cluding: "This continued homogenization of the world's flora and fauna, which represents at least millions of years of separate evolutionary histories, is an ecological holocaust of major proportions."

Science writer Robert Devine covers much of the same ground, but in greater and graphic detail, in his 1998 book *Alien Invasion*, a fascinating and horrifying examination of killer bees, kudzu, and feral pigs. Devine makes a convincing case that nonindigenous species may ultimately pose a more serious threat to biodiversity than even habitat destruction.

Although a few exotic freshwater fish and mollusks are examined in these descriptions, relatively little research has been focused on the effects of nonindigenous species in the marine environment. And given the combined effects of trawling, blast and cyanide fishing, eutrophication, pollution, and the other assorted human activities both on land and on sea, it's easy to see why habitat destruction is still considered the primary threat to marine biodiversity.

But we may be on the cusp of a new understanding about the human impact on marine life. The problems of overfishing, habitat alteration and nonindigenous species remain. But there is evidence of a new and potentially even more devastating problem. We may be transforming the ocean, especially coastal waters, into a breeding ground for disease.

Chapter 5

Outbreak

THE PHONE CALL was like so many others: a stranger on the other end of the line telling George Balazs that a sea turtle needed help. Ever since beginning his crusade to save the *honu* two years earlier in 1972, distress calls increased in frequency, until now they were a regular part of his job. A vacationing snorkeler would find a turtle with a flipper tangled in monofilament line and then somehow track down Balazs in his tiny office on Coconut Island. Or a local surfer would spot a turtle with an ugly fresh gash across its carapace—likely the work of a boat propeller—and Balazs's phone would ring. The junior biologist responded promptly to every call. After all, he *had* started the campaign to protect the turtles and now he couldn't very well say no when people sought his help for injured *honu*. So when the phone rang on that morning in early 1974, Balazs had no clue that the call would mark a major turning point in his life. The caller merely reported that a sea turtle had washed ashore on Waikiki Beach. Would Balazs please come take a look at it? Of course, he replied.

Balazs took a small skiff over to the mainland, hopped into a rusted-out State of Hawaii pickup truck, and drove the scenic, winding road from Kaneohe Bay over to Waikiki. Amid the mainland sun-seekers on that most famous of Hawaiian tourist destinations sat a large green turtle, immobile on the golden sand. The man who had telephoned told Balazs that the turtle had been blowing around like a balloon in the water. Then he pointed to the turtle's neck. "What the heck is *that*?"

Balazs stooped down to get a closer look. A fist-sized tumor grew beside the turtle's head. Balazs straightened up, astonished. He had no idea what the growth was. With the help of a couple of the onlookers, Balazs loaded the turtle into the back of his truck and headed back to Coconut Island, where he placed the animal in a tidal pond. The creature bobbed on the surface, unable to dive. Balazs wasn't sure what was wrong with the turtle, but he sensed that the problem was related to the horrible-looking growth on the animal's neck. He longed for someone to turn to for advice, but there was no one for him to call. *He* was supposed to be the turtle expert in Hawaii. So Balazs started combing through journals, new and old. He quickly found the 1938 article by Smith and Coates, "Fibro-epithelial Growths of the Skin in Large Marine Turtles, *Chelonia mydas*," describing the tumored turtle at the New York Aquarium. The authors used the word "wart" to describe the growths. That pretty much fit what he saw on the *honu*'s neck. But if this were a wart, thought Balazs, it was a huge one.

As he searched through the journals, Balazs found other references to the condition. A short paper published in the same year as the Smith and Coates article described growths found in a female green turtle caught off Florida's southwestern tip. The article was written by a cancer researcher named Balduin Lucké, and although his focus was cancer, Lucké was interested in all forms of neoplasms—the medical term for tissue growths that serve no physiological purpose. Cancer is a particular kind of neoplasm, a virulent growth that continues to spread to surrounding tissues and even throughout the entire system. By studying neoplasms in lower organisms such as turtles, frogs, and fish, Lucké hoped to gain better insight into just how cancer worked.

The turtle Lucké examined was covered with tumors. "They were located on the edges of both anterior flippers," he wrote, "in the axillary regions, the neck, on the eyelids, the corneal surfaces, and on the tail." The pathologist didn't know what caused the tumors. But he observed that humans and other animals developed similar growths and many of them were caused by viruses. Perhaps a virus was also responsible for the turtle growths, Lucké mused.

Balazs found a long article from the early 1950s on sea turtles in Malaysia, written by John Hendrickson, a name already familiar to him. Hendrickson was one of the top sea turtle biologists of his generation, and Balazs also knew of him as the author of the 1969 study that had overestimated the size of the Hawaiian *honu* breeding population—but only because it was based on the flawed data of other researchers.

In 1953 Hendrickson was a young professor of zoology at the University of Malaya, Singapore, who had recently graduated from the University of California–Berkeley and was conducting research on green turtles of the South China Sea. Balazs nearly jumped when he read an excerpt from Hendrickson's field journals, dated 16 March 1953.

> Found a turtle with a large, mushroom-shaped, leathery growth on its carapace.... This growth, measuring about 10 cm. by 15 cm. [4 inches by 6 inches], was attached by a relatively small stalk and I was able to remove the mass in its entirety. The growth was rooted very strongly through the carapace plates into the underlying bone, and the root was highly calcified. The mass contained a number of the burrowing barnacles seen before. When the mass finally came away from the turtle's carapace, it left a hole about 2.5 cm. [an inch] in diameter and about 2 cm. deep.... Is this a sample of a relatively successful host reaction to the parasites, isolating them off in a stalked tumour where they receive minimal blood supply, etc.?

Balazs quickly flipped to a series of black and white photographs accompanying Hendrickson's report. There it was, in the middle of the last page: the ugly, lobed tumor the young professor had cut off the turtle nesting on a Borneo beach. From the description and the photograph, it appeared that the Waikiki turtle suffered from the same condition as the one in Borneo had—and the others from Florida.

Balazs's research was productive, but it was also frustrating. The disease was known, but only in the sense that others had encountered it before. Beyond a physical description of the tumor, there was precious little information. Most important, no one knew what caused turtles to sprout the tumors. Not that there was any lack of hypotheses—everything from exposure to sunlight to a virus to a reaction to burrowing barnacles had been suggested.

Balazs ran across an early paper that proposed yet another scenario. Tiny leeches had been found in many of the tumors. The leeches could be opportunists, feeding off the blood vessels that crisscrossed the tumors. (Hendrickson was wrong about the tumor's "minimal blood supply"—there was plenty to keep the leeches happy.) A parasitologist named Ross Nigrelli, working with George Smith, the coauthor of the very first description of the tumors, suggested that the leeches could actually be helping the tumors to grow. To keep its food supply flowing, the leeches produced a compound called hirudin that prevents blood from clotting. Perhaps the increased blood flow caused by hirudin "fed" the tumor cells, allowing them to proliferate and grow.

One more plausible theory, sighed Balazs, closing the old journal.

In the course of his research, Balazs discovered an institution that would prove vital in his work. It bore the uninspired but utilitarian name: the Registry of Tumors in Lower Animals (RTLA). The RTLA was a division of the Smithsonian Institution in Washington, D.C., and was less than a decade old, the brainchild of a Clyde Dawe, a researcher at the National Cancer Institute. Like Lucké, Dawe believed that pathologists could learn about cancer by studying tumors in less complex organisms. The RTLA conducted some studies and published information about what it learned, but its most important contribution was, as its name denotes, to serve as a home for tumor samples. Starting

in 1965, zoologists from universities, veterinary clinics, and wildlife agencies began sending samples of tumors they had found in invertebrates and cold-blooded vertebrates. It was the only collection of its kind in the world. Balazs wrote the RTLA's director, John Harshbarger, asking if he had information about the tumors of sea turtles. Harshbarger responded that, yes, the registry had samples of the kind Balazs described and promised to send Balazs a copy of the most recent tumor inventory, which was then in preparation. The director added that "extraneous material of plant or animal origin is usually present" in the tumors and offered his opinion that this material "initiates the growths." Of course, he pointed out "this would have to be proven experimentally."

Without knowing what caused the condition, Balazs had no idea how to treat the turtle he had brought to Coconut Island. Each day the creature grew more listless. Balazs stood by, powerless to stop its decline. The turtle refused to eat, or perhaps it couldn't eat, and its plastron gradually collapsed, caving in as it starved. When the animal died a week later, a sense of inevitability pervaded its death. That didn't make the loss any easier for Balazs, but he tried to comfort himself with the thought that he was fortunate to have seen a case of this extremely rare disease. Over dinner that night Balazs told his wife, "Well, I'll probably never see *that* again, thank God."

In June 1974, a few months after seeing his first FP turtle, Balazs returned to East Island to continue the tagging program he had started the year before. He was encouraged by the fact that in his weeks on the isolated island 124 turtles came ashore to nest—more than a 50 percent increase over the previous year's total.

But Balazs made a more ominous discovery on East Island that year: 10 percent of the turtles had tumors.

Some of the growths were only the size of a nickel. Others were massive. The largest was nearly a foot in diameter. Balazs was startled to find so many turtles with tumors, especially since he had observed no tumored turtles at the nesting grounds the summer before. One possible explanation for that omission is that in his first year of the tagging program, Balazs had been so preoccupied with all the effort of beginning such a project—getting used to the island itself, figuring out the best procedure for tagging the turtles, etc.—that he missed spotting the tumors on the few turtles affected. After all, with only 81 nesting turtles observed in 1973, a 10 percent tumor rate would mean just eight turtles with growths.

But Balazs rejects the idea that he could have missed spotting tumored turtles. "I was very meticulous recording things that first year," he insists. "And later on [too], but especially that first year."

Reading through his field notes from that first summer, it's hard to imagine that Balazs missed *anything*. From the moment he set foot on the islands of French Frigate Shoals, Balazs kept scrupulously detailed records of virtually everything he saw, heard, or even thought. He was like a sponge, soaking up everything around and then transforming it all into scribbled descriptions on dozens of blue-lined pages. Balazs scrawled the names of the birds that crowded those coral islands, along with entries describing them: "Noddy Tern—gray; Sooty Tern—black/white, Red Foot Booby—in trees, Laysan Finch—male yellow." He made detailed maps of the islands, including what few buildings were there. (He even roughed in floor plans for those still in use.) He kept track of the weather by the hour ("10–11 pm: Light rain showers—hot during night, wind shifted west to north"). He made countless notes to himself on everything from how to improve his census ("Count eggs when falling into pit when convenient") to reminders of biological etiquette ("I would rather *not* get info on sex of baskers or tag present if it means making animals retreat into water").

And, most important, Balazs recorded anything that had to do with the *honu* that was out of the ordinary. These notations usually involved injuries, the work of the sharks that gathered in frightening numbers in the waters surrounding the islands. One turtle, he recorded, had a "healed bite in shell." Another was missing "[fr 1/2] right hind flipper." Others comments included anomalies as modest as "distinctive barnacle right side of carapace."

Given this attention to details, it's hard to believe Balazs could have missed something as obvious as tumors growing on 10 percent of the turtles at French Frigate Shoals. The most likely explanation for why he recorded no FP in 1973 is that there were no tumors to see. But this raised an even more perplexing question in Balazs's mind; namely, what accounted for FP's sudden appearance at French Frigate Shoals in 1974? The question baffled Balazs and drove him to learn more about the condition.

He still hadn't received the report from the RTLA with the inventory of sea turtle tumors, and so as soon as he returned to Oahu at the end of the summer, Balazs wrote John Harshbarger and reminded the RTLA director that he was keenly interested in learning about the registry's collection. Two weeks later he received the report. He tore open the envelope, giddy with anticipation. He quickly scanned the pages. The RTLA had over 400 tumor specimens in its collection. Most of them came from fish, but there were also neoplasms cut from mollusks, frogs, and several species of reptiles. Researchers had also submitted anomalies that turned out not to be tumors at all, but inflamed masses of tissue called granulomas, produced by the body as a reaction to an infection or a parasite. These samples came from starfish, corals, sponges—in one case, even from a fungus—in addition to the many creatures mentioned above.

Wading through this information, Balazs at last found the short section on sea turtles. There were only three samples. Two had been submitted from turtles caught in Florida. The first had been sent to the registry's founder, Clyde Dawe, back in 1963, even before Dawe had started the RTLA. A virologist at the Variety Children's Hospital in Miami had been vacationing in the Florida Keys when he had spotted a turtle with tumors on its neck and flippers. The researcher, named Glenn Waddell, removed samples of the tumors and sent them along with photographs of the turtle to Dawe. In a letter accompanying the material Waddell explained that he had begun a transmission experiment, transplanting some of the tumored material into young turtles. But as with Smith and Coates's mention of a similar intention, there was no record of any further study.

There was a second tumor from a Florida turtle, also from the Keys, and although the date listed in the registry for the tumor was 1972, that was the year the sample was processed. The material was actually obtained from a turtle off Marathon Key in the mid-1960s, by a graduate student studying parasitology at the University of Miami.

The only non-Florida record was entry #121. It consisted of three samples, each coming from a separate turtle, but otherwise, information about the tumors was nearly identical to that of the others in the registry. It had been submitted in 1967 by a young medical doctor named Al Smith, who had known Harshbarger when the two had been at the University of California–Irvine. The tumors resembled the others from Florida, both in gross appearance and under the microscope. Like the researchers in New York, and Waddell in Miami, Smith had wanted to do more experiments on the tumors. A grant application for this project was rejected, however, and he was forced to abandon the idea.

It was the location of entry #121 that got Balazs's attention. The tumored turtles had been given to Dr. Al Smith by a turtle fisherman working the waters of Hawaii.

A "baseline" is crucial to biologists, and the search for it is the first step in any scientific journey. That's because data without their context are, at best, meaningless. At worst, data ripped from the fabric of time and space lead to conclusions that sound reasonable and possess an irrefutable internal logic—but that may be completely wrong.

There is an old joke that relies on just this circumstance.

A medical researcher is studying longevity. The next subject walks in, bent over but apparently still getting around well with his cane. The man lowers himself slowly into a chair and says, "Well, doc, I can tell you right off the secret to my good health."

"Okay," says the doctor. "Go ahead."

"I smoke two cigars every day, without fail," says the man. "I drink a shot of cheap whiskey with every meal. And I chase women all night long, seven nights a week."

The doctor looks up from his chart, shocked.

"My God, that's amazing!" he says. "You smoke, drink, and carouse without let-up, and yet you appear to be in excellent health. That's simply amazing. How old are you, anyway?"

The man leans back in his chair and says, "Thirty-three."

Okay, it may not be a great joke, but it illustrates the need for a reliable baseline.

The quest to establish a baseline was behind George Balazs's tagging and monitoring program at French Frigate Shoals, and it was the starting point for his work on FP as well. When was the condition first seen? Where? What was the prevalence of the disease as far back as could be determined?

A baseline is just the beginning. By itself, a baseline is like a foundation with no building above it. Once a baseline was established, however, it could be compared to the current data Balazs was collecting. Out of this combination would emerge something akin to the Holy Grail for biologists: a trend. That was the key, finding FP's trend among the *honu*, and Balazs went after it with the same fierce determination that marked his other efforts at turtle conservation.

But first, the baseline. When did FP first show up in the Hawaiian Islands? That was one of the primary questions Balazs hoped to answer, and in seeking it he followed several different avenues. He corresponded with countless biologists and researchers. He continued combing through the scientific literature, extending his search to the so-called "gray literature," reports, studies, and field notes that had never been published or widely distributed. And he questioned local fishermen and wildlife officials whenever he got the chance. Over time, all three methods yielded results of varying quality, a mishmash of hard evidence, tantalizing clues, and dead ends. The RTLA records proved that FP was present in Hawaii in 1967. The disease was likely there before Al Smith sent his tumor sample to the registry, but how long before, exactly, and on what islands?

Balazs found a partial answer while searching through the gray literature, in an unpublished report prepared for the U.S. Fish and Wildlife

Service (FWS) by Eugene Kridler, the manager of the Hawaiian Islands National Wildlife Refuge. This was the same Gene Kridler who had angered Balazs in 1972 by testifying before Hawaii's Animal Species Advisory Commission against a full ban on the taking of *honu*. For his part, Kridler resented the suggestion that the upstart junior biologist (who was 24 years younger than Kridler) had begun the tagging and monitoring program in Hawaii. Kridler liked to point out that while working first as the refuge biologist and then manager, he had tagged hundreds of *honu* (in addition to 800 monk seals and thousands of birds) between 1964 and 1973. But despite his best efforts, Kridler's tagging operations were of limited scientific value. As usual, the biggest problem was money. For many years Kridler was the sole FWS administrator for U.S. territories in the Pacific, a domain that included more than 2,000 islands spread across 3.5 million square miles. The Hawaiian Islands Wildlife Refuge itself stretched some 800 miles, and Kridler had to hitch rides on U.S. Coast Guard and Navy vessels for his census trips. He was finally given an assistant, but the workload was still enormous, far beyond what two individuals could reasonably be expected to accomplish. Their tasks included (in addition to tagging turtles, monk seals, and birds) posting and maintaining refuge signs on all islands, conducting plant surveys on land and fish surveys in the sea, interdicting illegal trade in protected animals, and cleaning up mountains of trash left on the islands by the military.

Another problem involved the tags themselves, standard cattle ear tags made of an alloy that included copper and nickel. The tags were fine for land animals, but they corroded quickly in the tropical saltwater of Hawaii. (Balazs noticed this limitation right away and helped develop a long-lasting alloy still used for tagging turtles.) Given all these difficulties, it's not surprising that Kridler was unable to maintain reliable data on the sea turtles he encountered. Nor is it surprising that he took out some of his frustration on Balazs, who was, in essence, the new kid on the block.

But the younger man didn't allow any hard feelings to get in the way of his research on the turtle tumors, and he set about reading Kridler's many unpublished field reports. Balazs was going through a write-up of a 1969 trip to Pearl and Hermes Reef, a remote location over 1,000 miles northwest of Oahu, when he read: "Large growths, similar to cysts, were noted on the necks of two turtles. These growths were surgically removed, and although the turtles bled profusely for a few minutes it appeared that the cuts would eventually heal up."

Asked about the incident today, Kridler laughs about the phrase "surgically removed."

"By pocket knife," he explains. "That's all we had."

Neither turtle had been tagged previously, and Kridler doesn't remember whether he tagged them after the "surgery." But he recalls having seen the growths before and has a photograph of one *honu* with a severe case of the tumors, taken at Pearl and Hermes Reef in September 1966. That pushed back the date when FP was confirmed in Hawaii by more than a year.

Balazs's big break came unexpectedly. While chatting with an NMFS fisheries biologist, Balazs mentioned that he was interested in a tumor disease that afflicted green turtles. He asked biologist John Naughton if he had ever seen anything like it.

"Yeah, I've seen that," Naughton answered casually.

"Do you remember where and when?" Balazs asked.

Naughton said he could do better than that; he had a photograph of the tumored turtle at home, with the date the turtle was caught written right on the back. Balazs nearly grabbed Naughton by the collar and demanded to see the photograph.

It was the kind of snapshot you could find in any family album—grainy, slightly out of focus, the black-and-white emulsion faded with age. Six teenaged boys posed in a ragged semicircle, standing on a grassy area just in front of a beach. They all wore shorts or swimming trunks. Most of them were bare-chested. The photograph was taken on Oahu, on the shore of Kaneohe Bay. The bay appeared in the photo as a nearly white, featureless glow in the background.

The boys had just returned from fishing in the bay. In front of them lay a row of a dozen fish, arranged from smallest to largest, the scales still glittering in the tropical sunlight. Even across the years you could sense the life fading from the fish. Beside the fish was a smaller row of lobsters. A few of the boys looked directly at the camera. The others, by their gaze, drew the viewer to what was obviously the reason for the photo. The last two boys on the right held between them a large juvenile green sea turtle. Each boy gripped a front flipper. The carapace was perhaps two feet long. Balazs had to look closely before noticing the tumors. They were dark, nearly black in the photograph, a welter of fist-sized blobs bubbling along the left flipper. The boy holding the tumored flipper had his thumb carefully positioned near, but not touching, the tumors. That was John Naughton, who was sixteen when the picture was taken. The date on the back of the picture was 25 January 1958.

Balazs insisted that Naughton tell him everything about the turtle and the circumstance in which he found it.

There wasn't much to tell, insisted Naughton. The larger truth was that he was embarrassed to discuss it. As a fisheries biologist (who would later become the Pacific Island Environmental Coordinator for NMFS), Naughton wasn't especially proud of the fact that he had spent his high school years with his buddies plundering Kaneohe Bay.

Like most kids growing up in Hawaii, the group had spent much of their youth out on the water. Naughton and his friends found they could pick up some extra money while having fun, by selling fish to local restaurants and a few regular customers. It was an after-school-and-on-weekends activity. The group sometimes used the new technology of SCUBA, but that was rare. More often, they'd simply free dive from a small boat and take fish with a speargun. Turtles and lobsters they'd grab as they found them. The turtle in the picture was the first tumored one that they had seen, which was why they deemed it worthy of a picture. It was caught at the southern end of the bay, near where the reef crest separates the sheltered waters from the open ocean, and not far from where sewage was released into the bay.

They tried to sell the turtle, but none of their usual customers would buy it. Everyone thought it had cancer. The boys tried to give the turtle away, but there were no takers. In the end, they killed the turtle, kept its shell and threw the rest away.

Of course, Balazs was thrilled to have the photograph. Although the fishermen he questioned said they had on rare occasions seen turtles with tumors years earlier, January 1958 stands as the earliest documentation of FP in the Hawaiian Islands.

Over the next few years, Balazs saw several FP turtles. He took some samples of the tumors, preserved them in a fixative, and sent them off to John Harshbarger. In fact, all five FP samples submitted to the RTLA during the 1970s were collected by Balazs. The first came from an adult female, found bobbing in the surf in May 1975 off Waikiki Beach—the same general location where Balazs had seen his first FP turtle just one year earlier. This turtle had numerous tumors, inside and out. There were dark blobs of tissue on both sides of the animal's head and on her neck and a massive tumor hung from her right shoulder. Tumors had invaded her intestines, and they grew from her right lung and deep within her throat.

The next sample came from a small adult female that had washed up, weak and emaciated, on Kailua Beach on the southeast side of Oahu in April 1977. In addition to tumors on her jaw and right front flipper, large growths covered both the turtle's eyes. She died within hours, probably the result of starvation.

A few months later, in November 1977, Balazs found another tumored turtle, this one in Kaneohe Bay, in what was essentially his back yard. The turtle was smaller than the others—a little more than a foot long and weighing just 27 pounds. It, too, was more dead than alive, with multiple tumors, including growths that covered both eyes. Balazs euthanized it.

In March 1978 the head of a dolphin research center in Honolulu decided it was time to do something about a young adult turtle that had been in a display tank for several years and had, over time, grown a large stalklike tumor on its left front flipper. Balazs was called in. Since the animal appeared otherwise healthy, Balazs arranged to have the tumor surgically removed. After recovering from the operation, the turtle was tagged and released near Diamond Head, that famous peak overlooking Waikiki Beach and all of Honolulu. It was never seen again, but, then, most tagged turtles aren't, and so there's no way of knowing whether the animal survived.

The last sample Balazs collected during the decade of the 1970s was significant because it came from a turtle found on an island other than Oahu. The *honu* was an adult male, with two small neck growths, found basking on tiny Trig Island in French Frigate Shoals in June 1979. Balazs carefully removed the tumors with a sterile scalpel and tagged and released the turtle. Harshbarger's microscopic analysis of the samples made it official: fibropapillomatosis was indeed present in Hawaii, and far away from Oahu.

The decade ended with Balazs concerned by the high incidence of FP among the Hawaii *honu*. Smith and Coates had found the disease affecting just 1.5 percent of the turtles they examined in Florida. Why was the rate so much higher among Hawaii's nesting turtles? The higher prevalence was doubly troubling given the *honu*'s already extremely low population. The last thing the sea turtles needed was a major epidemic. But FP wasn't yet a major focus of Balazs's life. Between his tagging and monitoring program and his attempts to gain legal protection for the overhunted green turtles, the junior biologist had his hands full.

Besides, although the disease seemed serious locally, Balazs had no reason to believe that the tumors were a significant problem anywhere else in the world.

Chapter 6

The Cayman Hotspot

Grand Cayman Island, 1980

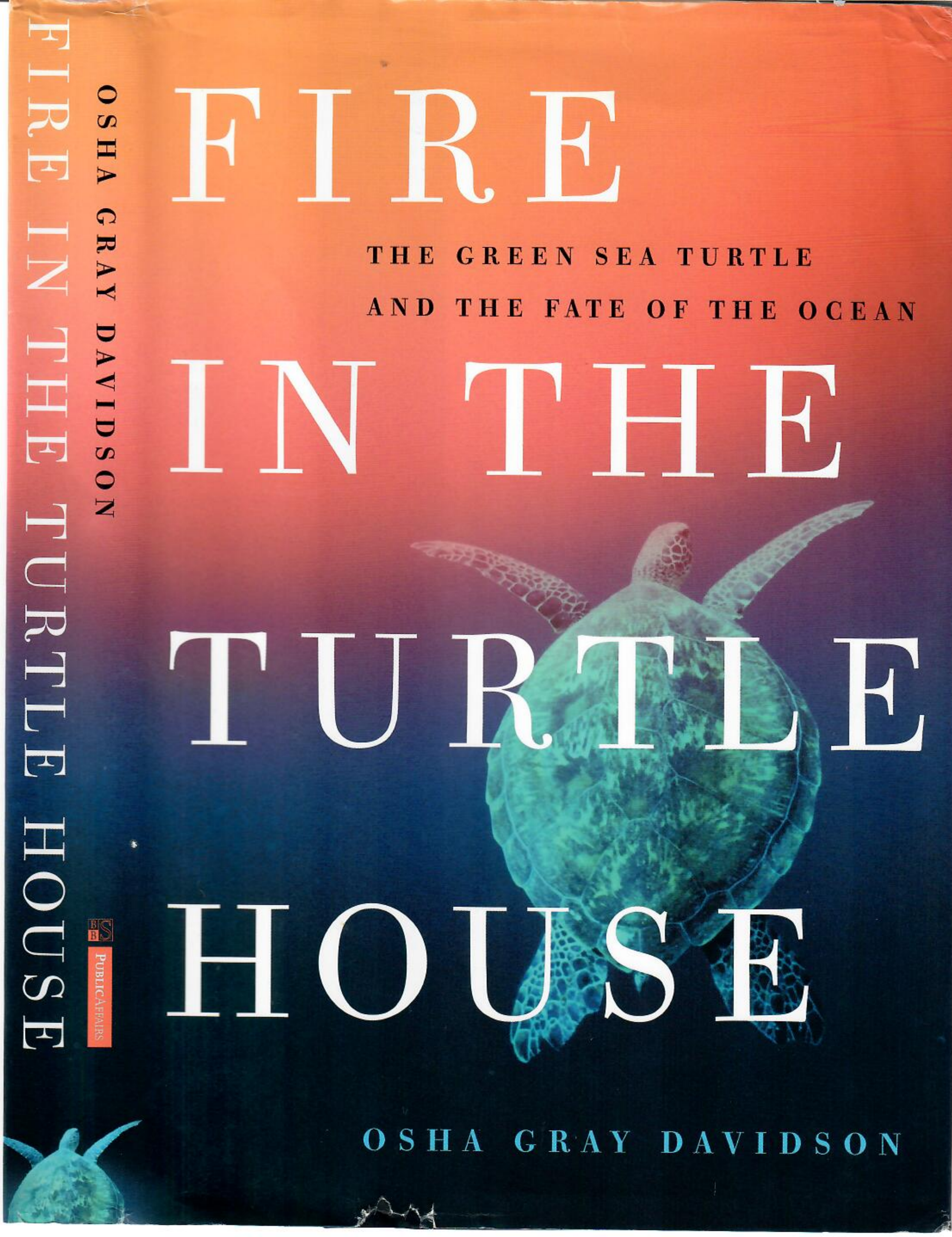
The problems began with the turtles from Isla Mujeras, a small island off the Mexican Gulf Coast. First it was leeches. There was no proof that the Mexican turtles had brought the parasites with them when they had been reprieved from a slaughterhouse in 1977 and flown over to the Cayman Island Turtle Farm. But because thousands of the tiny bloodsuckers first appeared soon after the arrival of the Mexican turtles, the outbreak would be forever linked to these turtles. At least that's how it seemed to Jim Wood, the director of the Cayman Island Turtle Farm.

There was always some health problem to deal with at the Turtle Farm—even before the arrival of the Mexican turtles. Not that the problem was unique to the facility. Wood, a trained zoologist, knew that diseases and the perpetual fight against them was a fact of life for "ranching" of any kind. Placing a large number of animals (of a single species) into a small area is a prescription for outbreaks of all sorts. This is especially true when that environment in question is artificial, as at the Turtle Farm, where the turtles lived in large concrete tanks resembling swimming pools. The number of factors that needed to be con-

The New York Aquarium, in Battery Park, Manhattan, where FP was first reported by scientists in 1936.

John Naughton

The first known photograph of an FP turtle in Hawaii. Taken 25 January 1958, Kaneohe Bay, Oahu.


FIRE
THE GREEN SEA TURTLE
AND THE FATE OF THE OCEAN
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