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The colonial ascidian *Didemnum* sp. A: Current distribution, basic biology and potential threat to marine communities of the northeast and west coasts of North America

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Abstract

Didemnum sp. A is a colonial ascidian with rapidly expanding populations on the east and west coasts of North America. The origin of *Didemum* sp. A is unknown. Populations were first observed on the northeast coast of the U.S. in the late 1980s and on the west coast during the 1990s. It is currently undergoing a massive population explosion and is now a dominant member of many subtidal communities on both coasts. To determine *Didemnum* sp. A's current distribution, we conducted surveys from Maine to Virginia on the east coast and from British Columbia to southern California on the west coast of the U.S. between 1998 and 2005. In nearshore locations *Didemnum* sp. A currently ranges from Eastport, Maine to Shinnecock Bay, New York on the east coast. On the west coast it has been recorded from Humboldt Bay to Port San Luis in California, several sites in Puget Sound, Washington, including a heavily fouled mussel culture facility, and several sites in southwestern British Columbia on and adjacent to oyster and mussel farms. The species also occurs at deeper subtidal sites (up to 81 m) off New England, including Georges, Stellwagen and Tillies Banks. On Georges Bank numerous sites within a 230 km^2 area are 50–90% covered by *Didemnum* sp. A; large colonies cement the pebble gravel into nearly solid mats that may smother infaunal

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organisms. These observations suggest that *Didemnum* sp. A has the potential to alter marine communities and affect economically important activities such as fishing and aquaculture.

Keywords: Ascidian; *Didemnum*; Distribution; Fouling; Georges Bank; Invasive species; Nonindigenous; Stellwagen Bank; Tillies Bank; Tunicate

1. Introduction

Many ascidians have experienced recent range expansions due to human-mediated transportation, such as the unintentional transport of ascidians on the hulls of recreational and commercial ships (Lambert and Lambert, 1998, 2003; Wasson et al., 2001). Ascidians are often strong spatial competitors (Grosberg, 1981; Nandakumar et al., 1993; Osman and Whitlatch, 1995a; Nandakumar, 1996; Castilla et al., 2004a,b) and once they become established in a new location they may persist and become dominant members of their new communities (Lambert and Lambert, 2003). In some cases, these rapid population explosions are known to reduce the abundance of previously established benthic species and cause significant changes in benthic community structure (Whitlatch et al., 1995; Bak et al., 1996; Lambert, 2001; Castilla et al., 2004a,b).

Didemnum sp. A is an aggressive and rapidly spreading colonial ascidian. Its origin is unknown. *Didemnum* sp. A was first officially documented on the east coast of the U.S. in 1988 (Table 1), though anecdotal reports suggest that it may have been present as far back as the 1970s. The initially observed populations were isolated and small. During the 1990s, the species began a rapid population expansion and is now a dominant member of many subtidal communities on both coasts of the U.S. (Carman and Roscoe, 2003). Indeed, *Didemnum* sp. A (or several closely related ascidians within the genus *Didemnum*), seems to be undergoing a rapid world-wide expansion with simultaneous population increases occurring in the U.S., Europe (G. Breton, personal communication; G. Lambert recent unpublished collections; R. Sheridan http://staff.umh.ac.be/Sheridan.Richard/inventaire/tun/htm/didemnum.htm), New Zealand (Coutts, 2002) and possibly Japan (Nishikawa, 1990, remarks under description of *D. pardum* and personal communication).

The taxonomy of *Didemnum* sp. A in the U.S. remains unclear. Kott (2004) recently described a new species, *D. vestum*, collected from a marina floating dock in Portsmouth Harbor, Newcastle, New Hampshire that she concludes is an unrecognized native of New England. The description is based on a poorly preserved sample (according to the author and judging from the photos of the few highly eroded spicules still remaining) and lacks larvae. While it appears to resemble our

Table 1
Dates of initial observation of *Didemnum* sp. A

Location	Date	Habitat type
East coast		
1 Damariscotta River, ME*	1988	Pilings, floats
1 Damariscotta River, ME	1993	Pilings, floats
2 Tillies Bank, MA	1996	Gravel
3 Georges Bank	1998	Pebble, cobble pavement
4 Stellwagen Bank	1998	Gravel
5 Sandwich, MA; Cape Cod Canal, MA	1998; 2000	Tide pool rocks; floats
6 Woods Hole, MA	2000	Docks
7 Buzzards Bay, MA	2000	Floats
8 Groton, CT	2000	Docks
9 Portsmouth Harbor, NH	2001	Floats, pier
10 Eastport, ME	2003	Subtidal rocks, pilings
11 Duck Island, Isles of Shoals, NH	2003	Subtidal rocks
12 Isles of Shoals, NH – open water	2003	Suspended fish cages
13 Narragansett Bay, RI	2003	Docks, floats
14 Chatham, MA	2003	Docks, floats
15 Provincetown, MA	2003	Docks
16 Martha's Vineyard	2004	Docks, floats
17 Plymouth, MA	2004	Docks
18 Orleans, MA	2004	Floats, docks
19 Shinnecock Bay, NY	2004	Docks
West coast		
20 San Francisco Bay, CA	1993	Docks, floats
21 Half Moon Bay, CA	1997	Docks
22 Monterey Bay, Elkhorn Slough, CA	1998	Docks
23 Morro Bay, CA	2000	Docks
24 Tomales Bay, CA	2001	Docks
25 Humboldt Bay, CA	2001	Docks
26 Port San Luis, CA	2002	Docks
27 Bodega Bay, CA	2003	Docks, rocks
28 Okeover Inlet, BC	2003	Mussel cages, subtidal rock walls
29 Puget Sound, WA	2004	Docks, sunken boat
30 Agamemnon Channel, BC	2004	Subtidal rock walls
31 Jedediah Island, BC	2005	Subtidal rock walls
32 Nanoose Bay, Vancouver Is., BC	2005	Algae, oyster farm
33 Tofino, Vancouver Island, BC	2005	Oyster farm

Entries with an asterisk are anecdotal observations. Entries without an asterisk are confirmed observations.