

"Gives readers a startling perspective on the fate of the planet by taking them through time and tides on the back of a sea turtle, whose every species is today endangered or threatened." —*OnEarth*



FIRE IN THE TURTLE HOUSE

THE GREEN SEA TURTLE
AND THE FATE OF THE OCEAN

OSHA GRAY DAVIDSON

Praise for Fire in the Turtle House

"Turtles have graced the seas for hundreds of millions of years. What their future holds, no one can say. *Fire in the Turtle House* is an important book about this wounded world and the people who are trying to set it right."

—Carl Safina, author of *Song for the Blue Ocean*

"A hard-working, sincere and scientifically valuable little book ... a truly menacing and heart-achingly sad tale. [Davidson] is a disciplined and cogent storyteller."

—*Los Angeles Times*

"An elegant eco-cautionary tale wrapped in a scientific mystery.... A quick-flowing narrative sparkling with wit.... Readers interested in ecology and animals, as well as those who value strong prose, will be intrigued and troubled by this book."

—*Publishers Weekly*

"*Fire in the Turtle House* is a profound and beautifully written account of the plight of the sea turtle. It is also, surprisingly, a story of hope for the future of these magnificent creatures."

—Jan Cousteau, ocean advocate

"A lucid and disturbing report on grim happenings in the sea-turtle world—and by extension the oceans themselves.... Davidson brings environmental passion, as well as a gimlet-eyed environmental appreciation, to the turtles' predicament."

—*Kirkus Reviews*

“Overhunting, coastal contamination, habitat destruction and global warming have conspired against the world’s oldest surviving reptiles, setting the stage for a plague of tumors. Osha Davidson’s saga of these ‘wise and generous’ creatures reminds us that we too are part of the food web and that we too are endangered by the current scope of our own activities.”

—Paul R. Epstein, Associate Director, Center for Health and the Global Environment, Harvard Medical School

“Reading like a detective novel, the text draws the reader into the search for the cause of the (turtles’) tumors: Is it a virus? Parasites? Marine pollution? Following the strands of evidence, the author reminds us of the interrelatedness of life and the environment.”

—*Booklist*

“A masterful scientific detective story, with abundant human interest thrown in for good measure. It is impossible to make the frightening story of green turtle fibropapilloma disease simple, but Davidson has made it highly readable; furthermore, most of the players in his story are my friends and colleagues, and the author has captured their personalities and nuances brilliantly. Every turtle aficionado, professional or amateur, should read this book.”

—Peter C. H. Pritchard, Ph.D.,
Director, Chelonian Research Institute

“Davidson’s writing is ... the best kind of journalistic reporting: clear and well-paced, employing individual human experiences—his own as well as those of dozens of people he interviews—to elucidate the global problem. He writes for people who don’t have biology degrees in a way that scientists will likely respect, simplifying the science but not the issues. Reads as readily as a detective story...”

—*The Honolulu Advertiser*

Fire in the Turtle House



*The Green Sea Turtle
and the
Fate of the Ocean*

Osha Gray Davidson



PUBLICAFFAIRS New York

Copyright © 2001, 2003 by Osha Gray Davidson.
Published in the United States by PublicAffairs™,
a member of the Perseus Books Group.
All rights reserved.
Printed in the United States of America.

No part of this book may be reproduced in any manner whatsoever without written permission except in the case of brief quotations embodied in critical articles and reviews. For information, address PublicAffairs, 250 West 57th Street, Suite 1321, New York, NY 10107. PublicAffairs books are available at special discounts for bulk purchases in the U.S. by corporations, institutions, and other organizations. For more information, please contact the Special Markets Department at The Perseus Books Group, 11 Cambridge Center, Cambridge, MA 02142, or call (617) 252-5298.

*Book design by Mark McGarry, Texas Type & Book Works
Set in Stempel Garamond*

Library of Congress Cataloging-in-Publication data
Davidson, Osha Gray.

Fire in the Turtle House: the green sea turtle and the fate of the ocean /
Osha Gray Davidson

p. cm.

ISBN 1-58648-199-1 (PBK.)

1. Green turtle. 2. Green turtle—Diseases. 3. Endangered species. 4. Ocean.
5. Nature—Effect of human beings on. I. Title.

QL666.C536 D37 2001

597.92'8—dc21

2001031868

10987654321

The most popular Hawaiian turtle legend is that of Kauila. Historian Daniel Akaka, Jr., tells the story this way:

This takes place on the island of Hawai'i at a black sand beach called Punalu'u. Two turtles, the female named Honupo'okea (White-headed Green Sea Turtle) and the male named Honu'ea (Hawksbill), entered the beach of Punalu'u and dug out a pond which provided the people of the area with a supply of drinking water. Honupo'okea left a nest of eggs and when they hatched, all but one of the hatchlings entered the sea and that one hatchling lived in the nearby pond. The people named the baby turtle Kauila, for her shell was the color of a dark-brown native hardwood of that name. This female turtle grew in the pond and was known to possess special powers. She could transform herself into a little girl and would often be seen playing on the beach with the other children. When children were caught in the strong ocean currents while swimming she would go out and save them. When Kauila wanted to retire back to her home pond she would once again transform back into her turtle form. The people of Punalu'u loved Kauila as the guardian of their children and also for the spring that gave them pure drinking water.

For Kauila and her children

Epidemics are like sign-posts from which the statesman of stature can read that a disturbance has occurred in the development of his nation—that not even careless politics can overlook.

—DR. RUDOLF VIRCHOW, 1848, quoted in Epstein (1997:3)

If an animal goes extinct that is not economically useful, no human is going to care too much.

—JIM SHEEHAN, director of international policy,
Competitive Enterprise Institute, *Toronto Star*, 3 May 1997

Contents

<i>Preface to the Paperback Edition</i>	VIII
<i>Acknowledgments</i>	XI
<i>Prologue</i>	I
1. Discovery	19
2. How Many <i>Honu</i> ?	25
3. The Turtle Sea	45
4. Lessons of Cannery Row	75
5. Outbreak	91
6. The Cayman Hotspot	105
7. Turtleheads	115
8. An Elusive Virus	137
9. Turtle Hospital	147
10. A Marine Metademic	161
11. Cells from Hell	171
12. The Environmental Key	189
13. Children of the Sea	211
<i>Bibliography</i>	223
<i>Index</i>	243

Preface to the Paperback Edition

Not much has changed for sea turtles since *Fire in the Turtle House* first appeared in 2001. These ancient mariners continue to die from the tumor disease called fibropapillomatosis (FP) and from the more established threats posed by commercial fishing and habitat destruction. The ocean itself is still abused as a resource to be exploited without limits and as the end point for our river-borne pollution, primarily nutrients from agricultural runoff and industrial livestock production.

Still, there is progress to report.

George Balazs, of the National Marine Fisheries Service, is finding the first tentative signs that FP may be declining in Hawaii. It's possible that the disease has reached a peak as turtles unable to shake the affliction die off and survivors develop a natural immunity. The federal program of euthanizing severely affected turtles (for research) may have also helped limit the spread of the disease.

Researchers led by Paul Klein at the University of Florida continue to make progress in unraveling the complexities of FP. Klein—whose accomplishments as an FP researcher and as a mentor to others were inadvertently omitted from the 2001 text—and his colleagues are exploring many areas, including similarities between the pathogen

linked to FP and another turtle killer, a herpesvirus known as LET (lungs, eyes, and trachea).

It's been known since the mid-1980s that some FP turtles regress, their tumors gradually disappearing. But a recent study by University of Central Florida (UCF) graduate student Shigetomo Hiram surprised many with the finding that 88 percent of lightly infected turtles caught in Florida's Indian River Lagoon were in various stages of regression when recaptured ten months or more later. Hiram's study has its limitations—it provides only a snapshot view of a single site using a small sample size—but his work underscores the importance of research into regression.

In another victory for turtles, nesting rates are increasing for several sea turtle species in the Archie Carr National Wildlife Refuge in Florida, as a variety of conservation measures take hold. The refuge is the most important nesting area for loggerhead turtles in the Western Hemisphere, with as many as 20,000 loggerheads coming ashore to nest annually. The number of green turtles nesting on these same beaches has skyrocketed. When Congress created the refuge in 1989, fewer than 100 green turtles nested there. In 2002 volunteers counted nearly 3,000 green turtle nests. In Hawaii, where the green turtle was once on the verge of extinction, nesting rates have been rising steadily, largely due to the Endangered Species Act's ban on hunting turtles.

But these gains are only a small part of the picture. The outlook for sea turtles and for marine life in general remains as clouded today as it was in 2001, for several reasons. There is growing evidence that global warming is linked to marine epidemics. As the Bush administration continues to resist meaningful reductions in the emission of greenhouse gasses that cause global warming, marine and terrestrial epidemics will likely spread, with new diseases emerging as temperatures rise.

Nutrient-laden runoff may have killed hundreds of sea lions and scores of dolphins off the California coast in 2002. The second largest die-off of marine mammals in U.S. history was linked to a toxic microorganism that thrives in coastal waters polluted with nitrogen

from agriculture. Even as I write, there are reports of a new spate of sea lion deaths in California, with the same toxin thought to be the cause.

Commercial fishing remains the single greatest killer of sea turtles. For example, the colossal leatherback sea turtle, the oldest species and the largest, is headed for extinction in the Pacific, a victim of longline fishing. A single longline can stretch up to sixty miles and carry 3,000 hooks. Although longlines generally target swordfish, leatherbacks are among the hundreds of species caught and killed accidentally by this gear (the total "by-catch" of nontarget species in U.S. waters alone is estimated at 2.3 billion pounds annually). Between 1980 and 2002 the number of nesting Pacific leatherbacks plunged 95 percent, a staggering decline that is largely attributable to longlining. In February 2003 hundreds of marine scientists from around the world signed a letter to UN Secretary-General Kofi Annan calling for an international moratorium on longline and gill-net fishing—another practice that kills sea life indiscriminately. The United Nations has not announced a decision on the issue.

Clearly, these are difficult times for those who love the sea. It sometimes seems that everywhere you look you're confronted with the specter of needless death. Dead turtles, dead sea lions, dead fish. Innumerable corpses ride the tides. If you gaze at them too long, you can be consumed by hard emotions: pain, rage, a piercing sorrow. But our salvation lies in the fact that hope is the last emotion to die—and the first requirement for action. Buoyed by hope, we can work. And in working we discover that the planet can be made whole again. It will be difficult, to be sure, but not impossible.

My father-in-law, a devout Catholic, believes in salvation, hard work, and hope's religious cousin: faith. He's also an Irish American with a fondness for Old World blessings. If I could coin a blessing for a new world, it would be this: May your children swim in an ocean full of turtles.

Phoenix, Arizona

May 2003

Acknowledgments

For many traditional peoples, turtles are the embodiment of wisdom and generosity. It must be true, because over the three years I've spent working on this book, the people who have devoted their lives to studying and helping protect these wonderful creatures have demonstrated both qualities in abundance.

First and foremost, I want to thank Ursula Keuper-Bennett for her help and encouragement in every phase of a project that grew like a turtle: slowly, inexorably, and seemingly without limits. She and her husband Peter Bennett have devoted their lives to a particular assemblage of wild turtles, the *honu* (Hawaiian for green sea turtle) of the eponymous Turtle House. I'm under no illusion why Ursula has been so helpful, and she's certainly never attempted to hide her reasons. These can be summed up in her motto: "Think of the *honu* first." Ursula believes that this book may in some way help the *honu* of Honokowai. I applaud her priorities and hope she's right.

Ursula appropriated that motto from her mentor, George Balazs. His official title is Leader, Marine Turtle Research Program, Southwest Fisheries Science Center, Honolulu Laboratory, National Marine Fish-

eries Service. But anyone who knows George knows that he holds an even nobler station in life: He is the *honu*'s best friend. And if he, too, went to extraordinary lengths to help this project, it was done in that capacity. Again, I only hope his faith proves justified.

There are so many others who have helped, supplying information, sharing memories, answering questions, taking time from busy schedules in order that I could better understand and write about the important and complex world of marine diseases. Most of them, too, have dedicated their lives to sea turtles, or to other creatures in the sea. Of course I appreciate their help. But my primary debt arises from their work itself. They are the protectors of the sea, and if the ocean world is to be saved, it will be because of their efforts and those of like-minded people throughout the world.

I also want to thank my longtime agent Alison Picard and my editor at PublicAffairs, Lisa Kaufman. To family and friends who have supported me in this work, I offer my heartfelt thanks and deepest gratitude.

Prologue

HAWAII

FORTY FEET DEEP in the shimmering waters off the west coast of Maui, I glide through a school of brilliantly colored fish that parts like a living curtain above a field of blue-gray boulders. The water is warm and clear. There had been a strong southward current running dangerously hard for days through the narrow channel separating Maui from the neighboring island of Moloka'i, but sometime before dawn the flow began to slacken. By 10 o'clock, it abated to a gentle tug.

There is nothing subdued about the sunlight, however. It illuminates everything for a hundred feet around with blinding tropical intensity. Clouds of bluestripe snapper hover around a rock the size of a minivan. An eel pokes its sinewy head out of a hole and then slithers back as my shadow ripples over it.

I am entranced watching a beautiful Picasso triggerfish when Ursula taps me on the arm. Ursula Keuper-Bennett is my dive partner. For nine months each year she teaches elementary school in Toronto, Canada, but every summer for over a decade she and her husband Peter have dived these waters, at a place called the Turtle House. She knows every boulder around, every sandy patch, even many of the individual crea-

Sea turtles have existed since the time of the dinosaurs. But now, suddenly, the turtles are dying, ravaged by a mysterious and gruesome plague that some biologists consider the most serious epidemic now raging in the natural world. Perhaps most important, sea turtles aren't the only marine creatures falling prey to deadly epidemics. Over the last few decades diseases have been burning through nearshore waters around the world with unprecedented lethality.

What is happening to the sea turtle, and how can it be stopped? In this fascinating scientific detective story, Osha Gray Davidson tracks the efforts of the extraordinary scientists, marine biologists, veterinarians, and others racing against the clock to unravel a complicated biological and environmental puzzle and keep the turtles from extinction. He follows the fates of particular turtles, illuminating their distinct personalities and why they inspire such devotion in the humans who come to know them. He also explores the history of man's relationship to the sea, and the role humans play in the increasing number of marine die-offs and extinctions. Beautifully written, intellectually provocative, *Fire in the Turtle House* reveals how emerging diseases wreaking havoc in the global ocean pose an enormous, direct threat to humanity.

OSHA GRAY DAVIDSON is the author of *The Best of Enemies: Race and Redemption in the New South*, *The Enchanted Braid: Coming to Terms with Nature on the Coral Reef*, and other books. His work has appeared in many publications including *The New York Times*, *The Los Angeles Times*, and *The New Republic*.

"Riveting . . . Impossible to put down . . . A lucid and compelling synthesis of historical events, empirical data, and personal testimony that reminds us of the indelible impact our mere existence has on this precious planet."

—*Ruminator Review*

"*Fire in the Turtle House* is a compelling story about turtles and their future that ought to change our view of the world. Reading this book is an education in illness infecting the ocean but reads like an adventure story. Whether the larger story—the survival of life on this planet—has a happy ending or not seems to be in question and certainly may be up to us.

—Jean-Michel Cousteau, President, Ocean Futures Society

"Not simply a lament for a vanishing exotic species but a serious look at what our use and abuse of the oceans has wrought."

—*Chicago Tribune*

\$15.00 / \$23.00 Can.

The author is donating part of the proceeds of this book to help save the sea turtles. For more information on what you can do to help, please visit www.oshadavidson.com

publicaffairs
 IN PAPER
www.publicaffairs.com

