

NOBANIS - Marine invasive species in Nordic waters - Fact Sheet

Ensis directus

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Species description

Species name

Ensis directus (Conrad, 1843)

Synonyms

Solen directus Conrad, 1843; *Solen ensis* var. *Americanus* Gould in Binney & Gould, 1870

Common names

American razor clam (UK); Atlantic Jackknife clam (USA); Amerikansk knivmusling (DK); Amerikansk knivmussla (SE); Amerikansk knivskjell (NO); Amerikanische Schwertmuschel (GE); Amerikaanse zwaardschede (NL); Couteau américain (FR).

Family

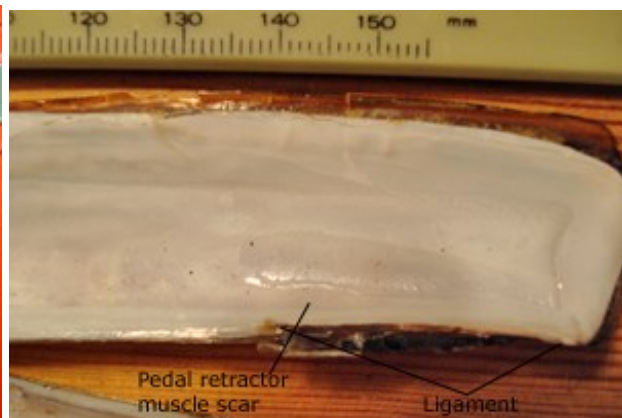
Pharidae H. & A. Adams, 1858 (see [WORMS](#) (World Register of Marine Species)). Only the genus *Solen* belongs in the family Solenidae Lamarck, 1809.

Identification

The American razor clam is characterized by an elongate (razor-shaped), brownish shell. The two valves are attached by a hinge in the anterior end. The hinge is composed of a few very small "teeth" and an elastic ligament. The shell is slightly curved or almost straight. In Nordic waters it rarely exceeds 20 cm in length.



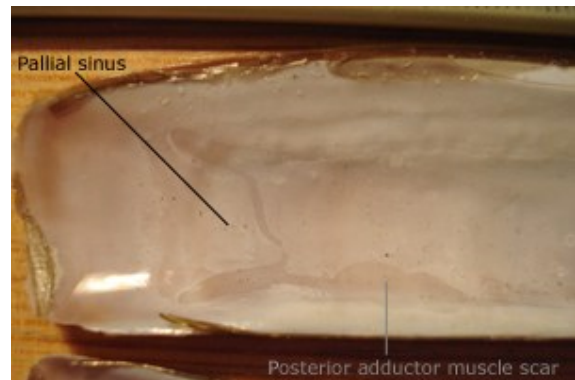
Ensis directus - external shell



Ensis directus - interior

Internally the shell is marked by adductor muscle scars anteriorly and posteriorly, and at the posterior end the pallial sinus is outlined; this indicated where the siphons can be withdrawn.

The American razor clam can be distinguished from other razor clams found in Nordic waters by the size, shape and location of the various scars and marks on the inside of the shell. In young, thin-shelled specimens marks may be indistinct and therefore difficult to see, and furthermore, irregularities caused by physical damage or other external impacts may occur.



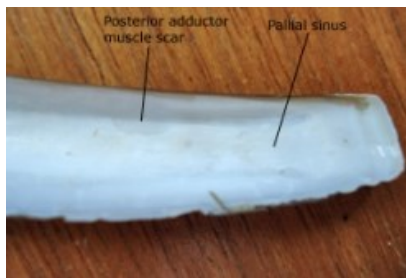
Ensis directus - interior

In *Ensis directus* the pallial sinus has straight, narrow edges and the bottom is oblique; the shell is curved and wider than that of *E. ensis*.

Ensis ensis (Linnaeus, 1758), has a narrow, strongly curved shell; the posterior adductor muscle scar is located far from the pallial sinus. Further information [here](#) (pdf) (in Swedish)



Ensis ensis - external shell



Ensis ensis - interior

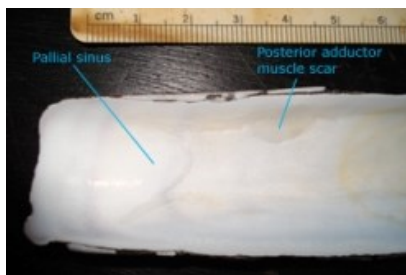


Ensis ensis - interior

Ensis siliqua (Linnaeus, 1758), has a long, straight and relatively wide shell; it is the largest species in Nordic waters, often growing to more than 20 cm in length; the posterior adductor muscle scar is located close to the pallial sinus, which is slightly conical. Further information at [The Conchological Society of Great Britain & Ireland](#).



Ensis siliqua - external shell

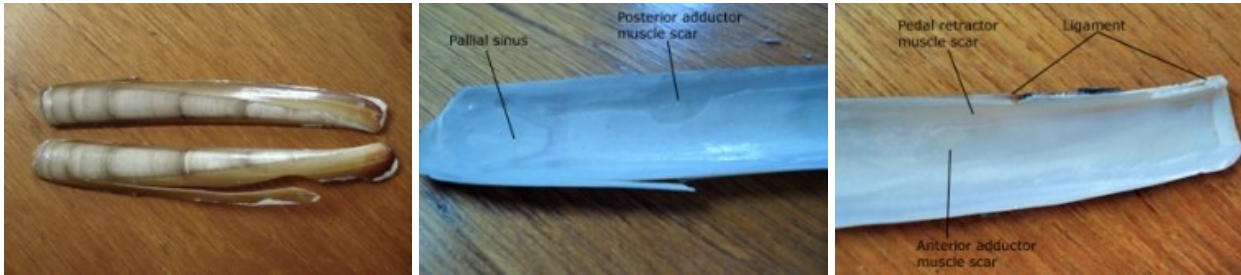


Ensis siliqua - interior



Ensis siliqua - interior

Ensis magnus Schumacher, 1817 (formerly known as *Ensis arcuatus* (Jeffreys, 1865)) has a slightly curved shell with straight, truncated ends; the distance between the bottom of the pallial sinus and the posterior adductor muscle scar is larger than the length of the scar. Further information see [Tjärnö marinbiologiska laboratorium](#) (in Swedish).



Ensis magnus - external shell

Ensis magnus - interior

Ensis magnus - interior

Ensis minor (Chenu, 1843) (Not = *E. minor* Dall) is a southern species occurring in the Mediterranean and the Atlantic coasts of Europe till the southern and western North Sea; it is likely that it will spread to the remaining North Sea with increasing temperatures. It is sometimes considered a variety of *E. siliqua* (see [The Conchological Society of Great Britain & Ireland](#))

Phaxas pellucidus (Pennant, 1777) (= *Cultellus pellucidus*) has very thin and almost transparent shells, and muscle scars as well as pallial sinus are difficult to distinguish. Hence it can be difficult to distinguish young specimens of other razor clam species from this species. Hinge teeth are different.

Taxonomic problems

The American razor clam is known as *Ensis directus* (Conrad, 1843) in its native area, and this is also what it was called when it was first introduced to Europe (Von Cosel *et al.*, 1982). However, further studies showed that this name was based on a fossil and presumably extinct species (van Urk, 1972, 1987). Hence the name *Ensis americanus*, being second-oldest, has been applied by some scientists. A recent revision of the genus *Ensis* (von Cosel, 2009) has shown that *E. americanus* is most likely a junior synonym of *E. directus*, and this has been accepted by most, including the recent species alert report from ICES (Gollasch *et al.*, 2015). However, both names still appear in various checklists. Främmande Arter uses *E. directus*, as do most of the large international databases, e.g. WoRMS, MARBEF Data System and ITIS, though DAISIE uses *E. americanus*. National checklists from different countries, e.g. Eno *et al.*, 1997, Hopkins, 2001, Gollasch & Nehring (2006), Kerckhof *et al.* (2007) use both names. To professional taxonomists this is just a minor nuisance; as long as the author name and year are included these scientists will know which species it is. For others it is very confusing, and for database managers it is almost impossible to handle. In agreement with WoRMS, we have decided to use *E. directus*.

Distribution

Native distribution

The American razor clam occurs along the east coast of North America from Labrador to South Carolina.

History of introduction to Europe

Ensis directus was first discovered at the German Wadden Sea coast in 1979 (Cosel *et al.*, 1982), and in 1981 the first specimens were found in the Danish section of the Wadden Sea (Knudsen,

1989). The first record from Sweden was in 1982 (Främmande Arter, 2006). In the following years it dispersed northwards to Skagerrak, Kattegat and the Limfjord (Rasmussen, 1996; Knudsen, 1997), and southwards to the Netherlands, Belgium and northern France (Essink, 1985; Luczak *et al.*, 1993). Later on it dispersed to the UK and to Norway, where it was first recorded in 1989 (Palmer, 2004; Brattegard & Holthe, 1997). Further information can be found in the species alert report from ICES (Gollasch *et al.*, 2015).

Ecology

Razor clams are famous for being able to burrow very fast and very deep into the sediment, making them difficult to capture live (Drew, 1907). The burrowing mechanism has been described in detail (Trueman, 1967). Their short siphons indicate that their usual position in the sediment is close to the surface. Often they are found with the posterior end protruding from the sediment, especially when they are exposed at low tide (Swennen *et al.*, 1985). *Ensis directus* lives in sandy or muddy sand substrate in fairly shallow water (intertidal to 12 m depth). It is a suspension feeder. In the Wadden Sea it grows to about 6 cm in one year; after 2 years they are about 12 cm long. After this growth slows down, and after 4 years they are about 14 cm long (Beukema & Dekker, 1995). Maximum biomass has been recorded in the German Wadden Sea, 1.4 kg AFDW (ash free dry weight) m⁻² (Armonies & Reise, 1999). Compared to other species of *Ensis*, *E. directus* can tolerate lower salinity and it is not as selective concerning sediment. *E. magnus* prefers coarse sand; *E. ensis* is found in the Venus-community, *i.e.* sand without wave action; *E. siliqua* prefers sandy bottom with heavy wave action and is most common in the Skagerrak. *E. directus* is also rather tolerant of hypoxia (Schiedek & Zebe, 1987). Several recent studies have shown that the success of *E. directus* as an invader is due to its preference for mobile sediment as well as a tolerance for high silt concentrations (Dekker & Beukema, 2012; Kamermans *et al.*, 2013; Witbaard *et al.*, 2015).

Reproduction

Ensis directus have separate sexes and are broadcast spawners, *i.e.* eggs and sperm are released into the water and fertilization is external. Larval development takes about 2-3 weeks at 18° C (Kenchington *et al.*, 1998). In the Wadden Sea spawning takes place in March – April. Settling density in the Wadden Sea has been reported as about 150 individuals m⁻² (Beukema & Dekker, 1995), 440 individuals m⁻² ((Mühlenhardt-Siegel *et al.*, 1983) and more than 3000 individuals m⁻² (Dauwe *et al.*, 1998). Recruitment may be very low or absent following cold winters (Armonies *et al.*, 2001).

Predators

In the Wadden Sea the American razor clam is eaten by oyster-catchers (Swennen *et al.*, 1985). In places without tides, or where the razor clam lives at greater depths, especially diving ducks are capable of catching and eating these clams. In particular common scoters feed exclusively on American razor clams near the off-shore windmill farm at Horns Rev in the Danish part of the North Sea (Skov *et al.*, 2008), but also eiders will feed on razor clams (Leopold *et al.*, 2001). Moonsnails that usually drill circular holes in the shells of their prey may capture and ingest a razor clam by drilling in the muscular foot. This means that there will not be the tell-tale hole in the shell (Schneider, 1982). The razor clam usually escapes moonsnail predation by digging out of the sediment and somersaulting across the surface. Being out of the sediment, however, it is an easy

prey for birds. In its native area *E. directus* is also eaten by a species of nemertines and by seastars (McDermott, 1976).

Parasites

Although no parasites were introduced with *E. directus*, they are now hosts for several native parasites, which may affect the natural life cycles of these parasites, but also relieve parasite pressure of native hosts (Krakau *et al.*, 2006).

Impacts

Ecological and biological

Although the American razor clam is one of the most abundant bivalve species in many places, no direct impacts on native species or communities have been attributable to this species. This may be due to lack of quantitative data from before the introduction of the American razor clam. It could also be because it primarily competes with large species as *Mya arenaria*, which lives for many years and does not need to reproduce every year. *E. directus* appears to have exploited a previously underexploited habitat of motile sand (Dekker & Beukema, 2012).

Economic impacts

Several attempts have been made to exploit the American razor clam commercially (Palmer, 2004). Also, the possibility of culturing the species in aquaculture has been investigated (Freudenthal & Nielsen, 2005). Neither possibility has been deemed profitable so far. However, the dredging for razor clams (and other clams) has significant adverse effects on the ecosystem (Hall *et al.*, 1990; Gaspar *et al.*, 1994, 1998; Robinson & Richardson, 1998; Tuck *et al.*, 2000; Chicharo *et al.*, 2002; Fahy & Carroll, 2007; Hauton *et al.*, 2007).

Other impacts

The sharp edges of the shells washed up on the beach and in shallow water may cause injuries to people walking bare-foot on the beach.

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