Bugula neritina

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**Common name**
bryozoan (English), common bugula (English), brown bryozoan (English)

**Synonym**
Sertularia neritina
Anamarchis neritina

**Similar species**
Bugula turrita, Bugula stolonifera, Bugula

**Summary**
Bugula neritina (brown bryozoan) is an erect, bushy bryozoan. It is an abundant fouling organism that colonises any freely available substratum, including artificial underwater structures and vessel hulls.

[view this species on IUCN Red List](http://www.iucngisd.org/gisd/species.php?sc=1080)

**Species Description**

*Bugula neritina* forms flexible bushy colonies, branching biserial, to about 10cm high and is purplish-brown in colour. Zooids white and globular, with the outer corner pointed (Bishop Museum 2002, in Gordon and Mawatari, 1992). Zooids are large and measure an average of 0.97 X 0.28mm. *B. neritina* differs from other species in this genus in that it possesses no avicularia and no spines. The lophophore measures an average of 0.764mm in diameter and bears 23 tentacles (SMSFP 2001). Embryos brooded in ovicells are dark brown in colour and measure approximately 0.25mm in diameter (SMSFP 2001 in Winston 1982).

**Notes**

Nudibranchs have been recorded as consumers of *Bugula neritina* (NIMPIS 2002). Southern California studies have shown a high mortality rate for bryozoans during red tides (algal blooms). Bryozoans are preyed upon by grazing organisms such as sea urchins and fish. They are also subject to competition and overgrowth from sponges, algae, and tunicates (PWSRCAC 2004). Bryozoans provide habitat for many species of juvenile fish and their invertebrate prey such as polychaete worms, amphipods and copepods (SMSFP 2001 in Winston 1995). Bryozoans are also found in association with other species that act as support structures: mangrove roots, oyster beds, mussels, etc. (SMSFP 2001).

The feeding activities of bryozoans and other filter feeding animals strain out excess food and debris particles to help keep the water clean (VMNH 2005). Bryozoan colonies located in 1m2 of seagrass bed could potentially filter and recirculate an average of 48,000 gallons of seawater per day (SMSFP 2001 in Winston 1995).
Lifecycle Stages
Bryozoans have swimming, lecithotrophic larvae that attach and metamorphose within 1 or 2 days following release from the colony. Larvae are initially photopositive but soon become photonegative/Geopositive, settling usually within a few hours of release (Lynch, 1947). Larvae may have gregarious settlement (Keough, 1984). Bugula larvae generally settle throughout the year except during midwinter (Sutherland and Karlson 1977). Field studies in Australia and North America show considerable variation in life history in B. neritina from different habitats, apparently due to genetic or early environmental effects (Keough, 1989; NEMESIS 2006). B. neritina’s life history may include an annual period of dormancy, in which colonies recede to a regenerative holdfast (Dyrynda and Ryland 1982). This senescence occurs at differing times of year and appears dependent upon water temperature, with populations in cool-temperate areas receding during winter and populations in warm areas receding over summer months (Keough and Chernoff, 1987).

Uses
Bugula neritina colonies are the source of a novel chemical compound (bryostatin) which has been shown to be effective against leukaemia and a number of other kinds of cancer. A newly described species of bacterium, which is symbiotic to B. neritina cryptic species ‘type D’, appears to be the source of bryostatins (Davidson and Haygood, 1999; Davidson et al. 2001).

Habitat Description
Bugula neritina colonies are typically found in harbours and embayments, intertidal to 5m, attached to any available hard substrate (Bishop Museum 2002). Larvae colonise a variety of artificial substrata including hulls (Mackie et al. 2006). Studies have shown B. neritina larvae prefer to attach to rougher surfaces and prefer to attach to organic material. For example, in nature they frequently affix themselves to algae and to established bryozoan colonies (Lynch 1947). B. neritina is found in euhaline and polyhaline regions (water salinity around 30-18‰) (Winston 1977). In North America B. neritina occurs on rocky reefs and seagrass leaves (Hayes et al. 2005).

Reproduction
Each bryozoan colony begins from a single, sexually produced, primary zooid. This zooid undergoes asexual budding to produce a group of daughter cells, which themselves form buds, and so on. Most bryozoans are hermaphroditic, each zooid capable of producing sperm and eggs. Sperm is released into the coelom and the fertilised eggs are retained and brooded for a time before being released (Bishop Museum 2002).

Nutrition
The bryozoan is a suspension feeder. It has a retractable U-shaped crown of tentacles (lophophore) which bear cilia that create a current, bringing microscopic plankton and organic particles toward the animal. Particles are then guided into the mouth by action of the tentacles and cilia (Bishop Museum 2002).
General Impacts
Bryozoans are one of the main organisms to encrust and foul ships, piers, buoys and other man-made marine surfaces and structures (VMNH 2005). *B. neritina* populations may tolerate high levels of pollution (including copper) which increases its potential to be a fouling pest. A tolerance to toxicants could provide a competitive advantage in polluted areas (Piola and Johnston 2006). Verification of the chemical tolerances of invasive and non-invasive lineages of *B. neritina*, and other fouling organisms in general, is needed to test this hypothesis (Josh Mackie., pers.comm., 2007).

Management Info
Preventative measures: A two year study was undertaken for the Department of Environment and Heritage (Australia) by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) to identify and rank introduced marine species found within Australian waters, and those not found within Australian waters. All of the non-native potential target species identified in this report are ranked as high, medium and low priority, based on their invasion potential and impact potential. *Bugula neritina* is identified as one of ten potential domestic target species most likely to be spread to uninfected bioregions by shipping. *B. neritina* is also identified as one of ten most damaging potential domestic target species, based on overall impact potential (economic and environmental). A hazard ranking of potential domestic target species based on invasion potential from infected to uninfected bioregions identifies *B. neritina* as a ‘medium priority species’ - these species have a reasonably high impact/or invasion potential.
For more details, please see Hayes et al. 2005.
The rankings determined in Hayes et al. 2005 will be used by the National Introduced Marine Pest Coordinating Group in Australia to assist in the development of national control plans which could include options for control, eradication and/or long term management.
It has been suggested that ballast water control measures be implemented to control the spread of *B. neritina* via the oyster aquaculture industry (PWSRCAC 2004).
Chemical: Copper-based treatments have been used to control many pest species. The attachment of *B. neritina* larvae to copper, mercury and control paint was investigated by Wisely (1962) who found that the numbers attaching to the control paint strips was seven times greater than the numbers attaching to copper, and twenty times greater than the numbers attaching to mercury (NIMPIS 2001). Introduction of *B. neritina* by copper-painted vessels may be aided by a potential tolerance to toxicants (Piola and Johnston 2006).

Pathway
*Bugula neritina* attaches to oyster shells and be transferred along with oyster shippings (Cohen 2005). *Bugula neritina* can be transported via tiny colonies attached to the sides of ballast tanks or on floating material inside the ballast tanks (Cohen 2005). Ship/boat hull fouling is a common means of movement of *Bugula neritina* colonies and a likely source of ongoing introductions.

FULL ACCOUNT FOR: Bugula neritina

Compiler: IUCN/SSC Invasive Species Specialist Group (ISSG) with support from La Fondation d'entreprise Total

Review: Dr. Josh Mackie, Invertebrate Zoology and Molecular Ecology Lab. Moss Landing Marine Laboratories. California USA

Publication date: 2008-05-08

ALIEN RANGE
[1] UNITED KINGDOM [24] UNITED STATES

BIBLIOGRAPHY
32 references found for Bugula neritina

Management information

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

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).


Summary: NIMPIS is a database of information on introduced and potentially invasive marine species for Australia.

General information


Summary: This source provides biological, introduction and distributional information of B. neritina.


Summary: English:
The species list sheet for the Mexican information system on invasive species currently provides information related to Scientific names, family, group and common names, as well as habitat, status of invasion in Mexico, pathways of introduction and links to other specialised websites. Some of the higher risk species already have a direct link to the alert page. It is important to notice that these lists are constantly being updated, please refer to the main page (http://www.conabio.gob.mx/invasoras/index.php/Portada), under the section Novedades for information on updates.

Invasive species - Aquatic invertebrates is available from:

Spanish:
La lista de especies del Sistema de Informació-n sobre especies invasoras de México cuenta actualmente con informació-n acerca de nombre cientí-fico, familia, grupo y nombre común, así como rutas de introducción y ligas a otros sitios especializados. Algunas de las especies de mayor riesgo ya tienen una liga directa a la página de alertas. Es importante resaltar que estas listas se encuentran en constante proceso de actualización, por lo que se recomienda consultar la página (http://www.conabio.gob.mx/invasoras/index.php/Portada), en la sección de novedades, para conocer los cambios.

Espécies invasoras - Otros invertebrados is available from:


Summary: This paper investigates fouling organisms and ecological conditions in the Suez Canal.


Summary: A species inventory of east central Florida s Indian River Lagoon (IRL) system including taxonomic, ecological and life history information.

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=156056 [Accessed 4 December 2006]


Lynch, W. L. 1947. The behavior and metamorphosis of the larva of Bugula neritina (Linnaeus): experimental modification of the length of the free-swimming period and the responses of the larval to light and gravity, Biological Bulletin 92: 115-150

Summary: The distribution, external morphology, swimming movements and metamorphosis of the larvae of B. neritina are discussed in this paper. Available from: http://www.biollbull.org/cgi/reprint/92/2/115 [Accessed 27 December 2006]


Summary: This paper studies population structure in invasive bryozoans using genetic analysis. There is evidence of widespread, rather than genetically independent introductions of bryozoans.


Summary: NEMESIS is a resource for information on non-native marine species that occur in the coastal waters of the United States. This page outlines some biological and ecological information for B. neritina. Available from: http://invasions.si.edu/nemesis/CH-ECO.jsp?Species_name=Bugula+neritina [Accessed 7 December 2006]


Summary: NEMESIS is a resource for information on non-native marine species that occur in the coastal waters of the United States. This page gives a history of spread and invasion comments for B. neritina. Available from: http://invasions.si.edu/nemesis/CH-INV.jsp?Species_name=Bugula+neritina [Accessed 7 December 2006]


Summary: Available from: http://invasions.si.edu/nemesis/CH-TAX.jsp?Species_name=Bugula%20neritina [Accessed 12 March 2010]


Summary: The North European and Baltic Network on Invasive Alien Species (NOBANIS) has developed a network of common databases on alien and invasive species of the North European and Baltic Sea region. NOBANIS is a common portal for access to IAS-related data, information and knowledge. This page is a record of B. neritina in Germany. Available from: http://www.nobanis.org/NationalInfo.asp?countryID=DE&taxaID=5818 [Accessed 19 December 2006]


Summary: This study compares the toxicity of copper to four cosmopolitan bryozoan species, *Bugula neritina*, *Watersipora subtorquata*, *Schizoporella errata* and *Tricellaria occidentalis*. Available from: http://www.int-res.com/articles/meps2006/311/m311p103.pdf [Accessed 12 December 2006]


Summary: This source provides biology, distribution, impact and control information about the single horn bryozoan (*Schizoporella unicornis*).


Summary: This study looks at larval recruitment patterns of fouling species at Beaufort (North Carolina, USA).


Summary: Distributional records for *B. neritina* in the USA.


Virginia Museum of Natural History (VMNH), 2005. More Bryozoan Information. VMNH Virginia, USA.

Summary: An overview of the biology and problems caused by bryozoans.


Summary: The role of larval exploration of surfaces in determining spatial patterns of settlement was examined in the field in a low-energy environment by comparing locations where larvae first contacted complex surfaces to locations where larvae metamorphosed. Two species were studied: the barnacle *Balanus amphitrite* and the bryozoan *Bugula neritina*. Available from: http://aslo.org/lo/toc/vol_37/issue_5/1101.pdf [Accessed 12 December 2006]


Summary: This article reviews the special ecological and physiological features of brackish-water ectoprocts (bryozoans) and their global distributions.


Summary: This paper discusses the management of introduced marine species in the Shark Bay World Heritage Property (Australia).