

Ocean Outbreak: Confronting the Rising Tide of Marine Disease

By Drew Harvell, 2019, University of California Press, 232 pages,
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Reviewed by Tessa M. Hill

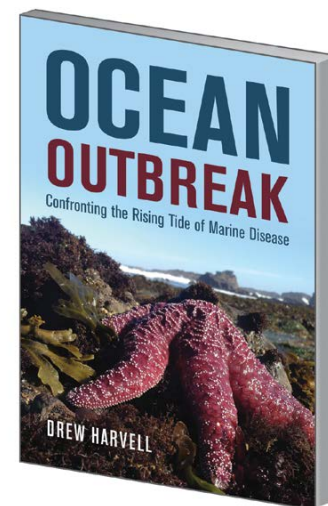
I am always on the lookout for good materials to assign as part of my oceanography courses, so this year I decided to incorporate Drew Harvell's new book, *Ocean Outbreak*, as reading for my biological oceanography summer class. In July, only a few weeks before class started, I found myself seated on an airplane for a short flight to do fieldwork, with the book in hand. I was diligently jotting ideas down on sticky notes—filling up the book with colorful tabs to indicate potential discussion ideas for my class—when the person sitting next to me became intrigued. She started asking me about the book, and about marine diseases and climate change. I ended up tucking the book away for the remainder of the flight because my neighbor and I never stopped talking. In the introduction to the book, Harvell states that her goal in writing it was to make the public and policymakers more aware about the threat of marine diseases to our “food supplies, economies, livelihoods, and health.” Based upon my first experience with book in hand, and the conversations it inspired with my neighbor, I'd say Harvell has been successful.

In this book, we peer into the world of marine diseases with several major examples: coral reefs, abalone, salmon, and sea stars. In each case study, we are treated to the science behind understanding the disease outbreak, as well as Harvell's firsthand accounts of being on the front lines of these problems. Harvell's writing paints a picture of the magic of discovery, and also the nitty gritty of doing this kind of science well: teamwork, travel, exhaustion, excitement, and some sadness. Her writing allows us to get to know places that Harvell has studied and known for decades, includ-

ing the Salish Sea, Indonesian tropical reefs, and research inside Hydrolab. The stories of disease outbreaks around the world unfold like a good mystery, with nighttime searches for clues, scientific dead ends, and evidence that has to be pulled together like small pieces of a puzzle in order for us to see the big picture.

“You always remember the moment when something bad turns big,” Harvell states in the opening chapter. Because I am interested in our changing scientific perspectives on human impacts and the ocean, I often ask colleagues if they recall an “aha” moment—a time when they became acutely aware that humans had fundamentally altered the ocean. Harvell seamlessly articulates multiple moments of discovery—and realization of the gravity of what she was observing—including swimming transects on the Yucatán peninsula and tidepool surveys on Puget Sound. A unique aspect of disease outbreaks, especially as described in this book's stories about coral reef pathogens, abalone withering disease, and sea star wasting disease, is the sense of an immediate, emerging crisis, with scientists racing to keep up with the process. Indeed, in some cases, by the time the scientific community has a grasp on what pathogen is impacting their species or ecosystem, the system itself has recovered. “The sea fan outbreak that had started in 1994 lasted about seven years and then slowly faded. By 2004, when we were fully geared up to study the epidemic, it had run its course,” she states. What does this mean for a future ocean where outbreaks due to ocean warming are an increasing threat, and for our ability to keep up in a scientific and policy sense?

While marine pathogens have always



been present, Harvell explains that the combination of a warming climate and a polluted ocean increases the chances of destructive disease outbreaks. The end of the book leaves the reader with the understanding that we are still discovering interesting aspects of marine diseases, and that there are actions we can take. Harvell points out that we'll need to improve our efforts to monitor and respond to ocean outbreaks, and to treat them in a way that matches how we respond to land-based pathogens. Coupling these efforts with reducing pollution, decreasing carbon emissions, and prioritizing ocean health is the only logical way forward for protecting species and ecosystems. I was left yearning for more information on how scientists are tackling the recovery of species that have been impacted by pathogens (e.g., one I know and love, the white abalone), but perhaps this is a good suggestion for Harvell's *next* book!

Now, back to those many sticky notes and our class discussions. *Ocean Outbreak* provided a perfect companion to our regular biological oceanography curriculum of a textbook and peer-reviewed articles. Students loved Harvell's storytelling about past periods of ocean discovery as well her observations and perspectives on current events. In their final class essays, my students commented that “the book felt equally an autobiography of a passionate scientist and a clarion call to action,” and that “Harvell managed to interweave

science and human connection all in one book.” In addition to the excellent scientific stories, there are some fundamental philosophies about how to pursue science that Harvell expertly weaves into each example of a disease outbreak: let curiosity drive you, choose your collaborations carefully, and prioritize the best possible science over the “easiest” answers. These lessons provided wonderful starting points for our class discussions (see suggestions below).

“Ignore infectious diseases in the ocean at your peril,” Harvell says toward the end of the book. The book is written in a way that science-interested members of the public, and policymakers, will find useful—but students and researchers in marine science, yearning to understand more about marine disease outbreaks, will gain just as much. Harvell beautifully articulates the urgent need for scien-

tists and non-scientists alike to do more to understand and protect the ocean. It will leave you wondering: are we doing our part, and can we resolve to do more?

Questions for Discussion: Using *Ocean Outbreak in Your Classroom*

- The author provides a fascinating account of the people involved and the scientific complexity of understanding multiple disease outbreaks. What aspect did you find surprising?
- We now understand the relationship between temperature and a pervasive pathogen in abalone. What other potential oceanographic or anthropogenic factors might play a role?
- What are some of the experimental challenges that scientists faced in identifying the sea star pathogen?
- What happens when the general public becomes very attached to an idea that

doesn't necessarily align with scientific evidence? Are there examples of this in the book, or others you can think of, and how can the scientific community respond?

- The book is fundamentally about studying disease outbreaks in the ocean, but there are more general lessons about how science operates, and how we might study resilience and recovery. What are those lessons?
- Harvell describes things she has considered as key to her success as a scientist. What do we learn from her experiences?

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