the sea, especially dunes" (Kerney and Cameron, 1979).

Biology and Ecology

Cochlicella acuta

Baker et al. (1991) studied the life history and population dynamics of *C. acuta* in a pasture-cereal rotation at Hardwicke Bay on Yorke Peninsula, South Australia. The life cycle of *C. acuta* was primarily biennial, with offspring being produced in large numbers in the pasture phase but not the cereal phase of the rotation. The breeding season lasts from autumn to spring. The one year old snails that infest crops in winter are slightly smaller in size (mostly 10 to 14 mm, or approx. $^{3}/_{8}$ to $^{9}/_{16}$ in, in height) than the two year snails that infest pastures at the same time (mostly 12 to 17 mm, or approx. $^{1}/_{2}$ to $^{11}/_{16}$ in), but both groups have mature albumen glands suggesting they are both capable of reproduction. Snails were most abundant in the spring and summer, especially near the edges of fields. Snails aggregate on robust weeds such as yellow mignonette (*Reseda lutea*), as well as at the bases of grass tussocks and beneath loose rocks (Baker, 2002). An average of 7.1 clutches and 257.7 eggs per pair of *C. acuta* were produced during the laboratory breeding season (Baker and Hawke, 1991). There is no evidence that egg production varies based on adult size (Heller, 2001).

In Europe, this species can be found in maritime habitats, usually in dunes and coastal grassland. It can occasionally be found on calcareous ground inland (Kerney and Cameron, 1979). It is native to coastal areas of the Mediterranean and western Europe (reviewed in Baker and Hawke, 1991).

Cochlicella barbara
In Europe, this species can be found in dry exposed sites near the sea, especially dunes, and occasionally inland (Kerney and Cameron, 1979). Herbert (2010) states that unlike *C. acuta*, "*C. barbara* is more cryptic in its habits and does not climb vegetation to aestivate".

In northern France, this species lives for approximately one year. Mating occurs in the spring with egg laying continuing through summer and autumn. Eggs hatch soon after in autumn and early winter, or during the following winter (reviewed in Herbert, 2010).

This species favors areas with relatively dry, Mediterranean climates, especially near the coast. It can be "common in gardens, cultivated and waste land where it may occur in large numbers under favourable conditions. [It] may thrive, largely unseen, beneath the surface of lawns" (Herbert, 2010).

Damage
Visual signs of *Cochlicella* spp. can include chewing or rasping damage to plants, presence of eggs, juveniles and adults, empty snail shells, mucus and slime trails, and ribbon like feces.

Pest Importance
In southern Australia, there are four introduced snail species that cause damage to grain crops and pastures: *Cernuella virgata*, *Cochlicella acuta*, *Cochlicella barbara*, and *Theba pisana* (Baker, 2002). This species, in association with the other three can become a contaminant of small grains due to large amounts of them aggregating on crops. Significant economic losses can occur to farmers due to this aggregation behavior which causes damage to the crop (contamination), damage to machinery during harvest, clogging of the farm machinery, and delays during harvest (Baker, 2002; White-McLean, 2011). Contaminated grain can be cleaned mechanically, but this is costly and difficult, because *Cochlicella* shells are comparable in size to cereal grains (Baker, 2002). Snails cause feeding damage to crop seedlings and legume-based pastures and foul herbage with their slime. In Australia, contaminated grain and seed has been downgraded and rejected for export (Baker, 2002).

Cochlicella acuta and *C. barbara* also cause damage to canola seedlings in Australia. They "may cause direct feeding damage to canola in early winter, just as they attack pastures and other crops in southern Australia (Baker 1986, 1989)" (Gu et al., 2007).

Cochlicella acuta
Godan (1983) lists *C. acuta* as a pest in England. Italy also considers this species a pest not only because of the damage it can cause to plants, but also due to its ability to ability to act as intermediate hosts for trematodes that in infect both humans and animals (Godan, 1983). *Cochlicella acuta* is considered a pest in citrus plantations along riverbanks in southern Australia (reviewed in Godan, 1983). *Cochlicella acuta* was accidentally introduced into southern Australia where it is considered a widespread and important agricultural pest (Baker and Hawke, 1991).

This species is also recorded as a pest of sainfoin (seed production) (Godan, 1983). This material is imported for use as a hay/pasture crop.

Cochlicella barbara
This species can cause appreciable agricultural and horticultural damage when population densities are high. Densities of over 1,000 snails/m^2 have been recorded in New Zealand. Damage to legume-based pastures have been reported in south-eastern Australia. This species is also a pest of wheat and canola in the Bredasdorp area, W. Cape (reviewed in Herbert, 2010). Davis et al. (2012) states that this species is considered a minor crop and pasture pest. Occasionally young vines can be seriously damaged. During the summer, when the species is inactive, it can shelter under ground debris or in crops where it can cause contamination during harvest (Davis et al., 2012).

Known Food Sources*

Cochlicella are native to the western Mediterranean and were first reported in southern Australia in the 1920's (Baker, 1986). They are a particular problem in alfalfa, clover, wheat, and barley fields and pastures in Australia.

*Terrestrial mollusks do not show host specificity and can feed on multiple crops as well as other materials, like decaying organic matter.

Pathogen or Associated Organisms Vectored

Human and Animal Pathogens
Serious diseases are associated with the consumption and improper handling of certain mollusks (snails and slugs). Of particular concern, many mollusk species serve as intermediate hosts of nematodes and trematodes.

Cochlicella unifasciata can act as an intermediate host the trematode *Dicrocoelium dendriticum* (Rudolphi) Looss, which could potentially infect humans and other animals (reviewed in Godan, 1983).

Cochlicella acuta and *C. barbara* are known to be intermediate hosts of nematodes and trematodes which infect man and domestic animals (Godan, 1983; Morrondo et al., 2005). *Cochlicella acuta* is an intermediate host of both *Müllerius capillaris* (Müller) and *Cystocaulus ocreatus* Davtian, lung worms of sheep (reviewed in Godan, 1983). Cochlicella barbara can act as an intermediate host for *Protostrongylus rufescens* (sheep lungworm) (Herbert, 2010).

Note: While most cases of human infections result from consumption of raw or partially cooked snail meat, government inspectors, officers and field surveyors are at-risk due to the handling of live snail, samples, and potential exposure to mucus secretions. ***Wear gloves when handling mollusks and wash hands thoroughly after any mollusk survey or inspection activities.***

Plant Pathogens
Unknown.

Known Distribution
Distribution lists may not be all inclusive.

Cochlicella acuta
Africa: Morocco; **Europe:** Albania, Belgium, Bulgaria, Croatia, Cyprus, France, Gibraltar, Greece, Ireland, Italy, Malta, Netherlands, Portugal, Romania, Slovenia, Spain, United Kingdom, and former Yugoslavia; **Oceania:** Australia, Bermuda (Cabaret, 1979; Kerney and Cameron, 1979; Baker, 1986; Baker and Hawke, 1991; Bank, 2011b).

Cochlicella barbara
Africa: Algeria, South Africa; **Asia:** Turkey; **Europe:** Albania, Belgium, Croatia, France, Greece, Italy, Israel, Netherlands, Portugal, Spain, and United Kingdom; **Oceania:** Australia, Bermuda, and New Zealand (Kerney and Cameron, 1979; Cook, 1997; Herbert, 2010; Bank, 2011b).

Pathway
This genus can be considered a hitchhiker pest as Godan (1983) states that *C. barbara*, *C. conoidea*, and *C. ventricosa* have all been found in the United States in ship storerooms and containers. *Cochlicella barbara* and *C. ventricosa* have also been intercepted in cars. Species in this genus have also been previously intercepted in postal packages, soil, and cargo (Godan, 1983).

Cochlicella barbara
Cochlicella acuta has previously been transported on sainfoin seeds from France to Germany. It has also been intercepted in the United States on young pine plants, *Allium ampeloprasum* (leeks), *Amaryllis* sp., *Apium raveolens* (celery), *Brassica oleracea* (cabbage), *Lactuca sativa* (lettuce), *Laurus nobilis* (bayleaves), *Lens culinaris* (lentils), *Lilium* sp. (lilies), *Mentha* sp., *Olea* sp. (olive), *Panicum* sp. (millet), *Rosmarinus* sp., and *Xeranthemum* sp. (immortelle), and the seeds of *Cichorium* sp., and *Helianthus* sp. (reviewed in Godan, 1983). Herbert (2010) states that this species is an opportunistic species that can be easily transported with plants, building materials, and household goods.

Cochlicella conoidea
Cochlicella conoidea has been intercepted in the United States on *Lens culinaris* (lentils) as well as other plants and seeds (reviewed in Godan, 1983).

Coclicella ventricosa
Coclicella ventricosa has been intercepted in the United States on the leaves of *Citrus* sp., *Mentha* sp., and palm leaves as well as on *Apium graveolens* (celery), *Brassica oleracea* (cabbage), *Crassula* sp., *Dianthus* sp. (carnations), *Lactuca sativa* (lettuce), *Lilium* sp. (cut flowers), *Phaseolus vulgaris* (seeds), *Petroselinum crispum* (parsley),

Sarcocaulon patersonii, *Solanum lycopersicum* (tomato), *Xeranthemum* sp. (immortelle), and mixed seeds (reviewed in Godan, 1983).

Potential Distribution within the United States

Cochlicella acuta and *C. barbara* have been introduced into California and are currently established, where they can become locally abundant, often in greenhouse situations (Hardy, 2004). Herbert (2010) states that *C. barbara* is found in California and South Carolina.

Cochlicella acuta can endure warm, sunny, and dry areas over relatively long periods meaning it has the potential of being widely distributed (Godan, 1983).

Survey

CAPS-Approved Method*:

Visual. See the Introduction to the mollusk manual for specific information on visual surveys. While conducting a survey, look for snail eggs, juveniles and adults, as well as clues that suggest the presence of mollusk pests which may include: empty snail shells, mucus and "slime" trails, and/or ribbon-like feces.

Notes: Negative data for the genera *Cernuella*, *Cochlicella*, and *Monacha* can be entered at the genus level if no individuals of that genus are found in the sample and if the sampling method used will capture individuals of that genus if they are present in the environment from which that sample was taken. All species of these genera are exotic and not native to the U.S. All positives, regardless of genus, must be reported at the species level; no positive entries at the genus level are allowed.

Survey Site Selection

New introductions of terrestrial gastropods will likely be related to commerce and human-assisted movement. The habitat and land-use type of each survey site may be variable, ranging from agricultural land, to residential or industrial features. When planning the survey route for a particular site, examine the following microhabitats:

- Near heavily vegetated areas, especially gardens and fields where plants have been damaged by feeding;
- Under rocks, asphalt or cement pieces that are in loose contact with the ground surface;
- Discarded wooden boards and planks, fallen trees, logs, and branches;
- Damp leaf litter (not wet or soggy), compost piles, and rubbish heaps;
- Under flower pots, planters, rubber mats, tires, and other items in contact with the soil; and
- Standing rock walls, cement pilings, broken concrete, and grave markers.

On rainy or humid days, inspect containers that are suspended inches above the ground, garbage bins, driveways, low-growing bushes, and ground-lying trash. During

dry or hot days, snails are attached, often in clusters of several to many individuals, to plants fences, and other objects; due to this behavior survey during dry weather may actually be easier, especially if snail density is low (CPHST, 2006).

Trap Placement
Trapping ***cannot*** be used alone but can be used to supplement visual surveying. Trapping for terrestrial gastropods is not species-specific and will attract non-target species, including non-gastropods. Platform or baiting traps can be used to supplement visual inspection. Trap placement can occur in the same areas that visual surveys occur.

Time of year to survey
Most species of terrestrial gastropods are active during nocturnal hours, when environmental conditions are cool and wet. Some species may also be active during daylight, especially during overcast and rainy days in the spring and fall. If possible, plan surveys during spring and fall, during the early morning, and on overcast days. Many slugs and snails have diurnal patterns of activity, so early morning and evening hours may be the best time to carry out a survey (Pearce and Örstan, 2006).

*For the most up-to-date methods for survey and identification, see Approved Methods on the CAPS Resource and Collaboration Site, at http://caps.ceris.purdue.edu/.

Literature-Based Methods:
Visual survey: In Australia, where the pest is known to be present, road sides are sampled extensively, because they provide favorable habitat and are easily accessible. Roads approximately parallel to each other and 8 km apart were plotted on large scale maps and sampling points ("stops") were chosen at 8 km (5 mile) intervals along them (Pomeroy and Laws, 1967; Butler and Murphy, 1977).

Soil Sampling: Soil litter can also be sampled to conduct a general mollusk survey. According to Nekola (2003), samples are collected and dried completely, then soaked in water for 3 to 24 hours, and finally subjected to careful but vigorous water disaggregation through a standard sieve series (9.5 mm, 2.0 mm. 0.85 mm, and 0.425 mesh screens). The fractions are then dried and passed through the same sieve series, and handpicked against a neutral brown background. All shells and shell fragments are removed and identified.

Key Diagnostics/Identification

CAPS-Approved Method*:
Morphological: Confirmation requires a morphological identification. All specimens should be submitted to Patrick Marquez. He is able to identify (even immature specimens) to the species level for this genus.

Both species (*Cochlicella acuta* and *Cochlicella barbara*) of pointed snail are fawn or brown. The size and shape of the shell of mature specimens can be used to separate the two species. The shells of mature pointed snails are 12 to 18 mm (approx. $^{1}/_{2}$ to $^{11}/_{16}$

in) long and the ratio of the shell length to its diameter at the base is always greater than two. The shells of mature small pointed snails are 8 to 10 mm (approx. $^{5}/_{16}$ to $^{3}/_{8}$ in) long and the ratio of the shell length to its diameter at the base is always two or less (CABI, 2007).

A key to terrestrial mollusks (including *Cochlicella* spp. and *Prietocella barbara* (=*C. barbar*a) is found here: http://idtools.org/id/mollusc/index.php.

*For the most up-to-date methods for survey and identification, see Approved Methods on the CAPS Resource and Collaboration Site, at http://caps.ceris.purdue.edu/.

Easily Confused Species

Cochlicella spp. are similar to each other. *Cochlicella barbara* has previously been misidentified as *C. acuta* (Herbert, 2010).

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