A female leatherback turtle crawls to the edge of the dune to make her body pit and dig her nesting cavity.

CHAPTER 1

Meet the Leatherback Sea Turtle

It is closing in on midnight in late May and everyone has walked a half-mile of beach along the noisy Caribbean surf searching for tracks. Kimberly is accompanied by two of her graduate students. Three local Kittitians and two American guests fill out the turtle party. Suddenly, a dark swath of disturbed sand emerges out of the surf line running straight up to the dunes. Kimberly trains a beam from her red headlamp. "It's a nesting leatherback!"

A leatherback sea turtle crawls up to the high-tide line to make a body pit and then dig a hole for her approximately 100 to 140 eggs.

A high tide washed out this leatherback sea turtle nest in Trinidad.

The 800-pound leatherback sea turtle crawls to the soft sand of the upper beach. She shimmers as the last of the seawater runs off her huge frame. Facing away from the sea, the female leatherback uses her three-foot-long front flippers to throw sand. Her strokes are powerful. As she pushes and hurls sand, her body, seven feet (213 centimeters) long, slowly rotates and settles into a wide body pit.

When the body cavity is dug, her rear flippers begin to excavate a nest cavity. The body cavity, or body pit, is a depression the female makes before she digs the two-feet-deep nest cavity or hole. She does everything by feel. She works one flipper at a time, reaching behind her, scooping out the sand, and flicking it to the side. Leatherback rear flippers are the size of a baseball glove. Imagine digging a hole with a baseball glove! Not easy. Her flippers are a multitool, though: they dig, scoop, pat, fling, and tamp down the sand.

"This area receives a very high tide in July," says Kimberly, scanning the dark beach. "We've got to relocate her eggs." Kimberly knows that sea turtle eggs laid in May will need to incubate for sixty days, so July's high tides could wash away this nest. But the leatherback still has work to do before she actually lays her eggs.

She falls into a steady rhythm: the right flipper digs, scoops, flings, tamps; the left flipper digs, scoops, flings, tamps; repeat. When her flippers have dug a hole about 28 inches (72 centimeters) deep, they begin to widen the bottom, making a vaselike nest.

Once her flippers have reached as far as they can go, the female leatherback stops digging. She pauses and rests one flipper on a pile of sand. She uses the other to shield the nest cavity, like a curtain screening a stage, protecting the nest from the view of predators.

"Quick! She's about to drop eggs! Someone count, someone get a bag!" The urgent commands come from Kimberly.

The mother turtle is moving fast now that her hole is dug. Wet, gleaming white eggs the size of billiard balls fall into the sandy nest before a bag can be set beneath her. We hear deep reptilian breaths.

"One, two, three," says Neil, the spouse of a veterinary student from the nearby Ross University School of Veterinary Medicine.

With the help of Theophilus Taylor, a towering fisherman from St. Kitts, Kimberly tucks a cloth laundry bag in the nest hole.

Kimberly spreads the opening of the bag wide as two turtle eggs plop inside.

"Five," says Neil, continuing the count, holding back the turtle's protective flipper to peer inside the nest cavity.

The rest of the group eases up alongside the turtle. They surround the nesting female and begin to collect data.

"Turtles go into a sort of trance once they start laying eggs," says Kimberly, "so we are able to work all around her. But we have to remember, even though she is incredibly focused on what she is doing, she is still susceptible to disturbance." Sea turtles spend 99 percent or more of their time in the ocean, hidden from human eyes. Scientists have an incredibly narrow but wonderful window to study them when they come out of the water to nest.

While she is laying, we walk to the front of the sea turtle and take note of her color. Her carapace, or top shell, is dark gray, almost black. Pinkish-white spots run the length of her shell and spill over onto her leathery flippers and face. Kimberly says her plastron, or bottom shell, is pale with gray-black markings. We squat beside her face.

Her eyes leak tears and mucus, pushing salt to the surface from a pair of hard-working glands in her head. Sea turtles ingest plenty of salt water when they devour their prey. Think about a leatherback consuming a lion's mane jellyfish that is seven feet wide with tentacles 150 feet long, and mostly made up of seawater. That's enough salt to cause dehydration. So salt or lacrimal glands, located near their eyes, allow leatherbacks to rid their bodies of salt by secreting saline tears.

Local islanders, though, say the sea turtle cries because she will never see her babies. Female sea turtles cannot stay out of the water for sixty days and wait while their eggs hatch. Survival for them means returning to the ocean as soon as they can or they will die in the baking heat of the midday sun. But the mother turtle is doing what she can to ensure the survival of her precious eggs. She has carefully dug a nest and will soon camouflage it.

SEA TURTLE FACTS

Sea turtles have two front flippers and two rear flippers. The front flippers help to lift and propel the sea turtle through the water. The rear flippers help steer the turtle and are used in nest digging. Unlike tortoises and land turtles, sea turtles cannot retract their heads (or limbs) into their shell. They have no teeth and instead use a large beak for crushing, biting, and scraping their food. Scientists don't know how long sea turtles live, but they estimate a lifespan of at least sixty years.

Sea turtles do not have external ears (the ear canals are covered by skin), and they are very sensitive to low-frequency sounds up to about 1,000 hertz (sounds that travel a thousand times per second). They have a keen sense of smell, often detecting prey in murky water.

Shell length of adult sea turtles ranges from about 27 to 80 inches or more (70 to more than 210 centimeters), depending on the species, with leatherbacks being the largest. Adult females can be weighed when they come ashore to nest, and scientists report weights of 315 to 1,247 pounds (143–567 kilograms) on the nesting beaches of the southern Caribbean (Trinidad and French Guiana).

The largest leatherback on record was a male weighing 2,015 pounds (916 kilograms) who was caught and died in a fisherman's net.

Color varies among sea turtles and is typically related to their habitat. Leatherbacks, for example, blend into the sun-dappled waters of the deep ocean with a dark body (black to charcoal gray) splotched with pale white, pink, or bluish markings. The plastron, or bottom shell, is pale with white to gray or black markings.

Weighing a leatherback takes plenty of muscle power.

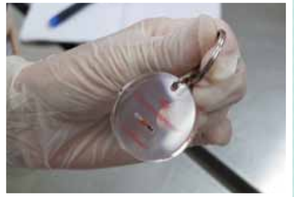
PIT TAGGING LEATHERBACKS

Nesting leatherbacks leave behind their eggs but take something back to the sea with them. "We tag all of our leatherbacks with PIT [passive integrated transponder] tags," says Kimberly. "They are cylindrical, about the size of a grain of rice, and are encapsulated in glass so they remain inert within the body."

Kimberly and other researchers inject the PIT tags into the shoulder muscle. For consistency they place them in the right shoulder unless there is significant injury there. When a specialized reader is passed over the tag, the reader generates a low-energy radio signal that energizes the tag to transmit its unique number. The turtle feels nothing as the reader (scanner) is passed over it. The received number, an alphanumeric code with nine to fifteen characters (a combination of numbers and letters), is displayed in the reader's viewing window.

"This number allows us to keep track of the sea turtle," says Kimberly. "The tags stay with the animal for life and are very rarely lost. For this reason they are better in many ways than external flipper tags to mark and identify individual sea turtles."

A hand-held scanner is passed over the injected tag to reveal a unique identifying number for the sea turtle.



PIT tags are the size of a grain of rice but allow scientists to identify sea turtles for years.

Jon, a graduate student, flicks a measuring tape across the sea turtle's carapace. "Width, 126 centimeters," he says.

Theophilus reclines in the sand, recording the turtle's width and other vital statistics on the data card in the glow of his red lamp. The researchers wear red headlamps because sea turtles are less sensitive to red light.

"She's already been tagged," says Kimberly, holding a metal tag attached to the trailing edge of the turtle's flipper. "We'll record the tag number and check out her past nesting records." Researchers later learn from the computer records that this is the female's sixth trip this year to lay eggs on the tropical beaches of St. Kitts.

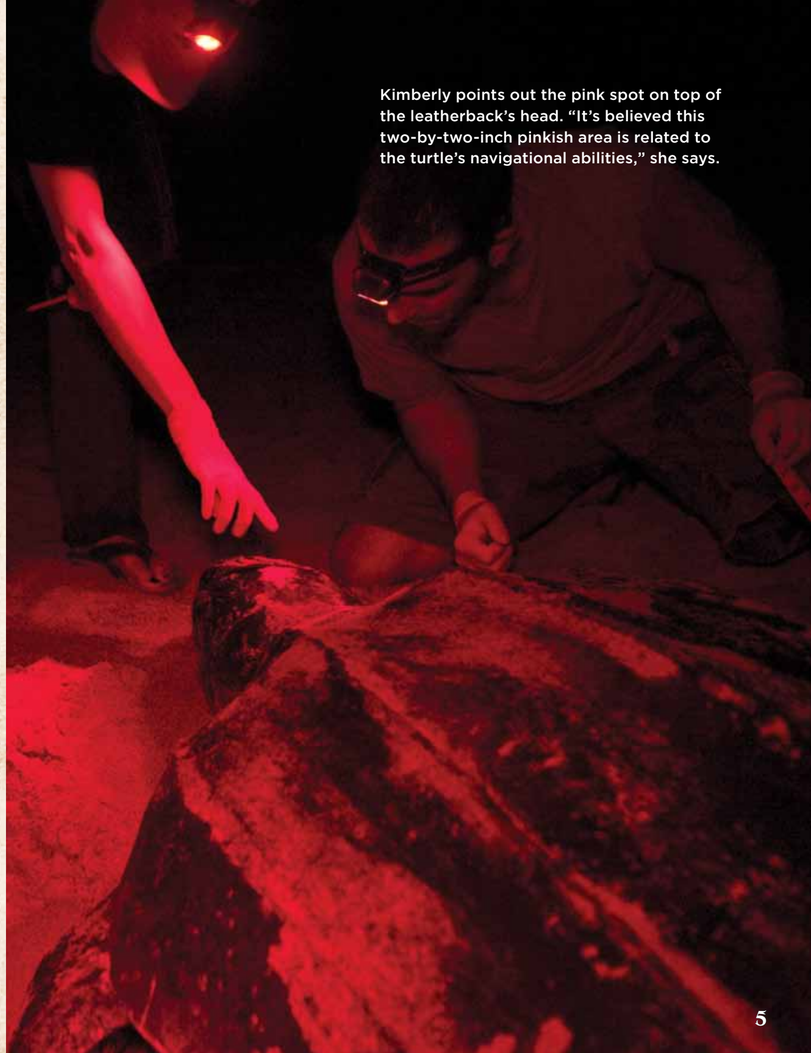
Female leatherbacks might nest anywhere from four to twelve times during a summer season. While mating between leatherback turtles has rarely been seen, females typically mate with a number of male sea turtles during the weeks prior to the nesting season, and then store the sperm until it is time to fertilize their clutches of eggs. Males play no part in nesting.

Kimberly preps the female's left flipper in order to take a blood sample. She swabs it clean of sand with an antiseptic solution and alcohol to destroy any germs or bacteria in the wound. Everyone is wearing protective latex surgical gloves. No one wants to transmit any germs to the nesting female or contract any bacteria from her.

"She's beginning to lay yolkless eggs," says Neil. Leatherbacks lay between seventy and ninety yolked eggs, followed by thirty to fifty yolkless eggs. Yolkless, or "false," eggs are laid on top of the fertile ones and are an indication that laying is coming to an end. Because there is no yolk, there is no nourishment for an embryo and no hatchling will result.

Yolkless eggs range from marble size to golf-ball size. Leatherback sea turtles are the only species to lay 30 percent or more of

A leatherback fills the nest cavity to the brim with two-inch leathery eggs.



Kimberly points out the pink spot on top of the leatherback's head. "It's believed this two-by-two-inch pinkish area is related to the turtle's navigational abilities," she says.

their clutch in yolkless eggs. Scientists are not exactly clear about the purpose of the yolkless eggs, but many believe that they provide space and aeration in the nesting cavity. The yolkless eggs deflate as incubation progresses, giving the newly hatched sea turtles a little more "wiggle room" as they prepare to emerge from the nest. When turtle researchers have to move a leatherback nest, they always make sure that they place the yolkless eggs on top of the others.

When the leatherback completes her egg laying, she pauses for a moment. An intense and long period of nest covering and camouflaging is about to begin.

"Final count," says Neil, "Seventy fertile, sixty-two yolkless."

As Theophilus pulls the bag full of eggs clear from the hole, Neil leans in and retrieves three eggs left behind in the sandy pit.

"She's covering," calls Kimberly. The research team members gather their equipment and back away. The leatherback spends forty-five minutes shoving, throwing, pushing, and tamping the sand dune around the empty nest cavity. Kimberly says you would be hard pressed to find the nest cavity after the tides have washed away the mother turtle's trail and all traces of the nest vanish.

When it seems she has tamped down an area ten times her size, the exhausted turtle finally turns back to the sea. Behind her is a set of wide tracks that marks her return trip to the ocean's edge.

As the leatherback disappears in the foam of the surf, she leaves behind her precious clutch of eggs. She doesn't know that the odds are stacked against her and her kind.

Kimberly extracts blood from the sea turtle's left rear flipper while a volunteer keeps a close eye on the number of eggs the turtle lays in the nest.

THE CRITICALLY ENDANGERED LEATHERBACK SEA TURTLE

Adult leatherbacks are the largest reptile on earth today. They dive more deeply (to four thousand feet or more) and travel more widely than any other reptile. Their range extends from the Arctic Circle south to Antarctica, and they swim, on average, about 6,215 miles (10,000 kilometers) each year. They are built for high-seas travel with a streamlined body and long, powerful front flippers for propulsion. Their smooth, leatherlike carapace gives them a perfect hydrodynamic form. As late as 1980, scientists still knew very little about this elusive species—and Kimberly's work is filling important gaps.

The leatherback is classified as a "critically endangered species," meaning that its global population has dropped by more than 80 percent in the last three generations (about a hundred years). Beaches on the Pacific coast of Mexico, for example, which once hosted tens of thousands of nesting females, now receive only a few hundred leatherbacks nesting each year. The bad news is that humans caused this problem. The good news is that we can help to fix it.

Why bother saving sea turtles? Someone might say, "I don't miss the dinosaurs; why will I miss the sea turtles?"

Consider that without the leatherback sea turtle, a major jellyfish consumer, jellyfish populations would explode. Jellyfish eat plankton and fish larvae. An exploding jellyfish population means fewer plankton and fish larvae. Scientists worry that the outcome of this scenario will be fewer larger fish for fishermen to catch. "As is true for all sea turtle species, the ecological role of the leatherback is complex," says Dr. Karen Eckert, executive director of WIDECAST. "For the oceans to remain in balance, top predators such as the leatherback sea turtle are very much needed. As large predators become scarce or disappear, food webs, including those that contribute to human diets, become unstable. In this case, the key to avoiding dangerous imbalances is to rebuild depleted sea turtle populations."

"A leatherback is incredibly focused during egg laying on the beach," says Kimberly.

Hatchlings make their way to the sea.