

THE OFFICIAL MAGAZINE OF THE OCEANOGRAPHY SOCIETY

# Oceanography

#### CITATION

Shank, T.M. 2010. Review of *The Silent Deep: The Discovery, Ecology, and Conservation of the Deep Sea*, by T. Koslow. *Oceanography* 23(1):228–229, doi:10.5670/oceanog.2010.106.

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## *The Silent Deep: The Discovery, Ecology, and Conservation of the Deep Sea*

By Tony Koslow, University of Chicago Press, 270 pages, ISBN 978-0226451251, Hardcover, \$35 US

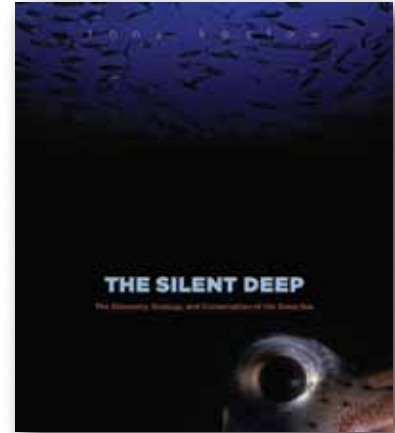
REVIEWED BY TIMOTHY M. SHANK

The deep sea represents one of the last great frontiers on Earth. Although once thought devoid of life, technology has brought the true abundance of deep ocean life into our human consciousness. Koslow's goal in this book is not only to introduce the intertwined explorations of scientific theory and the deep sea, but also to lay bare the facts of what humankind has inflicted on the depths. His vivid and succinct accounts of insults to the deep ocean are presented as freakishly appalling and irresponsible. As with most great frontiers, as Koslow puts it, "we humans devalue what we do not know." Unlike our moon, it remains out of sight for the vast majority of Earth's inhabitants.

Koslow relates the science, use, and future outlook of the deep ocean with an authoritative narrative that is easily understood. He compellingly uses the history of deep-sea exploration and science to demonstrate the human connection to the realms of ecological and evolutionary wonderment and exploitation. Historical science stories and personalities are woven into a fabric where the threads of science push ever forward. These stories are told only as someone with Koslow's experience and style can tell them—interesting, factual narratives that provide his readers, scientist and lay person alike, with

the wonders of the deep sea. He offers fascinating discoveries, ecologies, and evolutionary adaptations simultaneously, but also enumerates the ways humankind has impacted the deep sea and predicts the challenges of future stewardship. While scientists were discovering surprising oases of life at hydrothermal vents, society was concurrently polluting its ocean with chemicals, altering what were once thought to be inexhaustible fisheries through, for example, boat paint that changes the sex characteristics of benthic animals, and climate change that affects whole ecosystems.

*The Silent Deep* is actually three books in one, and throughout provides new and scholarly insights (even for the expert) as well as stimulating anecdotes. Part 1, "The Early History of Deep-Sea Exploration," presents early paradigms, such as the contention of a deep-sea devoid of life. Part 2, "The Ecology of the Deep Sea," discusses organisms and their ecologies from four major biomes—the fauna of the pelagic twilight zone; the seemingly ubiquitous and diverse "Lilliputian (or very small sized) Fauna" of deep seafloor sediments and muds; chemosynthetic ecosystems hosted by fluids and sediment laden with chemicals issuing from hydrothermal vents, cold seeps, the bones of fallen whales, and cold-water corals; and other invertebrates that dwell on seamounts. Part 3, "The Human Footprint Across the Deep Sea," discusses human activities, including mining, dumping, polluting, and deep-water fisheries activities, along with future conservation



and policy options. Although many of the figures are the standard for such books describing the deep sea, there are 16 plates containing more than 50 vivid images that depict the wide variety of habitats and life forms in the deep sea.

When I began reading this book, I was lead biologist for an international team of scientists on a Swedish icebreaker 4000 m above the deep seafloor using two new autonomous underwater vehicles to explore and sample, for the first time, Arctic hydrothermal vents and to compare their realities with our hypotheses regarding new species and their novel adaptations to the isolated deep Arctic Ocean vents. While remotely recovering hundreds of pounds of sticky mud and finding few if any life forms there, it was clear to me that Koslow not only captured the similar historical activities of the first deep-sea biologists, but he also breathed life into the organic ideas and the formative early exploration of the deep sea. I turned to the final page when I was conducting the first field trials of an exciting, new deep-sea vehicle—a hybrid with both remotely operated and autonomous capabilities, designed to reach the greatest depths on Earth (11,000 meters, which it accomplished in May 2008). The vehicle

employs technological advances new to marine science, such as ceramic spheres to provide buoyancy at pressures close to 16,000 pounds per square inch and a micro-fiber-optic cable the width of a human hair that can transmit multiple video streams along with vehicle sensor and navigation data to scientists aboard ship through a 20-km-long tether. While testing the vehicle's sampling capability, we discovered the anthropogenic legacy of mounds of spent munitions and gunpowder-filled tubes at 500-m depth. Coincident with this find in the Pacific was the discovery of massive damage caused by fisheries trawling on the Corner Rise seamounts in the North Atlantic. These recent experiences made only too real Koslow's major points: that deep-sea science has a storied

history and a legacy of exploration that extends to the current day and that the deep sea remains largely unexplored, although even the most far reaches are not only explorable by humans but have already been negatively impacted by us. He reminds us that we also have the power to steward the future health and use of the deep sea.

*The Silent Deep* is a unique and wonderful companion to the few other deep-sea textbooks that exist, such as Gage and Tyler's *Deep-Sea Biology: A Natural History of Organisms at the Deep Sea Floor* (1991, Cambridge University Press). However, I know of no other volume of work that so readily describes human impacts on the deep ocean, including the rapid spread and damage of trawling, the buildup of humanity's

toxic pollutants in deepwater life forms, the potential consequences of climate change and ocean acidification, and the future mining of seabed minerals and methane hydrates for hydrocarbons. The public needs to know what is at stake. From a single cigarette butt to megatons of radioactive waste, we have and will continue to impact the deep ocean.

I highly recommend this book for anyone with an interest in deep-sea ecosystems—and the future of our planet.

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## Enumerating the Sea's Dwindling Bounty

### A Review of *World Ocean Census: A Global Survey of Marine Life*

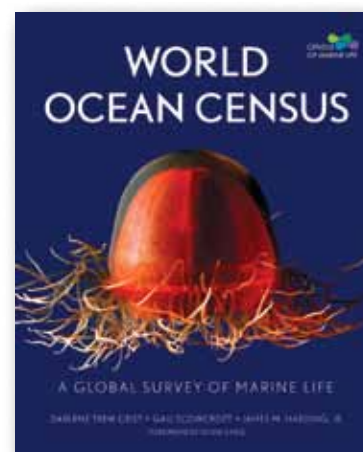
By Darlene Trew Crist, Gail Scowcroft, and James Harding, Jr., Firefly Books, 2009, ISBN 978-1-554-074341, Hardcover, 256 pages, \$40 US

REVIEWED BY CHARLES H. GREENE

During the first decade of the new millennium, a revolutionary approach to studying life in the sea was launched—The Census of Marine Life. Assembling over 2000 ocean scientists from 82 nations, the Census set out to answer three fundamental questions:

- What once lived in the global ocean?
- What is living there now?
- What will live there in the future?

In addressing the above questions, the Census evolved into an unusual mixture of nineteenth-, twentieth-, and twenty-first-century ocean science. Like the *Challenger* expedition of the mid-nineteenth century, the Census placed a strong emphasis on ocean exploration and cataloguing marine biodiversity. At the same time, it pioneered entirely new technologies to study the distribution, abundance, and genetic structure of marine populations as well as the behaviors of individual animals in the wild. It is not an exaggeration to state that over the past decade, the Census has played a fundamental role in transforming the study of life in the sea.



So, what has enabled the Census to play such a transformative role in marine biological research? During a decade in which federal support for such research was modest at best, the Sloan Foundation was able to use its own resources to leverage a large commitment of funding for the Census from