

TRACKING SEA STAR WASTING SYNDROME: A COLLABORATIVE EFFORT BY RESEARCHERS AND CITIZEN SCIENTISTS

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INTRODUCTION

The Multi-Agency Rocky Intertidal Network (MARINE), a long-term monitoring consortium with 200+ sites along the west coast of North America, is leading an effort to track and map changes in sea star populations related to the current incidence of Sea Star Wasting Syndrome (SSWS). SSWS describes a set of symptoms found in sea stars that typically progress as follows: skin lesions, tissue deterioration, arm loss, death (Fig. 3A, 3B). SSWS is not a new phenomenon for California; major outbreaks occurred in the 1980's and 1990's during El Niño events (periods associated with elevated sea surface temperatures). The impacts of these prior events were less extensive; major outbreaks were largely confined to southern CA and affected fewer sea star species (but included urchins and sea cucumbers). SSWS currently impacts sea stars from Alaska to northern Baja California and affects 15+ sea star species (9 of which occur within the MBNMS). Research is underway to determine whether elevated temperatures are playing a role in this occurrence. MARINE created a webpage to coordinate efforts by researchers and citizen scientists. One product of this effort is a tracking map (Fig. 1) that is helping to inform current SSWS research that is investigating potential pathogen(s) and other correlated factors.

MAPPING THE GEOGRAPHIC AND TEMPORAL EXPANSE

- **Why:** Causes may vary depending on whether the outbreak started from a single location or multiple points of initiation.
- **When:** Symptoms of wasting were first seen on the West Coast during June 2013 in Washington. Researchers at UC Santa Cruz began tracking SSWS in October 2013.
- **How:** The map is created using long-term monitoring data as well as observations submitted by researchers from numerous organizations (Fig. 2B, 2C) and members of the public (Fig. 2A).
- **Who:** Contributors thus far include universities, private firms, tribes, non-profits, government agencies, aquaria, and various members of the public. Within the MBNMS, many groups and individuals have contributed, including LiMPETS, REEF Check CA, Moss Landing Marine Laboratories (CA State Universities), Monterey Bay Aquarium, Hopkins Marine Station (Stanford University), Point Lobos Foundation, and local recreational divers and tidepoolers.
- **What you can do:** Visit our webpage (seastarwasting.org) where you can submit your observations and access many resources including photos and descriptions of disease symptoms, the latest findings, links to media such as articles and news broadcasts, and information on how to become more involved.



Photo: J. Ugoretz A



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Fig. 2:
 A) Young citizen scientist
 B) Subtidal researcher
 C) MARINE researchers

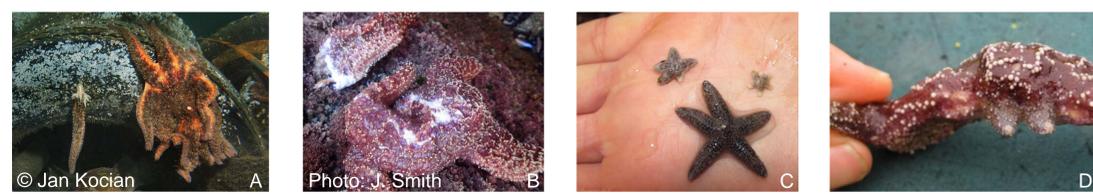


Fig 3:
 A) Diseased subtidal sunflower star
 B) Diseased intertidal ochre star
 C) Ochre star recruits
 D) Ochre star re-growing arms

CURRENT AND FUTURE EFFORTS

- Researchers from Cornell, University of Rhode Island, Brown, Roger Williams, and Western Washington University (among others) are conducting experiments, including stress and infectiousness studies, to determine whether a pathogen(s) is involved with the onset of SSWS.
- Recent tide-pool surveys in the Monterey Bay area documented high juvenile recruitment (Fig. 3C) and evidence of arm re-growth and lesion healing (Fig. 3D).
- As keystone predators, changes in sea star abundance may drastically alter their habitats. The MARINE group and partners are continuing to monitor communities on a long-term scale, documenting changes in sea star abundance and associated ecological responses.

Map made possible by:

Aaron Dufault, Abby Nickels, Allison Gong, Amy Dean, Angela Johnson, Anita McMillan, Ann Scarborough Bull, Ann Wasser, April Price, Ari Freedman, Art Kolter, Artemis Celt, Avrey Parsons-Field, Barb Erikson, Barbara Wagner, Betsy Steele, Bill Gomez, Brian Youngstrom, Brittany Brady, Callie Mack, Carlos Mireles, Catherine Drake, Claudette Dorsey, Clint Nelson, Cristoph Pierre, Dan Reed, Dan Schwartz, Daniel Clemens, Darren Fong, David Anderson, Denise Boniface, Derek Stein, Dida Kutz, Drew Harvell, Ellika Crichton, Elizabeth Bettenhausen, Elizabeth Seacord, Emily Carrington, Eric Eisenhardt, Fonseca Franco, Freya Sommer, Gabriela Montano, Gavin Wuttken, Gayle van Leer, Geoff Walsh, Gerald Winkel, Glenn VanBlaricom, Helle Anderson, Jackie Hildering, Jackie Patay, Jackie Sones, Jacob Eurich, James Watanabe, Jason Adelaars, Jan Kocian, Janna Nichols, Jared Figurski, Jay Smith, Jeff Adams, Jeff Goddard, Jeff Harris, Jeffrey Zankel, Jennifer Burnaford, Jennifer Kolbauer, Jenny Schefski, Jeremy Long, Jessie Altstatt, Jim Burke, Jim Knowlton, Jim Lyle, Jim van Gogh, Joe Tzyburczy, Joe Weiss, Joel Elliott, Joel Norton, John Gross, John Pearse, John Sayers, John Ugoretz, Joseph Gaydos, Joshua Sera, Judy Jordan-Biesele, Justine Maybee, Kate Melanson, Kelly Andrews, Katrine Heuer, Ken Bondy, Ken Collins, Ken Loomis, Kenneth Viknair, Kevin Clifford, Kevin Lafferty, Kevin Lee, Kim Coonen, Kirby Johnson, Kristin Riser, Laura Anderson, Laura Jurgens, Laura Rogers-Bennett, Leanne Foster, Liam Antrim, Liam Zarri, Linda Dudinyak, Linda Martin, Lindsey Eggers Damazo, Lisa Hall, Lorna Claerbout, Luke Miller, Maradel Gale, Marie Lindsey, Mark Nayer, Marm Kilpatrick, Matt Robart, Mathew Phillips, Matthew Hoehn, Megan Wood, Michael Behrens, Michael Guardino, Michael Kyte, Michelle Beaudry, Mike Kenner, Mike Schaad, Morgan Eisenlord, Nancy Tobin, Neil McDaniel, Nicole Abeln, Patrick Hutchins, Patrick Webster, Patsee Ober, Peggy Tillery, Peter Macht, Remi Le Reverend, Rhys Lewis, Richard Cranor, Ron Kacmarcik, Rouvaishyana, Russel Barsh, Russell Toerper, Ryan Berger, Ryan Stephenson, Sabine Doenninghaus, Samantha Winchell, Santiago Polo, Sarah Sampson, Scott Groth, Shannon Jarrell, Steve Clabuesch, Steve Lee, Steve Lonhart, Steve Rubin, Steve Simmons, Steve Tuckerman, Steven Morgan, Stephen Whitaker, Stuart Wobbe, Tara Troyer, Tim Herrlinger, Tish Conway-Cranos, Tristin McHugh, Wendell Wood, Wyatt Patry, Yvette Ralph, and many others.

CITIZEN SCIENCE

- **Definition:** Concerned/interested individuals (Fig. 2A) to organized groups.
- Expands spatial and temporal coverage (important where there are few long-term monitoring sites).
- Observation tracking logs (good for individuals without expertise/areas without pre-existing permanent plots):
 - Reporting healthy stars is also important!
 - Send photos if unsure of sea star identification and/or disease category.
 - Wash hands and gear after sampling to avoid spreading SSWS.
- Existing citizen science groups can be trained to use MARINE protocols (available at seastarwasting.org):
 - Intertidal and subtidal forms available.
- All reports go onto the tracking map (updated frequently).

Map made possible by:

