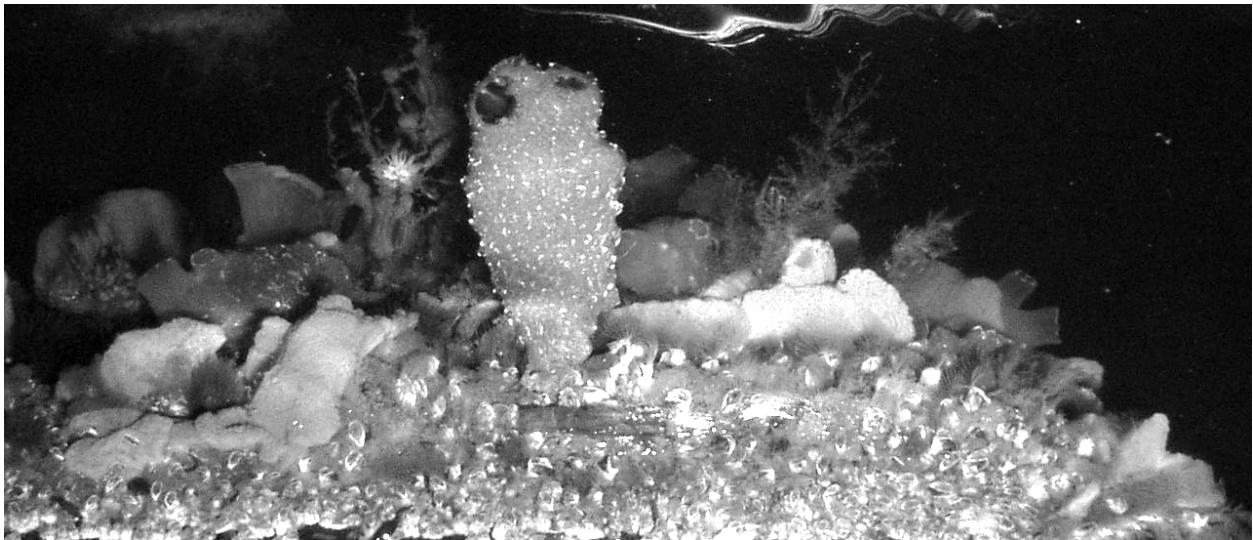


Citizens Monitoring for Marine Invasive Species: A Regional Approach to Covering the Coast

October 23, 2006



Sponsored by:
The Northeast Aquatic Nuisance Species Panel



Hosted by:
The New England Aquarium



Acknowledgements

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Michele Tremblay of Naturesource Communications who answered countless logistical questions in the weeks and months leading up to this event, and who coordinated the financing of this event with the NEANS Panel.

All of the speakers who presented their work at this event. In doing so you have helped meet the goal of this workshop and helped create a more interconnected regional invasive species monitoring effort.

And special thanks go to the volunteers who fuel citizen science initiatives. Without the contribution of your time and effort, much less would be known about marine invasive species.

This document was prepared by Charles Hernick, Massachusetts Office of Coastal Zone Management, 251 Causeway Street, Suite 800, Boston, MA, 02114. Phone: (617) 626-1218
Email: charles.hernick@state.ma.us. Cover photo by Charles Hernick.

Contents

Acknowledgements	1
Contents	2
Agenda	3
Presentation Abstracts	4
Round Table Discussion Notes	9
List of Attendees	10
Notes	13



Citizens Monitoring for Marine Invasive Species:
A Regional Approach to Covering the Coast

New England Aquarium, October 23, 2006

Agenda

8:30 Registration

9:00 Welcome and Introduction

Scott Weber, New England Aquarium

9:15 Plenary Presentation: Lessons Learned from Thirty Years of Volunteer Based Marine Monitoring in the Netherlands

Adriaan Gittenberger, National Museum of Natural History (Leiden, Netherlands)

10:00 The Marine Invader Monitoring and Information Collaborative (MIMIC) and Protocol

Beth Suedmeyer, Massachusetts CZM, & Barbara Warren, Salem Sound Coastwatch

10:30 Break

10:45 Vital Signs: Monitoring Invasive Species Program

Sarah Kirn, Gulf of Maine Research Institute

11:15 Atlantic Zone Aquatic Invasive Species Monitoring Program

Thomas Landry, Fisheries and Oceans Canada

11:45 Lunch

12:45 Salem Sound Coastwatch Monitoring Efforts

Barbara Warren, Salem Sound Coastwatch

1:15 North and South Rivers Watershed Association

Sara Grady, North and South Rivers Watershed Association

1:35 Results from new MIMIC members:

- Cape Cod Natural History Museum and Wellfleet (Beth Suedmeyer)
- Northeastern University Marine Science Center in Nahant, MA (Nicole Macrae)

2:05 Validation Study of Citizen Science and Implications for Regional Monitoring Networks

Dave Delaney, McGill University

2:25 Break

2:35 The Marine Invader Tracking Information System (MITIS)

Christiaan Adams, MIT Sea Grant

3:00 Round Table Discussion: Past Experiences and Future Expectations

Panelists: Barbara Warren, Sarah Kirn, Dave Delaney, Beth Suedmeyer, Thomas Landry
Moderator: Charles Hernick

4:00 Wrap-up & Adjourn

Presentation Abstracts

Plenary Presentation: Lessons Learned from Thirty Years of Volunteer Based Marine Monitoring in the Netherlands

Adriaan Gittenberger, MSc.

National Museum of Natural History (Leiden, Netherlands)

Email: gittenberger@yahoo.com

Phone: +31611381083

Nowadays over a thousand volunteers of the ANEMOON foundation are monitoring the Netherlands coasts by beach combing, netting, scuba-diving and/or deploying settlement plates. About 30 years of monitoring data is stored in a database maintained by the government. Getting and keeping these volunteers motivated over the years has not been an easy task. This presentation will deal on our experiences, and consequently the lessons that we have learned about how to work with volunteers in marine monitoring projects.

The Marine Invader Monitoring and Information Collaborative (MIMIC) and Protocol

Beth Suedmeyer

Invasive Species Specialist, Massachusetts Office of Coastal Zone Management

Email: beth.suedmeyer@state.ma.us

Phone: 617.626.4921

Barbara Warren

Executive Director, Salem Sound Coastwatch

Regional Coordinator, Massachusetts Bay Program

Email: barbara.warren@salemsound.org

Phone: 978.741.7900

The invasion of introduced species has emerged as one of the leading environmental threats to coastal and marine habitats and resources. Early detection of new introductions is critical to prevent further loss of biodiversity, negative impacts to coastal and marine industries, and costly control programs. However, the resources needed to coordinate monitoring by scientists are limited. As a result, monitoring has happened irregularly, and there is limited information and understanding of the distribution and impacts of marine invaders.

To develop an understanding of the extent and impacts of marine biological invasions in the region, a citizen science monitoring initiative was designed to support the efforts of regional scientists, academics, and natural resource managers. Salem Sound Coastwatch (SSCW), with the assistance of the Massachusetts Office of Coastal Zone Management (CZM), developed methods and protocols for monitoring marine invaders along the New England coast. A Citizen's Guide to Monitoring Marine Invasive Species was developed to provide the information necessary to become a member of a volunteer monitoring team or to initiate a marine invasive species monitoring program for citizen scientists and students. Additionally, a set of 20 identification cards of introduced species and potential invaders was developed.

Following several years of a pilot monitoring effort led by SSCW, CZM initiated the Marine Invader Monitoring and Information Collaborative (MIMIC) in 2006. Trained volunteers

and nonprofit organizations will collect information about current locations, abundance, and characteristics of introduced and native marine species in marine and coastal areas of Massachusetts. Data generated through this project will be contributed to a regional database hosted by MIT Sea Grant in collaboration with CZM. Ultimately, volunteer-collected data will be integrated with scientific data to provide a better understanding of the pathways of species introduction and the associated ecological impacts.

Vital Signs: Monitoring Invasive Species Program

Sarah L. Kirn

Vital Signs Program Manager, Gulf of Maine Research Institute

Email: Sarah@gmri.org

Phone: 207.228.1631

The Gulf of Maine Research Institute uses communications and computing technology in innovative ways to engage students in the scientific study of the Gulf of Maine and its watershed. GMRI's Vital Signs program has been successfully engaging students with science in their local aquatic ecosystems since 2000. We are currently developing a Vital Signs program to enable Maine students' participation in invasive species monitoring efforts statewide across freshwater and coastal systems. The Vital Signs suite of mobile and GIS technology tools will guide students' collection and analysis of rigorous data useful to invasive species scientists and natural resource managers. Through the study of invasive species, students will learn fundamental ecology concepts and skills. Vital Signs will build an effective partnership between Maine students and scientists, foster a community-wide awareness and understanding of invasive species in Maine waters, provide Maine schools a relevant and engaging science program, and benefit Maine's diverse aquatic environments and the people who study, use, and enjoy them.

Atlantic Zone Aquatic Invasive Species Monitoring Program

Thomas Landry

Section Head, Molluscan Productivity, Department of Fisheries and Oceans Canada

Email: LandryT@dfo-mpo.gc.ca

Phone: 506.851.6219

Over ten species of Aquatic Invasive Species (AIS) have been reported in Atlantic Canada over the past 10 years. More recently, four species of invasive tunicates have been reported in PEI in the last 5 years and are the cause of major concerns for the survival of the mollusk aquaculture industry. Monitoring is recognized as an important component of any AIS program, both in terms of developing management and mitigation strategies. A three level program of monitoring for AIS in the marine waters of Atlantic Canada is being developed. The levels of surveillance activities include: Level 1 – low-frequency (temporal), wide geographic coverage, direct, non-targeted sampling; Level 2 – high-frequency, low (focused) geographic coverage, direct, targeted sampling; and Level 3 – high-frequency, local geographic coverage, indirect, targeted. The third level is based on a stewardship program, which has been highly successful and will include a Clearing House function in the near future.

Salem Sound Coastwatch Monitoring Efforts

Barbara Warren

Executive Director, Salem Sound Coastwatch

Regional Coordinator, Massachusetts Bay Program

Email: barbara.warren@salemsound.org Phone: 978.741.7900

Salem Sound Coastwatch (SSCW) has trained citizen volunteers to monitor five permanent floating docks, six rocky shore areas, and many tidepools under its Coastal Habitat Invasive Monitoring Program. From May to October, monthly monitoring has been conducted in five coastal communities of Salem Sound and Cape Ann, Massachusetts for the past three years. SSCW has developed and refined three data collection methods, one for each of the habitats surveyed. The data collection methods record the presence and abundance of both native and non-native marine species to address one of SSCW's questions: are marine introduced species (MIS) affecting changes in our coastal habitats overtime? This question can only be addressed with long-term monitoring, another goal of the program.

In 2006, SSCW began a fourth data collection method, an annual inventory. A timed survey of the entire site is conducted at the end of the season, and only the presence of introduced species is recorded. This inventory makes sure that no MIS have been missed by the other methods that use random placement of quadrats or fixed transects. During the inventory, photographs of each invading species are taken at each survey site. This provides species verification for the season's monitoring efforts.

In general, rocky shores have had slightly fewer introduced species than docks or tidepools, which reflects the more subtidal nature of these two environments. Salem has the most number of introduced species (11), with Gloucester close behind with nine(9). Of the tunicates, *Botrylloides violaceus* is the only species found at every site, in every habitat. *Didemnum* sp. has not been found during monitoring sessions. However, small specimens were found in 2005 at the Beverly Public Pier and Salem Winter Island during training sessions. *Botryllus scholsseri* has also been present at every dock, as well as the Gloucester and Beverly shore. *Diplosoma listerianum* was not found until 2006, but this past season was easily located at Beverly Public Pier and Salem's Hawthorne Marina. The solitary *Styela clava* has been seen at all docks, tidepools and the Gloucester rocky shore. *Asciidiella aspersa* has been observed at the Gloucester, Manchester and Salem docks in 2005 and 2006, but not in 2004.

Codium fragile is growing in the rocky shore areas of Gloucester and Marblehead, as well as attached to docks in Salem. *Sagartia elegans* is consistently found at Hawthorne Cove Marina, but one must look closely for this small purple anemone. Another introduced anemone, *Diadumene lineata*, has colonized several floats at the Manchester Marina's where blue Styrofoam appears to be a poor attachment substrate for many other species. This orange striped anemone is also present at Hawthorne Cove Marina. Green Crabs (*Carcinus maenas*) are found at every shore and dock. Asian Shore Crabs (*Hemigrapsus sanguineus*) are also found at every shore, but less frequently on dock floats.

With the invaluable help of its citizen volunteers, SSCW hopes to be able to sustain data collection for the long-term and provide data that can be integrated with scientific data to enhance the understanding of marine introduced species impacts on local marine habitats. No "potential" invaders have been detected over the last three years in the SSCW evaluation sites, but its trained citizen volunteers will continue to be on the lookout to assist in early detection of new marine invaders.

North and South Rivers Watershed Association

Sara P. Grady, Ph.D

South Shore Regional Coordinator, Massachusetts Bays National Estuary Program

Watershed Ecologist, North and South Rivers Watershed Association

E-mail: sara@nsrwa.org

Phone: 781.659.8168

During the late spring and early summer of 2006 we surveyed nine docks and five intertidal sites within the North and South Rivers Watershed. Five invasive species were found among the eleven sites surveyed – Lacy crust bryozoan (*Membranipora* sp.), Common periwinkle (*Littorina littorea*), Orange striped anemone (*Diadumene lineata*), Green crab (*Carcinus maenas*), and Asian shore crab (*Hemigrapsus sanguineus*). The North and South Rivers have fewer invasive species present compared to other regions such as the North Shore and Cape Cod, as well as some of the busier harbors of the South Shore. Invasive tunicates are present in Plymouth, Duxbury, and Scituate Harbors but are completely absent from the North and South Rivers system. One explanation for the minimal presence of invasives in the North and South Rivers could be the influence of salinity. Although some invasives were found in locations along the river that experience salinities lower than 32ppt, none were found in locations with salinities lower than 15ppt. The North and South Rivers also have a lack of large boat traffic, a major vector of invasive species transport.

Results from new MIMIC members:

Cape Cod Natural History Museum & Wellfleet

Beth Suedmeyer

Invasive Species Specialist, Massachusetts Office of Coastal Zone Management

Email: beth.suedmeyer@state.ma.us

Phone: 617.626.4921

In 2006, volunteers and staff from 4 organizations received training in monitoring for marine invaders as part of the Marine Invaders Monitoring and Information Collaborative (MIMIC). The organizations from Cape Cod and the North Shore were: Cape Cod Museum of Natural History, MassAudubon Wellfleet Bay Sanctuary, Northeastern University Marine Science Center, and Americorps Cape Cod. Preliminary data gathered during summer 2006 through the efforts of volunteers from the first two groups listed will be covered in this presentation. We appreciate the efforts of these volunteers and their coordinating organizations. We anticipate the network will continue to grow in the future. Long term data collection is the goal of this project so that we can be better equipped to detect change in species distribution and diversity over time.

Nahant's Marine Invaders

Nicole MacRae

Outreach Assistant, Northeastern University Marine Science Center

Email: n.macrae@neu.edu

Phone: 781.581.7370 x 338 or 321

After a brief personal introduction, the presentation will introduce Northeastern University's Marine Science Center as well as its three components, education, outreach and research. The presentation will familiarize the audience with monitoring locations and commonly found marine invasive species in Nahant and at Lynn Docks. Lastly, the presentation will review graphs and observations on marine invasive species of Nahant.

Validation Study of Citizen Science and Implications for Regional Monitoring Networks

Dave Delaney

Department of Biology, McGill University

Email: david.delaney@elf.mcgill.ca

Phone: 514.398.1833

Approximately 1,000 volunteer citizens assessed the presence of invasive (*Carcinus maenas* and *Hemigrapsus sanguineus*) and native crabs within the intertidal zones of seven coastal states of the U.S., from New Jersey to Maine. Identification of crab species and determination of the gender of the observed crabs were documented at all 52 sites across a 725-km (4.26° latitude and 6.68° longitude) coastal transect. Using quantitative measures of accuracy and reliability of data collected by citizen scientists, significant predictors of accuracy were determined and eligibility criteria were set. Students in grades three and seven had the ability to differentiate between species of crabs with over 80% and 95% accuracy, respectively. Determination of gender of the crabs was more challenging and accuracy exceeded 80% for seventh grade students, while 95% accuracy was found for students with at least two years of university education. We used the data collected by citizen scientists to create a large-scale standardized database of the distribution and abundance of the native invasive crabs. *Hemigrapsus sanguineus* dominated the rocky intertidal zone from Sandy Hook, New Jersey to Boston Harbor, Massachusetts while *C. maenas* dominated the northern extent of the sampled coastline. A citizen scientist of this monitoring network detected a range expansion of *H. sanguineus*. We identified obstacles to creating a national monitoring network and proposed recommendations that addressed these issues.

Abstract from the paper: "Validation of Citizen Science and Implications for Regional Monitoring Networks" by David G. Delaney and Corinne D. Sperling, Department of Biology & School of Environment, McGill University, Montreal, Canada, and Christiaan Adams, Massachusetts Institute of Technology, MIT Sea Grant College Program, Cambridge, Massachusetts, USA, and Brian Leung

The Marine Invader Tracking Information System (MITIS)

Christiaan Adams

Research Engineer, MIT Sea Grant College Program

Email: adamscs@mit.edu

Phone: 617.253.9311

MIT Sea Grant is developing the Marine Invader Tracking Information System (MITIS). It will be a resource for non-native marine species programs throughout the northeast and beyond. MITIS is a collection of websites, databases, and geographic information systems (GIS) applications that allows those collecting species sighting data, including scientists, volunteers, and others, to enter the data through a simple website, and then to view the data online in various formats, including tables and interactive maps. The data will also be integrated with outside systems such as NISbase and Google Earth. As-of October 2006, MITIS is under construction, with a selection of data entry sites operational, and more coming online soon.

Round Table Discussion: Past Experiences and Future Expectations

Panelists: Barbara Warren, Sarah Kirn, Dave Delaney, Beth Suedmeyer, Thomas Landry

Moderator: Charles Hernick

NOTES:

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October 23, 2006 - New England Aquarium

Participant List

Last	First	Affiliation	Email	Phone
Adams	Christiaan	MIT	adamscs@MIT.EDU	617.253.9311
Albert	Marc	National Park Service	Marc_Albert@nps.gov	781.231.7339
Auker	Linda	Department of Zoology UNH	l.auker@unh.edu	814.931.8303
Baker	Jason	MA Office of Coastal Zone Management	jason.baker@state.ma.us	617.626.1204.
Bash	Chris	Salem Sound Costwatch	christinabash37@hotmail.com	978.745.7639
Beck	Eric	US EPA New England	beck.erik@epa.gov	617.918.1606
Blume	Emily	Northeastern University Marine Science Center	e.blume@neu.edu	781.581.7370 x 338
Brown	Caroline	URI Watershed Watch & Woonasquatucket River Watershed Council	caroline_brown@hotmail.com	401.349.4419
Calhoun	Fred	Salem Sound Costwatch	captaincalhoun@msn.com	978.525.3432
Carman	Mary	WHOI	mcarman@whoi.edu	508.289.2987
Cole Ekberg	Marci	Save The Bay - Narragansett Bay	mcole@savebay.org	401.272.3540 x 113
Comeau	Christine	Narragansett Bay National Estuarine Research Reserve - RI		
Coudill	Frances	Salem Sound Coastwatch	frances.caudill@gmail.com	978.526.7459
Cute	Kevin	RI Coastal Resources Management Council	k_cute@crmc.state.ri.us	401.783.3370
Deacutis	Christopher	Narragansett Bay National Estuarine Research Reserve - RI	deacutis@gso.uri.edu	401.874.6217
Delaney	Dave	McGill University	David.Delaney@mcgill.ca	617.770.0483
Dijkstra	Jennifer	University of New Hampshire,	dijkstra@cisunix.unh.edu	603.862.3647
Durfee	Elizabeth	NH Coastal Program	edurfee@des.state.nh.us	603.559.0028

Last	First	Affiliation	Email	Phone
Ellis	Stephanie	Salem Sound Coastwatch		978.741.7474
Enterline	Claire	MA Office of Coastal Zone Management	centerline@state.ma.us	617.626.1096
Forman Orth	Jennifer	UMass Boston Department of Biology	jennifer.forman@umb.edu	
Gasowski	Carl	Landmark School	cgasowski@landmarkschool.org	978.236.3328
Gittenberger	Adriaan	National Museum of Natural History (Leiden, Netherlands)	gittenberger@yahoo.com	31611381083
Glaub	Gretchen	AmeriCorps Cape Cod	gretchen.glaub@rdoac.org	508.375.6974
Grady	Sara	North and South Rivers Watershed Association	sara@nsrwa.org	781.659.8168
Griswold	Carolyn	National Marine Fisheries Service	Carolyn.Griswold@NOAA.gov	
Hadlock Seeley	Robin	Shoals Marine Laboratory	rhs4@cornell.edu	607.539.7897
Hajduk	Tracy	Northeastern University Marine Science Center	t.hajduk@neu.edu	
Halbett	Cindy	Electric Insurance Company	Cindy.Halbett@ElectricInsurance.com	978.524.5518
Hanlon	Peter	Massachusetts Bays Program	Peter.J.Hanlon@state.ma.us	617.626.1230
Hernick	Charles	MA Office of Coastal Zone Management	Charles.Hernick@state.ma.us	617.626.1218
Herron	Elizabeth	URI Watershed Watch Program	emh@uri.edu	401.874.4552
Hoagland	Elaine	NOAA/NCCOS/CCMA BioGeo Group	elaine.hoagland@noaa.gov	
Kelly	Carolyn	Salem Sound Costwatch	covefarmcarolyn@worldnet.att.net	978.526.0052
Kirn	Sarah	Maine Vital Signs	vs@gmri.org	
Landry	Thomas	Prince Edward Island, Fisheries and Oceans Canada	LandryT@dfp-mpo.gc.ca	
Levesque	Al	Salem Sound Costwatch	albertlevesque@verizon.net	978.745.8013
Levesque	Mary	Salem Sound Costwatch	albertlevesque@verizon.net	978.745.8013
Lipsky	Andrew	USDA Natural Resources Conservation Service	Andrew.Lipsky@ri.usda.gov	401.822.8842
Lovell	Sabrina	US EPA	ise-lovell.sabrina@epa.gov	401.782.9689

Macrae	Nicole	Northeastern University Marine Science Center	n.macrae@neu.edu	
McHan	Chris	Northeastern University	mchan.c@neu.edu	321.689.7902
Pryor	Don	Brown University - CES	Donald_Pryor@brown.edu	401.863.1322
Raczko	Mary	Boston Harbor Islands NPS	Mary_Raczko@nps.gov	617.223.8596
Rhineland	Jeanne	Salem Sound Costwatch	jcrrhino@aol.com	
Robertson	Deborah	Clark University	debrobertson@clarku.edu	
Ryan	David	Salem Sound Costwatch	t.radicans@verizon.net	978. 526.7155
Scanlon	Judith	Orleans Volunteer Monitoring Coordinator	nohnacsj@aol.com	508 255.1763
Smith	Jan	Massachusetts Bays Program	jan.smith@state.ma.us	617.626.1231
Spence	Heather		heatherspence@juno.com	202.361.6511
Stephenson	Elizabeth	Maine Coastal Program - State Planning Office	Elizabeth.Stephenson@maine.edu	207. 287.4120
Styles	Jennifer	Volunteer Center of RI - Land and Water Conservation Partnership	jstyles@vcri.org	401.421.6547 x 110
Suedmeyer	Beth	MA Office of Coastal Zone Management	Beth.Suedmeyer@state.ma.us	
Van Wagner	Kristin	Narragansett Bay National Estuarine Research Reserve - RI	kristin@nbnerr.org	401.683.1478
Waniga	Miles	NH Coastal Program	mwaniga@des.state.nh.us	603.559.0028
Warren	Barbara	Salem Sound Costwatch	barbara.warren@salemsound.org	978.741.7900
Weber	Scott	New England Aquarium	sweber@neaq.org	617.973.0227
Weinstein	Capt. David	Island Alliance	dlskings@gis.net	617.218.8938
West	Jen	Narragansett Bay National Estuarine Research Reserve - RI	jennifer@nbnerr.org	401.683.6780 x 6
Westerman	Erica	Univeristy of New Hampshire - Zoology Department	erica.westerman@unh.edu	603.862.3647
Winslow	Sigurd	Orleans Water Quality Monitoring-Volunteer	sigurdw@bellatlantic.net	
Ying	Wei	Brown University	Wei_Ying_Wong@brown.edu	401.451.0399

Last	First	Affiliation	Email	Phone
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