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Proceedings of the 5th International Invasive Sea Squirt Conference (October 29–31, 2014, Woods Hole, USA)

Editorial

Introduction to the proceedings of the 5th International Invasive Sea Squirt Conference, 2014

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Sea squirts (ascidians, tunicates) are common marine invertebrates that occur worldwide. Invasive ascidians possess all of the characteristics common to successful invasive organisms; they reproduce quickly, grow rapidly, have a simplistic feeding mode (filter feeding), are strong competitors, often possess effective anti-predator defenses, and readily spread. In the past 30 years, several species of invasive ascidians have become common fouling organisms globally. The economic and environmental dangers posed by invasive ascidians have been the subject of significant research. While effective control methods remain elusive, a growing body of literature illuminates the factors that contribute to the spread of invasive ascidians and the impact they can have on newly invaded communities.

The 5th International Invasive Sea Squirt Conference (IISSC) was held at the Woods Hole Oceanographic Institution from October 29–31, 2014. The meeting drew 45 participants from 6 countries. In addition to the talks and poster presentations, participants were given an ecological tour of Woods Hole fouling communities or were invited to participate in a taxonomic workshop led by Gretchen Lambert and Rosana Rocha. All participants were also provided with an ascidian "banquet"; Walter Rhee, from the University of Hawaii, prepared several species of edible ascidians, including invasive species, and served them to meeting attendees. This was the first opportunity for many ascidian researchers to actually taste their test subjects, and the banquet was a highlight of the meeting.

In terms of research topics, the scope and focus of invasive ascidian studies has been evolving since the initial 2005 IISSC. Locke and Hanson (2011) conducted an empirical assessment of the research topics that had been presented at the different IISSC's, and this work is continued and expanded here (Table 1). Quantitatively, the distribution of research topics at the IISSC has remained relatively stable over time, especially between the 3rd and 5th IISSC's (Table 1). Qualitatively, however, there appears to have been a shift in research effort. At the first meeting, much of the work was focused on describing the overall problem posed by invasive ascidians (Lambert 2007), assessing their current distributions or recent invasions (Bullard et al 2007; Gittenberger 2007), and addressing the ecological impacts of invasive ascidians on invaded communities (Blum et al. 2007; Dijkstra et al. 2007). At the 5th IISSC, much of the work still examined the ecological impacts of invasive ascidians. But by this time, the types of questions had either shifted to be more narrowly focused (Koplovitz et al. 2016), or had expanded to be more broadly applicable (Colarusso et al. 2016). A good deal of work was also focused on describing the distribution patterns of invasive ascidians (e.g., McKenzie et al. 2016a). Few studies assessed the impacts of ascidians on aquaculture (but see Rosa et al. 2013), but several presentations described aquaculture mitigation techniques (e.g., Carman et al. 2016a).

This special issue of *Management of Biological Invasions* includes 13 papers derived from the 30 talks and 12 posters given at the 5th IISSC.

Table 1. Main themes (as % of abstracts) presented at the different International Invasive Sea Squirt Conferences (2005 = 1st IISSC; 2007 = 2nd IISSC; 2010 = 3rd IISSC; 2014 = 5th IISSC). Derived and expanded from Locke and Hanson (2011).

Topic	2005	2007	2010	2014
Ecological interactions	32	18	12	24
Survey Results	27	23	27	26
Impacts on ecosystem or components	19	16	10	10
Temperature/Climate Change	19	13	14	14
Use of Habitat	19	8	6	10
Genetics	8	16	10	5
Management methods (treatments)	8	15	14	10
Patterns of establishment and spread	8	2	0	7
Monitoring methods (development)	5	10	20	10
Biogeography	5	3	6	7
Vectors	3	11	4	0
Impacts on aquaculture	3	5	0	2
New records of species	3	3	6	5
Industrial/commercial use	3	4	0	5
Management (plans)	0	10	4	5
Predictions/future trends	0	3	2	0
Taxonomy (traditional)	0	3	0	0
Mathematical models	0	2	4	0
Culture techniques	0	2	2	5
Laboratory techniques	0	0	0	2
Number of studies	37	62	51	42

Diverse topics of ascidian biology and ecology are covered. Three of the included papers survey the current distributions of ascidians. Granthom-Costa et al. (2016) and Skinner et al. (2016) examine ascidian distributions in Brazil. McKenzie et al. (2016a) survey invasive ascidians in Newfoundland, Canada. Three of the articles assess the ecology of invasive ascidians. Colarusso et al. (2016) examines the impact of invasive ascidians in shallow water coastal communities. Koplovitz et al. (2016) investigate the ability of tropical floating docks to serve as reservoirs for *Herdmania momus*. Carman et al. (2016b) document the colonization of eelgrass by ascidians along the east coast of the US and Canada. Two papers examine ascidian biology. Reid et al. (2016) study post-metamorphic attachment of *Ciona intestinalis*. Turon et al. (2016) compare the relative success of native and invasive ascidians in the subantarctic. Two papers look at management and mitigation techniques. McKenzie et al. (2016b) present a rapid response plan to control invasive ascidians. Carman et al. (2016a) describe treatments to eradicate ascidians from mussel aquaculture. Three papers cover completely unique topics. Stefaniak and Heupel (2016) describe a useful technique for relaxing ascidians prior to preservation. Valentine et al. (2016) describe using large (m^2) panels to assess ascidian recruitment and colonization. Lambert et al. (2016) provide a ground-breaking review on edible ascidians. This last article deserved special mention, as it is the first comprehensive review to document which ascidian species are consumed by humans, how they are cultured, and how they are prepared. This is an important topic given rapidly increasing world population levels, the increasing need to find new human food sources, and the fact that consuming invasive ascidians could help with control efforts.

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