Mya arenaria **System:** Marine

Kingdom	Phylum	Class	Order	Family
Animalia	Mollusca	Bivalvia	Myoida	Myidae

Common name vanlig sandskjell (English, Norway, Svalbard & Jan Mayan), nannynose (English), steamer clam (English, USA), almindelig sandmusling (English, Denmark), long-necked clam (English, USA), eastern soft-shell clam (English, USA), sandmusslan (English, Sweden), soft-shell clam (English, USA), sand gaper (English, USA), smelinuke (English, Lithuania), Sandklaffmuschel (English, Germany), hietasimpukka (English, Finland), liiva-uurikkarp (English, Estonia), sandskel (English, Iceland), liela smilšgliemene (English, Latvia)

Synonym *Mya hemphillii*

Similar species *Platyodon cancellatus, Cryptomya californica, Mya truncata, Schizothaerus nuttalli*

Summary Mya arenaria (soft shell clam) has a large global distribution, largely due to its adaptability to varying environments. Impacts of Mya arenaria range from habitat alteration to massive bioaccumulation.

view this species on IUCN Red List

Species Description
Mya arenaria can grow to be 10-15cm long and 8-19cm wide with a white to pale grey shell which can be variable in colour depending on the sediment stratum it burrows into. The shell is thin and fragile, rounded in the front and forms a point at the rear hinge. The exterior of the shell is rough and has uneven concentric rings. The interior right valve has a deep pit, while the interior left valve has a \"shelf-like projection\" (chondrophore) which is used to distinguish it from many native Pacific bivalves. Two fused brown siphons that filter water are located at the posterior end of *M. arenaria* (Cohen, A. N., 2005).

Lifecycle Stages
Approximately 12 hours after fertilization, the larval forms of *Mya arenaria* hatch from the eggs (Cohen, 2005). High juvenile and larval mortality are common due to high egg production (Tyler-Walters, 2003). The larvae spend 2-5 weeks free-floating with plankton and other organic particles before metamorphosizing and settling to the bottom of the sea floor. The clams then spend another 2-5 weeks moving along the sea floor or temporarily attaching itself to the surface of objects. *M. arenaria* then begins to burrow into the sediment and stays burrowed for the rest of its life (Cohen, 2005). Young soft-shell clams can reborrow if disturbed, but aduls cannot because of their large shell size (Tyler-Walters, 2003). *M. arenaria* reaches maturity in 1-4 years, depending on the length of each growing season. The typical lifespan is between 10-12 years, but cases have been recorded of some soft-shell clams reaching 28 years of age (Cohen, 2005).

Uses
The soft-shell clam *Mya arenaria* is harvested by humans for culinary purposes, like \"clam bakes\" which are common in areas in New England and Canada. It is not commonly eaten in Europe or the UK (JNCC, undated) or on US west coast (Dr. James (Jeb) Byers., pers.comm., May 2008). Byers (2005) hypothesized that this was one of the reasons *M. arenaria* was so much bigger in Washington state than anywhere on US east coast where clam is native (with less human harvest pressure the clam got bigger).
M. arenaria is a valuable food source for migrating shorebirds along the Pacific coast of the United States (Carlton, 1977). Fish, sandworms, crabs, rays, sharks, flounder, gulls, sea otters, raccoons, and wading birds, (Tyler-Walters, 2003). Staghorn sculpin (*Leptocottus armatus*) also prey upon *M. arenaria*. *M. arenaria* is important to U.S. fishery (on the US east coast), and is also an important research species (Tyler-Walters, 2003). As a suspension feeder, it plays a crucial role in filtering and cleaning water sources, and can be used as a tool in regulating and enforcing pollution standards in water quality control (UK Biodiveristy Group, 1999).

Habitat Description
NOBANIS (undated) states that *Mya arenaria* is found in brackish waters, estuaries, and marine habitats. *M. arenaria* burrows into the sediment and can be found 20-30cm below the surface of the soil. It prefers sandy soils with a preference for a sandy-mud mixture with some gravel. If the substrate is too coarse then it cannot adequately burrow and may damage its thin shell (Cohen, 2005). Locations with clean, fast-flowing water sustain the highest populations of *M. arenaria* (Tyler-Walters, 2003). It is typically found in the upper intertidal zone to the lower intertidal zone, subtidal zone, and even in deep waters, up to 190m beneath the surface of the ocean (Tyler-Walters, 2003). It can survive between -2 and 28 ° Celsius, with optimal temperatures between 6-14 ° Celsius. Optimal salinity concentrations are between 25-35 parts per thousand with a tolerance as low as 5 parts per thousand. The soft-shell clam is also very tolerant of anaerobic environments and can survive in an oxygen depleted environment for up to 8 days (Cohen, 2005).

Reproduction
Separate male and female sexes occur in the species, with fertilization occurring externally in the environment. Female soft shell clams can release from 1-5 million eggs in its lifetime and typically one to two spawnings happen a year, one in early spring and the other in late summer, depending on locality and monthly tidal cycles (Abraham & Dillon, 1986). Temperature is the crucial factor in reproduction with optimal temperatures between 10-15° Celsius (Cohen, 2005). Fecundity also increases with size and age, particularly with females (Tyler-Walters, 2003).

Nutrition
The soft-shell clam is an active suspension feeder, filtering organic particles and microinvertabrates, like plankton, filamentous algae, diatoms, jellyfish and fish larvae, and flagellates. It feeds using two fused siphon tubes that draw in water to be strained with micro-cilia. The water is then forced back out through the siphon. An adult soft-shell clam can filer up to 50 liters of water per day (Tyler-Walters, H., 2003). Excessive siltation reduces feeding efficiency by clogging the gills of *M. arenaria* (Palacios*et al*, 2000).

General Impacts
NOBANIS (undated) reports that *Mya arenaria* competes with other species, causes abiotic changes, and uses resources. Other ecological impacts of *M. arenaria* include benthic-pelagic interaction, bioaccumulation, community dominance, and habitat change. (Baltic Sea Alien Species Database, 2007).

Management Info
Preventative measures: A two year study undertaken for the Department of Environment and Heritage, Australia by CSIRO (Commonwealth Scientific and Industrial Research Organisation) Marine Research, was designed to identify and rank introduced marine species found within Australian waters (potential domestic target species) and those that are not found within Australian waters (potential international target species). Potential domestic target species, in this context are defined as ship-vectored, established, non-native (or cryptogenic) species that have demonstrated significant impact on human health, economic interests or environmental values in the Australian marine environment. Potential international target species are similarly defined as ship vectored, non-native (or cryptogenic) species that have demonstrated significant impacts outside of Australia. All of the non-native potential target species identified in the independent report published are ranked as high, medium and low priority, based on their invasion potential and impact potential.
The potential international target species are prioritised by their location in the invasion potential/impact potential space. *Mya arenaria* has been categorised as 'Low priority'. (Hayes *et al.* 2005).
Human use in fisheries for harvest as a food source has made this species well established in its non-native range, making eradication infeasible (Hoagland & Jin, 2006).
Physical: Management reccomendations include remediation of over-harvested and polluted sites to reestablish an increase in species biodiversity, thereby maintaining predation interaction (UK Biodiveristy Group, 1999).

Pathway
The eggs and larval stages can be transported in the ballasts of ships. *Mya arenaria* was introduced to the west coast of U.S. *via* ship ballast water (Carlton, 1977).It is widely believed that some stock of *Mya arenaria* was unintentionally introduced when transporting stock of American oyster (*Crassostrea virginica*) to the West coast of the United States . (Stearns, 1881).NOBANIS (undated) states that *Mya arenaria* was introduced to Estonia by hull fouling considered a primary vector for transporting species.

Principal source: Cohen, A. N., Guide to the Exotic Species of San Fransico Bay, San Fransico Estuary Institute, Oakland, CA, June 7, 2005.

Compiler: National Biological Information Infrastructure (NBII) & IUCN/SSC Invasive Species Specialist Group (ISSG)

Review: Dr. James (Jeb) Byers, Assistant Professor, Dept. of Zoology, Department of Zoology University of New Hampshire. USA

Pubblication date: 2007-07-31

ALIEN RANGE

[7] ATLANTIC - NORTHEAST
[1] CANADA
[1] ESTONIA
[1] FINLAND
[1] GERMANY
[1] ICELAND
[1] LATVIA
[4] MEDITERRANEAN & BLACK SEA
[1] PACIFIC - NORTHEAST
[2] PORTUGAL
[1] SPAIN
[1] SWEDEN
[21] UNITED STATES
[1] AUSTRALIA
[1] DENMARK
[1] FAROE ISLANDS
[2] FRANCE
[1] GREECE
[1] ITALY
[1] LITHUANIA
[1] NORWAY
[1] POLAND
[1] RUSSIAN FEDERATION
[1] SVALBARD AND JAN MAYEN
[1] UNITED KINGDOM

BIBLIOGRAPHY

21 references found for **Mya arenaria**

Managment information

Centre for Environment, Fisheries & Aquaculture Science (CEFAS)., 2008. Decision support tools-Identifying potentially invasive non-native marine and freshwater species: fish, invertebrates, amphibians.

Summary: The electronic tool kits made available on the Cefas page for free download are Crown Copyright (2007-2008). As such, these are freeware and may be freely distributed provided this notice is retained. No warranty, expressed or implied, is made and users should satisfy themselves as to the applicability of the results in any given circumstance. Toolkits available include 1) FISK- Freshwater Fish Invasiveness Scoring Kit (English and Spanish language version); 2) MFISK- Marine Fish Invasiveness Scoring Kit; 3) MI-ISK- Marine invertebrate Invasiveness Scoring Kit; 4) FI-ISK- Freshwater Invertebrate Invasiveness Scoring Kit and AmphISK- Amphibian Invasiveness Scoring Kit. These tool kits were developed by Cefas, with new VisualBasic and computational programming by Lorenzo Vilizzi, David Cooper, Andy South and Gordon H. Copp, based on VisualBasic code in the original Weed Risk Assessment (WRA) tool kit of P.C. Pheloung, P.A. Williams & S.R. Halloy (1999).
The decision support tools are available from:
http://cefas.defra.gov.uk/our-science/ecosystems-and-biodiversity/non-native-species/decision-support-tools.aspx [Accessed 13 October 2011]

The guidance document is available from http://www.cefas.co.uk/media/118009/fisk_guide_v2.pdf [Accessed 13 January 2009].

Gollasch, S., 2006. Overview on introduced aquatic species in European navigational and adjacent waters, *Helgol Mar Res* (2006) 60: 84-89.

Summary: Overview of introduced species in European waterways and their vectors for introduction. This report gives information on which species occur in different European regions.

Hayes, K., Sliwa, C., Migus, S., McEnnulty, F., Dunstan, P. 2005. National priority pests: Part II Ranking of Australian marine pests. An independent report undertaken for the Department of Environment and Heritage by CSIRO Marine Research.

Summary: This report is the final report of a two year study designed to identify and rank introduced marine species found within Australian waters (potential domestic target species) and those that are not found within Australian waters (potential international target species).
Available from: http://www.marine.csiro.au/crimp/reports/PrioritypestsFinalreport.pdf [Accessed 25 May 2005]

Palacios, R., Armstrong, D. A., & Orensanz, J. L. 2000. Fate and legacy of an invasion: extinct and extant populations of the soft-shell clam (*Mya arenaria*) in Grays Harbor (Washington), *Aquatic Conservation: Marine and Freshwater Ecosystems* 10: 279-303.

Summary: An in depth view of populations of soft-shell clams in Grays Harbor. The authors attempt to answer several questions about its introduction, persistence, mass extinction, and survival capabilities.

UK Biodiversity Group, Maritime species and habitats, Tranche 2 Action Plans, Vol. V, pp. 211

Summary: This website discusses coastal habitat management strategies on how to stabilize an ecosystem population against factors like pollution, construction and development, as well as outreach, regulation, and education on how these ecosystmes play an importnat role in society.
Available from: http://www.ukbap.org.uk/UKPlans.aspx?ID=66 [Accessed on 12, January, 2007]

Zenetos, A., & N. Streftaris. Undated. Introduced species in marine and coastal waters. Aquculture as a means of introduction.

Summary: This fact sheet discusses the potential for aquculture to introduce marine species to European waters. Provides informative charts and graphs about abundance, location, and magnitude of invasive species.

General information

Abraham, B. J. & Dillon, P.L., Species profiles: life histories and environmental requirements of coastal fishes and invertabrates (mid-Atlantic)--softshell clam, *U.S. Fish Wildl. Serv. Biol, Rep.* 82 (11,68), U.S. Army Corps of Engineers, TR EL-82-4 pp.18

Summary: In depth analysis of the reproductive cycles of *M. arenaria* and what environmental conditions it requires for physiological growth, development, nutrition and reproduction.
Available from: http://www.nwrc.usgs.gov/wdb/pub/species_profiles/82_11-068.pdf [Accessed on: 12, January, 2007]

Baltic Sea Alien Species Database, 2007. *Mya arenaria*. Olenin S, Daunys D, Leppøkoski E, Zaiko A (editors).

Summary: A database of Baltic Sea Alien Species. Information is available pertaining to ecological and resource impacts of *M. arenaria*.
Available from: http://www.corpi.ku.lt/nemo/alien_species_directory.html [Accessed 19 May 2008]

Byers, J. E. 2005. Marine reserves enhance abundance but not competitive impacts of a harvested nonindigneous species. Ecology 86(2): 487-500

Carlton, J. T., 1977. Introduced Invertabrates of San Fransico Bay, *San Fransico Bay: The Urbanized Estuary Investigations into the Natural History of San Fransico Bay and Delta With Reference to the Influence of Man*, Pacific Division of the American Association for the Advancement of Science, June 12, 1977

Summary: This report discusses the presence of about 100 introduced species that exist in the San Francisco Bay and their mechanisms of introduction. Impacts of these species, particularly Ecological and Economical are discussed throughout the paper.
Available from: http://www.estuaryarchive.org/cgi/viewcontent.cgi?article=1035&context=archive [Accessed on 12 January, 2007]

Carlton, J. T., 1992. Introduced Marine and Estuarine Mollusks of North America: An End-of-the-20th-Century Perspective, *Journal of Shellfish Research*, Vol. 11, No. 2, pp. 489-505, 1992.

Summary: A review of the introduced marine mollusks of the Atlantic, Gulf, and Pacific coasts of America. Methods of species introduction are discussed in this paper as well.
Available from:http://sgnis.org/publicat/papers/jsr11_2.pdf [Accessed on 12, January, 2007]

Cohen, A. N., Guide to the Exotic Species of San Fransico Bay, San Fransico Estuary Institute, Oakland, CA, June 7, 2005.

Summary: Very informative website that gives fairly detailed information on the general biology and on both the historical and current distribution of *M. arenaria*. This particular site focuses on the effects of the clam s introduction to the San Fransico Bay area.
Available from: http://www.exoticsguide.org/species_pages/m_arenaria.html [Accessed on 12, January, 2007]

Hoagland, P. & Jin, D., Science and Economics in the Management of an Invasive Species, *Bioscience*, Nov. 2006, Vol. 56, No. 11
Summary: This journal srticle discusses the impact of invasive species in regards to economics with emphasis on the European green crab, with mention of the soft-shell clam. Not much specific information on the effects of *M. arenaria*, but reiterates conceptual ideas of maritime species management and some of its shortcomings.
ITIS (Integrated Taxonomic Information System), 2007. Online Database *Mya arenaria*.
Summary: An online database that provides taxonomic information, common names, synonyms and geographical jurisdiction of a species. In addition links are provided to retrieve biological records and collection information from the Global Biodiversity Information Facility (GBIF) Data Portal and bioscience articles from BioOne journals.
Available from: http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=81692 [Accessed on 12, January, 2007]
JNCC (Joint Nature Conservation Committee). Undated. *Mya arenaria*.
Summary: Information about the existence of the soft-shell clam in British waters. Include dispersal and distribution information. This website s work contributes to maintaining and enriching biological diversity, conserving geological features and sustaining natural systems in the UK.
Available from: http://www.jncc.gov.uk/default.aspx?page=1720 [Accessed on 12, January, 2007]
Lepp&#65533;koski, E. and Olenin, S. 2000. Non-native species and rates of spread: lessons from the brackish Baltic Sea. Biological Invasions. Vol. 2: 151-163.
Summary: This article discusses introductions of nonindigenous species to the Baltic Sea and provides a date for the discovery of *Rhithropanopeus harrisii*.
NOBANIS (North European & Baltic Network on Invasive Alien Species) 2008. *Mya arenaria*.
Summary: A European website that records and monitors invasive species in North and Central Europe. Gives great distribution information and also includes the status, invasiveness, impact, method of introduction, frequency, and year when available. Great categorical maps are also available on this page.
Available from: http://www.nobanis.org/speciesInfo.asp?taxaID=247 [Accessed on 12 January 2007]
Petersen, K.S., Rasmussen, K.L., Heinemeler, J., & Rud, N. 1992. Clams before Columbus? Nature, 359: 679.
Stearns, R. E. C., *Mya arenaria* in San Fransico Bay, *The American Naturalist*, Vol. 15, No. 5, (May, 1881) pp. 362-366.
Summary: This paper discusses the presence of *M. arenaria* in different parts of the world. It describes a species that is very similar to the soft-shelled clam and strives to determine the source that led to the introduction of *M. arenaria* in the San Francisco Bay.
Tyler-Walters, H., 2003. *Mya arenaria*. Sand gaper. *Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme* [on-line]. Plymouth: Marine Biological Association of the United Kingdom.
Summary: This website allows the user to view tabbed information concerning marine life of Britain and Ireland. It includes taxonomy and identification, general biology, habitat preferences and distribution, reproduction and logevity, sensitivity, importance and basic information.
USGS (United States Geological Survey). 2005. *Mya arenaria*. NAS (Non-indigenous Aquatic Species).
Summary: A compilation of U.S. locations of *M. arenaria*. This site includes maps, fact sheets, and collection information concerning non-native aquatic species.