Didemnum spp. **System:** Marine

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Ascidiacea	Enterogona	Didemnidae

Common name sea squirt (English), colonial tunicate (English), ascidian (English)

Synonym

Similar species *Didemnum carnulentum, Didemnum albidum, Tridemnum opacum*

Summary The genus Didemnum encompasses an unknown number of Ascidian species that have become invasive around the globe. They display a varying degree of morphology. These species can reproduce rapidly. They foul marine habitats such as shellfish aquacultures and fishing grounds.

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Species Description
Didemnum spp. colonies exhibit a wide variety of morphological variants that range from: 1) long, ropey or beard-like colonies that commonly hang from hard substrates such as docks, lines, and ship hulls; to 2) low, undulating mats with short surficial appendages that encrust and drape rocky sea beds (pebbles, cobbles, boulders, and rock outcrops). The colonies can be tan, cream, yellow, orange or pinkish. They are most readily distinguished from other colonial sea squirts by their extensively lobed form. *Didemnum* spp. has frequently been reported growing out in sheets that often grow over or fold over and fuse to other parts of themselves, forming irregular lobes that can be cylindrical and rope-like, flat, bulbous or branching and of considerable size, reaching as much as a metre in length (Cohen, 2005; USGS-WHSC, 2005).
The following details may be seen with a microscope after being dissected. Each colony of *Didemnum* spp. consists of many small individuals called zooids, each about a millimetre in length, embedded in the sheet-like matrix. Each zooid pumps water through its body, filtering out food particles, and along with neighboring zooids discharges the filtered water into a common space from which it exits the colony. Embedded in a thin layer in the surface of the matrix are tiny, spiny, calcareous balls, each one shaped like the head of a medieval mace (Cohen, 2005).

Notes
Didemnum spp. is a general name given to a variable number of *Didenmnum* species that are becoming particularly invasive around the globe. But the actual number of species that are involved and determining whether they are native or exotic to the waters they invade, are matters that are being hotly debated by sea squirt taxonomists, and which will can only be eventually resolved through molecular genetic studies (Cohen, 2005).

Lifecycle Stages
Didemnum spp. reach sexual maturity in just a few weeks and have long breeding seasons. They tolerate wide fluctuations in temperature and salinity and acclimate rapidly to these changes. They also tolerate various types of pollution and are known to sequester or use metal ions. They have the ability to attach tenaciously to substrates but the tunic is flaccid and tears easily. If even a small bit adheres to any organisms that are transported, it can rapidly colonize a new substrate and may already be in reproductive mode (Lambert, 2002).

Habitat Description
Didemnum spp. grows subtidally in bays, harbors and coastal waters, on rocks and all kinds of artificial structures, and on gravel and boulders. It has not been reported on mud or sand bottoms that lack gravel or cobbles. In New England it is common to depths below 30m and has been found down to 65m. It can tolerate temperatures from -2° C to 24 ° C, and in San Francisco Bay has been collected only at salinities above 26 ppt. Colonies are found on hard substrates that include dock structures and floats, wood and metal pilings, moorings and ropes, steel chain, automobile tyres, polythene plastic, rock outcrops, gravel seabed (pebbles, cobbles, boulders), and ship hulls. The colonies have been found at water depths ranging from intertidal to continental shelf depths of 65m (213 ft) (Cohen, 2005; USGS-WHSC, 2005).

Reproduction
Didemnum spp. A broods its larvae within the colony's matrix. When released, the larvae would spend a few hours in the plankton before attaching head down to a firm surface and metamorphosing into the initial zooid of a new colony. Larval settlement has been observed in summer and fall. In addition, *Didemnum* spp. A can produce new colonies through fragmentation. Lobes from a colony can break off, drift to a new site, settle or become entangled in the bottom, and grow out over the substrate (Cohen, 2005).

General Impacts
Didemnum spp. can become a nuisance species when they reproduce rapidly and foul marine habitats like shellfish aquacultures and fishing grounds, ship's hulls, and maritime structures. The rapid spread of *Didemnum* spp. colonies alters marine habitats and threatens to interfere with fishing, aquaculture, and other coastal and offshore activities. They overgrow organisms such as tunicates, sponges, macroalgae, hydroids, anemones, bryozoans, scallops, mussels, oysters, seaweeds, limpets, barnacles, and other species of sea squirts. Where these colonies occur on the seabed, they likely cover the siphons of infaunal bivalves. *Didemnum* spp. mats choke off bottom-dwellers such as shellfish and may cover grounds needed by fish to lay eggs. (Cohen, 2005; USGS-WHSC, 2005).
While *Didemnum* spp. has been observed primarily colonizing artificial substrates in harbors and manmade structures there are fears that natural reefs may become susceptible. Healthy natural ecosystems such as coral reefs comprise a high biodiversity, with complex interactions among the species, and this is thought to be an important factor in preventing the establishment of *Didemnum* spp. and other invading species. However, many coral reef areas are becoming degraded due to anthropogenic activities, global warming, natural events like El Nin˜ o, and perhaps other causes. *Didemnum* spp. is spreading to various temperate and tropical regions of the world. The reasons for this species sudden invasiveness are not known.To add to these fears, *Didemnum* spp. have not declined with the return of cooler water; on the contrary they continue to proliferate (Lambert, 2002).

Management Info
A company in New Zealand was contracted to develop and plan a management strategy for the eradication of *Didemnum* spp. from Shakespeare Bay, NZ. A unique removal system was created including a special cutter and vacuum that was used to remove *Didemnum* spp. from ships hulls and the ocean floor. Other treatments included dumping dredging on the seabed under the old barge site to suffocate the remaining *Didemnum* spp. that could not be manually removed; placing plastic wrappings around the wharf piles in the hopes of again suffocating the invasive; covering the seabed under the wharf with filter fabric; and inspecting all vessels in the harbor and treating them when it was found they carried *Didemnum* spp. Treatment costs were estimated to be around $300,000. These management actions were unsuccessful, and officials have abandoned further eradication efforts, although the situation will still be monitored continually (Vaughan, 2004).

Pathway
Didemnum spp. could have possibly been introduced to the North American Pacific coast with oysters or other shellfish stock (Cohen, 2005).*Didemnum* spp. was probably introduced to the North American Pacific coast in hull fouling, or as colony fragments in ballast water (Cohen, 2005).

Principal source: USGS-WHSC, 2005 *Genus Didemnum: colonial tunicate; ascidian; sea squirt* Cohen, 2005*Guide to the Exotic Species of San Francisco Bay*

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ALIEN RANGE

[2] ATLANTIC - WESTERN CENTRAL
[4] BRAZIL
[1] ECUADOR
[1] FRENCH POLYNESIA
[1] INDONESIA
[1] MEDITERRANEAN & BLACK SEA
[1] NEW CALEDONIA
[1] PACIFIC - NORTHWEST
[1] PALAU
[3] TANZANIA, UNITED REPUBLIC OF
[2] AUSTRALIA
[3] CANADA
[1] FRANCE
[1] GUAM
[1] JAPAN
[1] NETHERLANDS
[12] NEW ZEALAND
[1] PACIFIC - SOUTHEAST
[2] SPAIN
[23] UNITED STATES

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Summary: This publication aims to first provide decision makers and managers with information on the existing international and regional regulations that address the use of alien species in aquaculture, either directly or indirectly; and three examples of national responses to this issue (New Zealand, Australia and Chile).
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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.
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