

Supplementary Material for:

Spatial and temporal dynamics of ascidian invasions in the continental United States and Alaska

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Supplementary Table 1: List of the ascidian species excluded because their distribution (or portions of their distribution) are currently considered cryptogenic (i.e. not definitively classified as either native or introduced; Carlton 1996) in the United States. We also provide rationale for labeling each species as cryptogenic. This list does not represent the full list of species considered cryptogenic in this region.

Species	Cryptogenic coasts	Rationale for cryptogenic designation
<i>Botryllus schlosseri</i>	Atlantic	<i>B. schlosseri</i> was previously thought to be introduced to the Northwest Atlantic, but recent genetic work (Yund et al. 2015) presents evidence for the possibility that it, or some of its genotypes, are native to this region.
<i>Ciona intestinalis</i>	Atlantic	The invasion history and population origin (i.e. native or non-native) of this species in the Northwest Atlantic is unresolved and complicated by the presence of cryptic species and its wide-ranging distribution (Therriault and Herborg 2008; Zhan et al. 2010).
<i>Diplosoma listerianum</i>	Gulf/portions of the Atlantic	The origin (native range) of this species is unknown and its population history in the Gulf of Mexico and Southeastern US is complicated by the presence of cryptic species (Perez-Portela et al. 2013). We consider it cryptogenic south of Cape Hatteras, North Carolina, but non-native further north where it was first reported from Long Island Sound, Connecticut in 1970.
<i>Ecteinascidia turbinata</i>	Gulf/portions of the Atlantic	Its population origin (i.e. native or non-native) is unknown throughout most of its distribution on the Atlantic/Gulf coasts (North Carolina through Caribbean) and we consider it cryptogenic here, however, an introduced population is known from Virginia (which is reported in our paper).
<i>Lissoclinum fragile</i>	Gulf	Likely represents a complex of cryptic species and further study is needed to disentangle its geographical origin.
<i>Phallusia nigra</i>	Gulf	Recent genetic evidence indicates that this species may be native to the West Atlantic or Red Sea (its type locality) (Vandepas et al. 2015).
<i>Polyclinum constellatum</i>	Gulf/Atlantic	Likely represents a complex of cryptic species and further study is needed to disentangle its geographical origin.

Supplementary Table 2: The 26 ascidian species currently introduced and established in the United States with occurrence records for the north and south non-native range edges throughout North America (shown in Figure 3). Range edge occurrences were reported during the extensive literature review and this information is publicly available at:

<http://invasions.si.edu/nemesis/browseDB/GroupSummary.jsp?GRP=Tunicates>.

Coast	Species	Range edge location (N/S)	Range edge citation (N/S)
Pacific	<i>Ascidia zara</i>	N: Bodega Bay, CA S: Bahia San Quintin, Mexico	N: Fairey et al. (2002) S: Rodriguez and Ibarra-Obando (2008)
	<i>Botrylloides giganteum</i>	N: San Diego Bay, CA S: Bahia San Quintin, Mexico	N: Lambert and Lambert (1998) S: Rodriguez and Ibarra-Obando (2008)
	<i>Botrylloides violaceus</i>	N: Sitka, AK S: San Pedro Tutuepec, Mexico	N: Lambert and Sanamyan (2001) S: Low-Pfeng and Peters Recagno (2012)
	<i>Botryllus schlosseri</i>	N: Sitka, AK S: Topolobampo, Sinaloa, Mexico	S: Lambert and Lambert (1998) N: Tovar-Hernández et al. (2012)
	<i>Ciona robusta</i>	N: Bodega Bay, CA S: Ensenada, Mexico	N: de Rivera et al. (2005) S: Lambert and Lambert (2003)
	<i>Ciona savignyi</i>	N: Seattle, WA S: San Diego Bay, CA	N: Lambert (2003) S: Lambert and Lambert (2003)
	<i>Corella inflata</i>	N: Coos Bay, OR S: San Francisco, CA	N&S: Ruiz et al. unpublished
	<i>Didemnum vexillum</i>	N: Sitka, AK S: Bahia San Quintin, Mexico	N: Cohen et al. (2011) S: Rodriguez and Ibarra-Obando (2008)
	<i>Diplosoma listerianum</i>	N: Bamfield, BC S: San Diego Bay, CA	N: Eldredge (1966) S: Mackie and Singla (1987)
	<i>Microcosmus squamiger</i>	N: Oxnard, CA S: Bahia San Quintin, Mexico	N: Lambert and Lambert (2003) S: Rodriguez and Ibarra-Obando (2008)
	<i>Molgula citrina</i>	N: Kachemak Bay, AK S: Humboldt Bay, CA	N: Lambert et al. (2010) S: G. Lambert unpublished
	<i>Molgula ficus</i>	N: Oxnard, CA S: San Diego Bay, CA	N&S: Lambert (2007)
	<i>Molgula manhattensis</i>	N: Prince Rupert, BC S: Newport Bay, CA	N: Clarke Murray et al. (2011) S: Lambert and Lambert (1998)
	<i>Perophora japonica</i>	N: Humboldt Bay, CA S: San Diego Bay, CA	N: Lambert (2005) S: G. Lambert unpublished
	<i>Polyandrocarpa zorritensis</i>	N: Tomales Bay, CA S: Bahía Banderas, Mexico	N: Fairey et al. (2002) S: Low-Pfeng and Peters Recagno (2012)
	<i>Styela canopus</i>	N: Venice, CA S: Puerto Angel, Oaxaca, Mexico	N: Fairey et al. (2002) S: Tovar-Hernández et al. (2012)
	<i>Styela clava</i>	N: Bamfield, BC S: Ensenada, Mexico	N: White and Orr (2011) S: Lambert and Lambert (2003)
	<i>Styela plicata</i>	N: Santa Barbara, CA S: Bahia San Quintin, Mexico	Lambert and Lambert (1998)
	<i>Symplegma reptans</i>	N: Los Angeles, CA S: Bahia San Quintin, Mexico	Lambert et al. (2010)
	Atlantic/ Gulf	<i>Ascidia sydneiensis</i>	N: Biscayne Bay, FL S: Santa Mata, Colombia
<i>Ascidella aspersa</i>		N: Mahone Bay, NS S: Avery Point, CT	N: Moore et al. (2014) S: Michael Berger and Bob Whitlatch pers comm.
<i>Botrylloides violaceus</i>		N: Belleoram, NL S: Norfolk, VA	Lambert (2005)
<i>Clavelina lepadiformis</i>		New London, CT	Reinhardt et al. (2010)
<i>Didemnum perlucidum</i>		N: Indian River, FL S: Stetson Bay, TX	N: Ruiz et al. unpublished S: Culbertson and Harper (2000)

Coast	Species	Range edge location (N/S)	Range edge citation (N/S)
	<i>Didemnum sp. aff. psammotodes</i>	N: St. Augustine, FL S: Salut Islands, French Guiana	N: Smithsonian Marine Station at Fort Pierce (2011) S: Monniot and Monniot (1994)
	<i>Didemnum vexillum</i>	N: West Bay, NS S: Shinnecock Bay, NY	N: Moore et al. (2014) S: Bullard et al. (2007)
	<i>Diplosoma spongiforme</i>	N: Indian River, FL S: Tampa Bay, FL	N&S: Ruiz et al. unpublished
	<i>Diplosoma listerianum</i>	N: Lunenburg Harbour, NS S: Cape Charles, VA	N: Moore et al. (2014) S: Ruiz et al. unpublished
	<i>Ecteinascidia turbinata</i>	N: Wachapreague, VA S: Gloucester Point, VA	N: US National Museum of Natural History S: Calder et al. (1966)
	<i>Polyandrocarpa zorritensis</i>	N: Cape Canaveral, FL S: Port Isabel, TX	N: Rosana Rocha pers comm. S: Lambert et al. (2005)
	<i>Styela canopus</i>	N: Sable Island, NS S: Isla Margartia, Venezuela	N: US National Museum of Natural History S: da Rocha and Bonnet (2009)
	<i>Styela clava</i>	N: Malpeque Bay, PEI S: Chincoteague, VA	N: Locke et al. (2007) S: US National Museum of Natural History
	<i>Styela plicata</i>	N: Chincoteague Bay, VA S: Isla Margartia, Venezuela	N: O'Beirn et al. (2004) S: US National Museum of Natural History

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