5. ENCOUNTERING LEATHERBACKS IN MULTISPECIES KNOTS OF TIME

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Exploring what it might mean to write in a time of extinctions, Deborah Bird Rose (2013) proposes that one must take seriously the way that "living beings call and respond; ethics are situated in bodies, in time, in place and necessarily, in encounter" (6). To write about extinction ethically, she suggests, is not to write in the abstract, but to understand how the confluence of forces making up this process might connect with the "present temporalities, localities, and relationalities of our actual lives" (6). In what follows, I offer my own attempt to take these words to heart and to write in response. My focus is the threatened extinction of the leatherback turtle, and how to understand this as something more than a crisis happening in a wide blue elsewhere.

Of course, one of the difficulties of attempting this is that leatherbacks rarely enter into the great majority of people's lives with any directness. When I first encountered them, it was as a potential object of research. I had heard of them, but just barely, and I had certainly never seen one. It seemed that in all likelihood I never would, unless I somehow managed a trip to Costa Rica, Trinidad, or Florida. So, as you will read for yourself shortly, building connections that might embed leatherbacks and me in

"shared, or partially shared, lifeworlds," as Rose (2013:5) suggests, ended up taking a circuitous route by way of clocks, filing cabinets, conference deadlines, journal articles, fellow commuters, YouTube videos, and a walk along Edinburgh's Water of Leith. While most of these elements will become clearer as this chapter unfolds, an explanation for why clocks appear in this list is in order.

I've come to be fascinated by what it is that clocks do, and particularly what they *might* do (Bastian 2012, forthcoming). Long detested as the device that surveils, enforces, admonishes, ignores, and reduces, the clock nonetheless offers a fascinating window into some of the ways that processes of connection are facilitated and managed. By offering a mesh that encompasses the globe—in the form of Coordinated Universal Time (UTC)—clocks suggest that everything is, in principle, able to be connected with everything else. They promise that we are all together in the same moment, in the same ticking of the second hand. Increasing accuracy has been crucial to this process. Temperature, humidity, movement, sudden shocks, gravitational effects, electromagnetic effects, and more call materials to respond, and when they do the clocks made from them become less accurate and less reliable. And so the process of creating this mesh of connection has been marked by the search for materials and devices that are less and less likely to respond to the environmental conditions around them (Bastian 2014; Mann 2014).

Telling time in a time of extinctions poses different problems. A point highlighted by Rose (2012) in her account of the ethics of multispecies temporality. Focusing on sequence and synchrony, rather than on accuracy and universality, she tells a story of the coevolved relationships between flying foxes and eucalyptus trees. Rose describes the way that synchronies between species—where flowering eucalypts offer sustenance to the migrating foxes, who, in turn, pollinate the trees—sustain each of them through

sequences of generational time. Neither sequence nor synchrony happen automatically, but both are embodied achievements. The flying foxes and the trees must find each other, and at the right times. As Thom van Dooren (2014b) writes, sequences depend on "real embodied generations—ancestors and descendants—in rich but imperfect relationships of inheritance, nourishment, and care" (27–29). Neither do synchronies and sequences occur in isolation; rather, multitudes of them bring together food and fed, pollinator and pollinated, traveler and medium traveled. In the case of flying foxes and forests, however, as both of their populations decrease, these "multispecies knots of time" are fraying, threatening the functional extinction that precedes the actual (Rose 2012:138). As this volume shows, these are only one set of knots among many. Thus Rose's proposal is that, with the loss of these relationships in a time of extinctions, time itself is being unmade.

What, then, of the clocks that so often chart our way through relationality? Why summon them here to guide us into a story of turtles? Only a hunch and a hope that they might one day work differently. All clocks are not the same, after all. Within research on circadian rhythms, for example, the environmental conditions that promote responses from body clocks do not threaten time's accuracy, as they do for their namesakes.[1] Instead, elements of daily life that affect embodied time—such as light, temperature, eating, and socializing—are known as *Zeitgebers*, or "time givers" (Pittendrigh 1981). For these clocks, time cannot exist in isolation but is given in relationship. Here accuracy is not about keeping to a regular disinterested beat, but adjusting to the shifting cycles that make life possible. At the heart of this chapter, then, is the question of what happens when the experiences of leatherbacks are drawn into everyday experiences and further, once there, what kind of "time givers" might they prove to be?

Tuesday, February 8, 2005

8:01 p.m.

My partner and I have just moved to Sydney and have been in our new flat for only four days. The four years of my doctorate stretch out unknown before me. We are just arriving home from getting the groceries, and we pause on the side entry to look out over Coogee Beach. It is a new moon, and the ocean is dark. We wonder, like we always will, what might be happening out there, over the water.

Nine years later, I find out. Trying to retrace where I was on that date at that time, I shuffle through filing cabinets, flip through appointment diaries, and consult old rental agreements, as well as weekday and moon-phase calculators.[2] Playing the game of "where were you when this happened?" I collude with the clock and its promise of an all-encompassing time. It offers me a retroactive synchrony that connects that place with another, allowing a leatherback to weave its way into my life.

Because at the same moment that we are standing there, out over that water, on the other side of the Pacific, on another beach, leatherback turtles are hauling themselves up onto land (Shillinger et al. 2010:222).

Over in Playa Grande, Costa Rica, it is 3:01 a.m. The local time is different, but the darkness of the ocean remains, the new moon shared across the globe long before international timekeeping agreements. Since October, female leatherbacks have been congregating offshore, making multiple trips to the beach to nest. Laying between October and February links their reproductive cycles to the cycles of the ocean, with large seasonal eddies helping to pull hatchlings out to sea when they eventually venture forth (Shillinger et al. 2012:1).[3] Like my partner and me, the turtles have been

watching the moon, often preferring to wait for a dark night like tonight before making the risky trip onto land.

Aware of these cycles and hoping to play some role in their continuation, human researchers have congregated on the beach. They are responding to the threat of the leatherback's imminent extinction. This threat had been announced five (long) years before (Spotila et al. 2000). And this particular population of eastern Pacific leatherbacks has declined by up to 90 percent in twenty (short) years (Shillinger et al. 2010:215). In other places, they have disappeared entirely. As James Spotila and his colleagues (2000) note, "Leatherbacks had disappeared from India before 1930, declined to near zero in Sri Lanka by 1994, and fallen from thousands to two in Malaysia by 1994" (529). On Playa Grande, there is still hope that the population will recover. This beach is one of their key nesting sites and has been designated as a national marine park since 1991. Egg harvesting has been reduced, and hatcheries have been created to save threatened nests.

But a focus on the short life stages spent on land can only do so much. The intensification of open-sea fisheries in the eastern Pacific, including the use of longlines and gill nets, has had a swift and massive impact. Drawn to the same productive upwellings out to sea, a new synchrony between humans and turtles—one in search of swordfish and the other, jellyfish—has created the conditions for the extinction of a species. Roland Brañas, a local fisherman from Chile, remembers that "before ever using nets, leatherbacks were extremely odd, some fishermen perhaps couldn't even tell them apart from other sea turtles" (Arauz 1999:14). During the late 1980s and early 1990s, however, he estimated that each boat in his area would catch around thirty leatherbacks a year. As early as the mid- to late 1990s, Brañas no longer heard of them, and the leatherback had again become rare (Arauz 1999:14–15). Overall estimates suggest that fisheries "killed at least 1,500 female

leatherbacks per year in the Pacific during the 1990s" (Spotila et al. 2000:530). Both before and after, an encounter with a leatherback at sea was a curiosity, but while in one moment this rarity supported the continuation of life, in the other it signaled a decimation.

And so up on the beach, researchers are attaching satellite trackers to the leatherbacks. The hope is that if they can track where the turtles go once they finish nesting, perhaps they can help undo this deadly sharing of time. Inspired by the TurtleWatch mapping tool, which has helped longline fishers in Hawai'i avoid dangerous interactions with loggerhead turtles,[4] the researchers here plan their own "clocks," ones that draw on growing knowledge of how turtles move and their ways of reading the ocean as they search out their prey (Shillinger et al. 2008:1414). If they can discover a pattern, they will be able to suggest that "dynamic time-area closures" be put in place in the southeastern Pacific, like those used by the Hawaiian TurtleWatch, where the boundaries of conservation zones are set, and reset, based on current conditions and their likelihood of attracting turtles, rather than on static geographical borders (Shillinger et al. 2008:1409).[5]

Importantly, for George Shillinger and his colleagues, this time(and space)-telling device is not being built in the service of connecting across distance, but rather to separate human from turtle. Their turtle watch fosters *a*synchrony, using specific, embodied understandings of time to deliberately disconnect (Shillinger et al. 2011:286; see also Benson et al. 2011). As Brañas's story suggests, the knots of time that support life may also have to be read in reverse—for the patterns of de-synchrony, dis-coordination, and disconnection, which may have been just as important for sustaining generational sequences of leatherbacks and others as the synchronies that Rose (2012) highlights.

When the time is right, the tagging begins; so far this season, four turtles have been added to the project's growing list of tracked

animals. Tonight, there are two more: PTT ID 56268 and PTT ID 56280 (Shillinger et al. 2010:222).[6] PTT ID 56280 was first identified in the 1994/1995 season and has been seen back at Playa Grande four times since then. This year, she first hauled up on the night of January 17, and her last return will be on March 1, when she will end her time of inter-nesting and head back to her foraging grounds. As she travels, her tag will send intermittent data to the Argos GPS tracking system, with the researchers following closely all the while.

In the months and years after her tagging, turtle PTT ID 56280 starts to stand out in the analyses of this particular data set. I first came across her in July 2012, learning something of the poetry buried in the strict form of scientific papers. While all the other turtles from Playa Grande headed out into the Pacific toward the Galápagos Islands, Shillinger and his team (2008) reported that "a single turtle in this study (tag ID 56280, tagged during 2005) occupied exclusively nearshore foraging habitats along the coast of Central America throughout the entirety of its tracking duration (562 d)" (1411). Such a matter-of-fact tone, yet in the midst of all the graphs and statistics, her journey insisted on telling its own story. Its implications rushed out and ahead and around. Why was she the only one? What had happened to all the others? How many might there once have been? Did she notice their absence?

I am not the only one to wonder. I trace hypotheses through other papers that mention her. Given the large number of leatherbacks caught in fisheries off Peru and Chile, turtle PTT ID 56280 might represent one of the few remaining "coastal" leatherbacks from a population that is on the very edge of localized extinction (Saba et al. 2008:657). Given the diversity of migration paths utilized by other leatherback populations, it seems unusual that eastern Pacific leatherbacks would have only one (Shillinger et al. 2008:1411). Indeed, these coastal leatherbacks may have been

one of the most successful populations in the eastern Pacific, with their foraging areas being more productive and, importantly, more predictable than the open seas of the southeastern Pacific (Saba et al. 2008:657). Eating well requires a particular confluence of temporalities. Being able to predict when and where food will arrive allows a more efficient use of your own resources. PTT 56280 herself was one of the largest tagged in this particular data set; she had larger than average clutches and reached areas where she could forage much sooner than other tracked turtles (Bailey, Fossette, et al. 2012).

Even so, when a particular population has dropped by 90 percent or more in such a short time, and there have been little to no systematic records kept, how can such speculations be answered? As Karen Bjorndal and Alan Bolten (2003) argue, "Many sea turtle populations of today are ghosts . . . of past populations" (16). Who knows how many ghosts may be accompanying PTT 56280 on her solitary journey. Excitement over "soaring" numbers of nesting sites in Puerto Rico, where more than 1,700 were seen in the first half of the 2014 season (EFE 2014), pales in comparison with stories of thousands of nests in a single night on Playa Grande. But anecdotes like these are few, often forgotten or misremembered, and they don't translate easily into the particular language of scientific practice (Pauly 1995).

In an ocean thick with hauntings, what kind of clock could set things to right? Shillinger and his colleagues (2011) hope that their complex of asynchronies will, supporting new forms of reckoning in this time of leatherback extirpations. If they can get it running, their clock promises to remove (some) dangers for (some) eastern Pacific turtles. But to do so, their research must be translated into politically viable objectives. The press release that does some of this translation work shows complexities already being smoothed over. In it, the unusual (and improbable) discovery that eastern Pacific

leatherbacks (or at least those who remain) "consistently follow a relatively narrow corridor out into the sea, past the Galapagos Islands and across the equator to an area in the South Pacific" is heralded as "the key to the leatherbacks' salvation" (Stanford University 2008). As the title of the research paper describing this discovery suggests, "persistent leatherback turtle migrations present opportunities for conservation" (Shillinger et al. 2008).

What a relief to find a consistency within the context of so much loss, a stillness inside the chaos. PTT 56280 appears as an interesting oddity, and the implications of her existence are left to future studies. Here and now, the promise of a dependable and limited migration corridor is pragmatically given priority. It offers the kind of time that is most needed for knitting together the range of national and international bodies that might support its continuation. Easier to negotiate with the time of the living, perhaps, than with the time of ghosts.

Yet the ghosts refuse to be banished. I hear them quite close by. The steady tick that offers (on occasion) a sense of safety, of predictability and calculability, has been transposed into an eerie clattering.

Tuesday, July 9, 2013

2:17 a.m.

I am far from home, cold, tired, and anxious. My doctorate is long finished, and home is now on the other side of the world in Edinburgh. There it is 5:17 p.m. Once again, the clock connects me, weaving distant others into the present. Knowing the time, I can guess that my partner will be getting home from work soon. Other homes in Edinburgh will be filling up with returning occupants.

Putting down their bags, making a hot drink, thinking "what shall we have for tea?"

I have found my way back to Sydney, but to a time that is out of sync. I sit at my desk, still awake. Almost everyone else is fast asleep. The traffic has lulled, and the birds are quiet. A clock ticks, steady when I listen for it, but when my attention breaks and I focus back on my screen, it seems to move faster. Suddenly it is 2:54 A.M.

Tick, tick, tick.

Hurry up, hurry up, hurry up.

You'll be late; you won't have any sleep; you don't have time.

I have traveled here to talk about leatherbacks at a conference on animal studies, but I still haven't written my paper and I'm presenting it tomorrow. All the times when I could have done something, could have acted, could have been one of those well-timed and responsible academics, weigh heavily. The consistent and persistent version of myself is yet to be realized, and, as usual, I have procrastinated and put it all off.

I think back to earlier in the evening, when I spent that extra half hour at the opening of the conference exhibition.[7] Or the half hour afterward, waiting at my favorite vegetarian place for steamed dumplings. After I'd spent twenty minutes deciding what to get, enjoying the luxury of so many options.

Despite my pleas, the clock is implacable and won't return the time I've lost.

I am not alone in this time, though. Others will still be awake, working on their presentations. All of us shrugging our shoulders at the gallery, colluding with one another to put it off a little longer. "It'll get written sometime." Now here we are, in this time outside of time, a synchrony of untimeliness.

Still the clock ticks.

Tick, tick, tick.

In a session yesterday, we wondered over the meaning of a magpie's song, but we never doubt the meaningfulness of this monotonous tick. Too early, too late, so bored, can't wait. The clock sings to us in its own way. It tells us stories of late trains, of exams, of cinema screenings, of job interviews, of grant deadlines (not a millisecond after 4:00 P.M.).

We are told there is only one clock time, a rigid mechanical process that is "unaffected by context and seasons" (Adam 1998:70). Your watch might be two minutes faster than mine, but that is not because it is like the magpie, calling us to see it as a unique, creative creature. It is simply because it is wrong. It has the wrong time.

But they once said that the Pied Butcherbird sings only by instinct. Not convinced, a musician and researcher has spent years listened attentively to their song (Taylor 2008). The uneconomic practice of simply spending-time-with produces the "sharp ear" that could move beyond hearing only mimicry and repetition (Taylor 2013). Individuals become distinct, and their song now rings clearly as the voice of a unique being exploring its world.

Maybe we haven't been listening to clocks attentively enough either. Maybe we've just been poring over their bones, clacking them together—clack, clack, clack—and thinking that we know all there is to know about time and the rhythms that bind beings together.

Our clocks promise that they can keep us coordinated, that if we plan sensibly, all will take place as it should. The lure of persistent consistency still guiding understandings of how best to act and respond in the face of existential threats. But what if, in this time of extinctions, our hours are muddled, our dates disoriented, our counting confused?

I hold the clock's bones in my hands, wondering how they might work differently. Time is not what it once was, and all around rhythms are shifting and transforming.

It's now 3:41 A.M.

The bones have started growing flesh.[8]

The cold predawn has me lying on the carpet and soaking up the radiant heat from the under-floor system. I am reading scientific articles, as precise and dry as ever. Despite the authors' best intentions, I evade the longlines of scientific rationalism. Instead, the dark carpet in my room morphs into black sand. I am on another beach, Tortuguero, on Costa Rica's Atlantic coast. In this place, the time is "peak leatherback nesting season" (Veríssimoa et al. 2012).

A jaguar ventures out of the cover of trees. She, too, is under the close eye of human researchers, tagged and tracked, as part of an attempt to halt the fast downward trend of jaguar populations across the Americas (Carrillo, Fuller, and Saenz 2009). Tonight, she is hungry and is seeking unusual prey—sea turtles. Until recently, she had no need to hunt this well-protected quarry. The forest was large and held many options for her. She could take peccaries, monkeys, agouti, or many different kinds of birds or fish. But the forest grows smaller, and so do her choices.

Then, if you had asked her the time, she might have told you about following white-lipped peccaries from uplands to coastal forest to swamps, as the wet season turned to the dry (Carrillo, Saenz, and Fuller 2002). Or of hunting during mornings and late afternoons when the peccaries were out foraging for their food, both peccary and jaguar resting during the mid-day heat (Carrillo, Fuller, and Saenz 2009). But with their numbers dwindling, she has become attentive to a new rhythm. This clock does not signal through the shifting scents of ripening fruits, but by the sound of bodies dragging themselves out of the ocean.

Ever the opportunist, she has begun to forge new relationships of predator and prey. To do this, she has also had to forge a new time. She has noticed that the turtles arrive with the new moon and adjusts her sleep to coordinate with them (Carrillo, Fuller, and Saenz 2009:565). Synchrony is made flesh in her desire to sustain her own life. The beach now holds jaguar and turtle in a fraught and fragile shared moment.

Usually she finds green turtles digging out their nests. But she is early, the time not quite yet "peak green turtle nesting season." Tonight, something huge and unexpected has hauled itself out of the water. Although it does not look very much at all like the others, she is still able to attack the leatherback's vulnerable flippers and neck. Perhaps next year, she will show a cub how to take advantage of the unprotected flesh; the cub, in her turn, might bring her own cubs to feed on this becoming-familiar prey. A new synchrony in the present extending out toward new futures.

I later read that this is indeed what researchers in Tortuguero have found, suggesting that the taking and sharing of turtle carcasses may be "the result of a locally learned behavior, passed down several generations, which [has] now become prevalent across the jaguars living in the area" (Guilder et al. 2015:71). Encroaching agricultural activities, including banana and pineapple plantations, as well as illegal hunting in the national park, have pressed jaguars into finding new food sources.

But learning to kill a turtle also involves learning its temporalities and spatialities, being in the right place at the right time, hoping for prey that is both available and reliably so (Arroyo-Arce, Guilder, and Salom-Pérez 2014:1455). Like my clock, the new moon promises the jaguar that if she keeps to the right rhythms, all will take place as it should. But how many turtles will survive and return next year? How much habitat will she have left? And what are conservationists to do when one endangered species starts eating another (Veríssimoa et al. 2012)? While there is evidence

that, unlike the eastern Pacific leatherbacks, the turtles tied to these Atlantic coasts are increasing in number (for example, Stewart et al. 2010), the Tortuguero population is still decreasing (Gordon and Harrison 2012).

Created year after year, synchronies become a sequence through generational time. Or at least they used to. Since the last great extinction event, the tangle and weave of embodied time has grown increasingly ornate and precise, but here in the midst of another such event time is becoming threadbare. The forests, the peccaries, the jaguars, the leatherbacks—all are under threat. They will shift and adapt, seeking out gaps and openings that might remake the rhythms that support their lives.

And so time ends and time begins, with different consequences rippling out for each of those bound up in the knot.

During the peak green turtle nesting season, jaguars often leave much of the carcass untouched. Abundance means that they don't have to take the time to laboriously claw out the hard-to-access meat (Guilder et al. 2015). Not seeing the point in letting the turtle meat rot, local people propose to the park management that they be given rights to the fresh carcasses (Campbell 2007:322). Unlike the jaguar, they draw on centuries-long histories of eating sea turtles, including leatherback. But this request is denied. In a time of extinction, a human encounter with a turtle is not supposed to be about food, but about tourism and research. Nesting season closes public beaches for locals, but opens them for foreign visitors taking advantage of gaps in their own time to "see the turtles" (Campbell and Smith 2005:179). The new temporalities that press the jaguar and turtle into connection, disrupt and disconnect others.

Journal articles are scattered all around me now, here on the warm carpet. I reach for one at random and am swept out even farther, all the way to the other side of the Atlantic (Witt et al. 2007). With the time now "jellyfish season," the leatherbacks have shifted from

prey to predator. They have been searching out the optimum conditions for jellyfish blooms. Conservation scientists are slowly piecing together the multiple factors that each turtle attends to in order to be in the right place at the right time. Underlying search rules begin piling up: "Ekman upwellings," chlorophyll-a levels, sea-surface temperature, eddies, swells, choppiness, and currents (Bailey, Benson, et al. 2012; Benson et al. 2011; Hays 2008; Heaslip et al. 2012; James et al. 2005; Witt et al. 2007). Unlike our own context-insulated clocks, leatherbacks' modes of coordination trace intersections between a range of dynamic environmental conditions.[9] Constructing clocks of their own, but so different from the one ticking here in my room.

Once the blooms are found, the turtles can settle into methodically eating their prey, the sheer abundance of jellyfish allowing them almost to graze (Heaslip et al. 2012:6). Like the jaguar, their daily rhythms track those of their prey, rising to the surface at night and sinking down during the day (Witt et al. 2007:237). While the jaguar's body has not yet invented an efficient way of getting into a large turtle's carapace, the leatherback's has had the time it needed to find solutions to its own problems. Jelly after jelly gets pulled into its spiny throat. Known for its immense size, a leatherback is nonetheless capable of eating its own body weight in a day.

The turtles are off the coast of Ireland, feasting on blooms of barrel jellyfish 4 square miles wide (Houghton et al. 2006:1967). Until the publication of Jonathan Houghton's paper, these consistent aggregations of jellyfish in the northeastern Atlantic were unknown to science. Indeed, in the articles scattered around me, marine biologists and ecologists have been lamenting how little is known about jellyfish: when they bloom, how, why, or where. Until very recently, there has been no funding for research and no interest from policy makers in learning more about them (Doyle et al. 2008; Hay 2006; Houghton et al. 2006; Richardson et al. 2009).[10] They are a form of life that humans seem to feel no need

to synchronize with. Leatherbacks, though, draw on sequences 110 million years long, knowing where to be, and when, in order to create the beneficial synchronies that make futures.

Unlike with the jaguar, however, the fear is not that the leatherback's prey is decreasing, but that it may be exploding exponentially (Richardson et al. 2009).[11] Many of the human activities that have contributed to the swift reduction in leatherback populations might, perversely, be turning the oceans into a perfect habitat for jellyfish (Purcell, Uye, and Lo 2007). Where once there were stories of fish being so abundant that, during salmon runs, rivers might contain more fish than water (for example, Roberts 2007:45–57), now jellyfish are shutting down tourist resorts, killing fish farms, and blocking intake valves of nuclear power plants (Danigelis 2013). Clearing them from the Orot Rabin coal-fired power station in Israel in 2011 required diggers and shipping containers (Kwek 2011). As with fears of the rise of superweeds on land, abundance is not absent but appears to be abruptly shifting form.

The fears of humans don't always coincide with those of leatherbacks, though. Their nesting cycles are determined by the availability of prey. Only after meeting their own needs do they start storing energy for the intensive work of producing eggs and traveling to nesting beaches. The time between visits is thus different in different places. While eastern Pacifics take an average of three to four years to return, the Atlantics take an average of only two years (Stewart et al. 2010:272). These different rhythms are thought to reflect the varying levels of unpredictability each face. The "more consistent foraging environment in the Atlantic basin," and thus the shorter time between nestings, may be one reason why the population there has a more positive outlook for recovery (Stewart et al. 2010:272). Increased jellyfish blooms may remake these cycles and transform the rhythms of leatherbacks' lives. Being able to build their energy reserves more quickly could allow more frequent returns to nesting beaches and larger clutches (Stew-

art et al. 2010:272). Oceans filled with hauntings may replenish themselves, even yet.

Still, it is hard for conservation researchers to know. Data on jellyfish is patchy and often anecdotal. Their eerie physicality—so incorporeal that they are shredded by sampling nets, so massive that they can capsize research boats—combines with their unpredictable and polymorphous life cycles to discourage researchers from taking them up as objects of study (Schrope 2012). Lacking the time, money, methods, and inclination, Western science has shied away from learning what makes jellyfish tick.

Putting off the task of addressing the difficult questions that animals pose is not unique to conservation (Buchanan 2007), but not making the time threatens to break time. In both scientific articles (for example, Richardson et al. 2009) and the popular press (for example, Gershwin 2013), the rise of jellyfish threatens to unmake time's supposed dependability and calculability. The fear is that jellyfish may become so dominant that a regime shift could replace fish with jellyfish as "an alternative stable state in marine ecosystems" (Richardson et al. 2009:313). Relinquishing its implacable forward movement, time (whose time?) threatens to stall and begin to run in reverse, looping the Anthropocene back around into the Cambrian (Richardson et al. 2009:317).[12] But it's hard to tell. Jellyfish are not included in the models, and simulations can't be run (Richardson et al. 2009:320).

Unaware of human imaginings, jellyfish bodies react to the cascades of transformations altering the seas. They are not bound to our clacking bones, with their repeated incantation that everything will continue as it has ever done. Instead, they have heard the perfect harmony sung by intertwining rhythms—overfishing, eutrophication, climate change, translocation of invasive species, and seabed destruction (Purcell 2012). They respond, move, bloom, die, and wait—already reflecting back the times before anyone knew to look.

* * *

How long does it take to learn how to tell time differently? To evolve the sharp senses that are able to tune into multiple, contradictory rhythms, here, now, in our time of extinctions?

A quick glance at a clock face does not suffice. Jaguars learn to tell time with turtles over years and generations. Can we even imagine how long it took leatherbacks to tell time with jellyfish? We'll probably never know; these processes are shrouded in deep time and only occasionally read through inscriptions on rocks. We are, however, able to witness a new relationship forming knots in the time of leatherbacks, a geological moment happening right before our eyes.

In 1968, an autopsy conducted on a leatherback gives the first recorded instance of plastics being found in the animal's gastrointestinal tract (Mrosovsky, Ryan, and James 2009:288), offering a tentative date for the beginning of their fraught relationship. Since then, just over 35 percent of leatherback autopsies have revealed plastics in their guts, and, of these, they were the likely cause of death in around 9 percent of cases (Mrosovsky, Ryan, and James 2009:288). Plastic may kill only a few outright, but this new relationship adds another indeterminate cadence to the lives of leatherbacks.

Trapped in the turtles' intestines, plastics slow the absorption of nutrients. The hope for increased nestings as a result of increased jellyfish populations is now tempered by an opposing rhythm. Abundance of a food source is no help if the ability to digest it is reduced (Mrosovsky, Ryan, and James 2009:288). Here, then, is a new impediment that must somehow be coordinated with. Yet another fraught and fragile shared moment being created in a time of extinctions. How far into the future it will extend can't yet be said. As Alan Weisman (2007) writes, "Plastics haven't been around long enough yet for us to know how long they are going to be around for."

Ask why leatherbacks eat plastic, and the obvious response seems to be that the floating, bilious plastic bags have simply been mistaken for jellyfish. But ask *when* leatherbacks eat plastic, and the story becomes more complicated and more interesting. One suggestion from research done in the Gulf of Gascony is that as their jellyfish prey decreases, leatherbacks' intake of plastic increases (Duguy, Morinière, and Meunier 2000). In an abundance of jellyfish, there is not much reason to risk trying this strange new variety of prey. But hunger shifts time, and once steady, predictable relationships give way to uncertain futures.

Continued life depends on risk taking, on changing and adapting. The jaguar knows this, and so do leatherbacks. Would leatherbacks be here today if their own ancestors hadn't taken a risk and found ways of forging a beneficial relationship with toxin-laden jellyfish? By doing so, they were able to gift to their descendants a niche coveted by few other creatures (Mrosovsky, Ryan, and James 2009:287). Faced with its own new and unusual prey, the leatherback's body is again being pushed to find novel solutions. And so, hungry and more open to forging new relationships, the leatherback takes a chance and bites.

Monday, March 10, 2014

9:20 a.m.

I am in Edinburgh, trying to write about leatherbacks again, but for the second time in a week the flesh of my palm is burning. This morning, on my way into work, a van came so close to my bike that I only had to reach out slightly to hit it in warning. I reacted so quickly that there was no time for thought, only feeling—threat, fragility, anger, self-righteousness. Knowledge of my right to be on the road turned visceral, demanding space and demanding respect.

While the taxi that I lashed out at a couple of days ago moved aside, today the driver and his passenger only looked at me blankly. Rather than delay their journey slightly, they were intent on getting through the space I was taking up and being on their way. They moved even closer, and I fell back, a slower traveler's demand for space and time overwhelmed by the demands of others.

Delay weaves its way through much of the research on leatherback conservation. The example of the torturous passage of U.S. legislation on turtle-excluder devices, which reduce the number of turtles drowning in fishing nets, is one I've written about before (Bastian 2012:44–45). General admonishments to avoid these untimely uses of time, and to work quickly and efficiently, seem to forget that these positives also cast the shadow of their negative image. After all, the delay for the turtles was justified by shrimpers' own seeming efficiencies. And today in the traffic, the focal point provided by the conjunction of destination, traffic movements, and desired arrival time obscures everything else. Time narrows, and the expansive flow that might accommodate others is funneled away by the rush of battling through all that hinders you.

Take the risk, I tell myself; follow your own time; do it differently somehow. And so, trying to avoid the focus that loses perspective, I start out each day with a reminder to go at my own pace. It becomes a mantra, "Go at your own pace; go at your own pace." But still I feel everyone's time pressing in on me. It starts to become me, and suddenly I'm chasing my own deadlines, arbitrary though they are, and the living beings around me become obstacles instead of fellow travelers. Pedestrians scurry across the road in front of me, knowing better than I do that they won't be given time to inhabit this space with others. Try as I might, I lose the expansiveness I promised I'd hold onto, and my burning palm reminds me just how far it slipped away. My time is not my own; it is given to me, absorbed by me, and offered back to the world through me.

Sitting here now at work I'm distracted, and my hand hurts, so I'm flicking around the Internet, trying to find a way of summoning up a connection. YouTube offers me the perfect link bait—leatherback rescues. Quite amenably, I bite and am reeled in.

Jumping from Newfoundland to Florida to Grenada, I watch people scrambling to help the tangled and the stranded. Fear and concern lapping against each other as they try to figure out how to return this large strange creature safely back to the oceans (for example, alinapphotography 2012; Vincent 2013). Groups of passersby collect around the scene, plans and destinations forgotten as the drama unfolds. Rusty knives, tarps, and ropes are pressed into action, and eventually the turtle is freed. Kind shouts follow—"Get going buddy"—and, not quite ready to end the moment of connection and concern, those filming continue to scan the water hoping to see it safely on its way. Eventually, in boats and on beaches, those who stopped to help are released back into their own lives and times.

Turning back to my pile of articles, I read of another video, although in this one the turtle is an obstacle to time, rather than the opening to a new one. Randell Arauz has been collecting stories of leatherbacks along the Pacific coast of South America. His report lists the number of leatherbacks killed by longlines and gill nets, and records attitudes toward interactions with leatherbacks, seeking to understand when a turtle is saved and when it isn't. He mentions a film that shows a fisherman dealing with a leatherback caught in the lines. The fisherman raises his machete to cut off a flipper so he can retrieve the hooks "in an easier and faster fashion, before being stopped" (Arauz 1999:25). Given that many turtles captured by longlines may be found alive, Arauz sees in this moment the possibility for learning to tell time differently. Careful attention could reduce the number of turtles who die from the injuries sustained during gear removal (Arauz 1999:25). Thus while Arauz (1999) suggests that many are responsible for stopping

the decline of turtle numbers he writes that it is fishers "who will have the ultimate responsibility during fishing operations at high-seas, of saving that turtle on the hook" (26)!

While Shillinger and his colleagues (2011) hope for a disconnection, Arauz (1999) invests in the moment of connection as the time when conservation might do some of its most crucial work. The steady tick of predictability and calculability that echoed through the planned turtle watch becomes a background note. Instead, Arauz turns toward the same tick that chivvied me into action early on a Sydney morning. Under a watchful gaze, those who are out of sync are insistently reminded to adjust, catch up, keep to time. So many of us then chase the lie that all that is needed for proper coordination is for individuals to appropriately calibrate themselves with the correct forms of time (Sharma 2014:138).

But can taking the time to recalibrate to a time of care be done alone? As Maria Puig de la Bellacasa (2012:198) suggests, acts of care are embedded in interdependent worlds, and those expected to care may often be laboring under conditions of exploitation and domination. The tourist on the beach wedging the tarp under the stranded turtle and the fisher out at sea are enmeshed in very different webs of time, with different rhythms, expectations, futures, and pasts, pressing in on each of them in different ways. Adjusting to a time in which fishers can be "patient enough to release hooked turtles, untangle them, or use techniques to safely release hooked turtles" (Arauz 1999:25) may involve more tangles than just those accessible to the fishers alone. As Sarah Sharma (2014) argues, time is not "singularly yours or mine for the taking but [is] uncompromisingly tethered and collective" (150).

A jaguar's time is tethered to its shifting prey; a turtle's, to the amount of plastic in its gut, just two threads among many. These stories suggest that learning to tell time differently is both a collective risk and a collective task, though not in the same way for

everyone. After all, it's easy to focus on the single-minded fisherman wielding his machete, but this tracing of connections with leatherbacks will also bring me face to face with the narrowings of time fostered by my own trade.

A fisherman is complaining about the lack of response from researchers. He has returned at least thirty tags to a research project in Costa Rica and has never had a reply. Arauz (1999:21) delicately describes the fisherman's reaction as "discouragement" over this lack of interest. Originally from Costa Rica, where he participated in an environmental education program, he is now involved in longline fishing in Ecuador. He has taken this education to heart and tries to take care of any turtles he encounters. But his efforts to help support the continuation of shared futures between turtles and humans are met with a foggy uncertainty.

In my now unsteady pile of research papers and reports, I follow this thread all the way to Canada, where fishers there, too, have received no feedback on tags and no follow-up after "spending hours hauling a full-size whale to shore" for researchers to study (Martin and James 2005:114). Conservationists trying to do things differently find that employers and funders are insensible to the multiple, contradictory rhythms involved in building ongoing communities of concern. They face the continuing challenge of "convincing funding agencies that are conditioned to support traditional research that funding 'softer' aspects of a conservation programme, like community outreach, is supporting science" (Martin and James 2005:113; see also Delgado and Nichols 2005:96). Cutting time back to its bones may seem to support staying consistently on target, but it leaves the remnants of the careful responses of others trailing in its wake.

Not everywhere, though. Other threads of time belie the clock's claim that one time can encompass all. Kathleen Martin and her colleagues (Martin and James 2005) are involved in the Nova

Scotia Leatherback Turtle Working Group (NSLTWG), which works closely with local fishers on conservation projects. Many are no longer able to hunt for swordfish, which have become increasingly rare, and so the years of cultivating particular embodiments are turned to other uses. Forging new futures, they now go "turtling," working with conservation scientists to learn more about the behavior of leatherbacks in Canadian waters. As Martin and James (2005) write, "The ability to spot leatherback turtles at sea requires observational abilities that only those who have fished on the ocean for years can cultivate" (113). Indeed, like the jellyfish of the northeastern Atlantic, until the fishers of the NSLTWG turned their swordfish-trained eyes to turtle spotting, the presence of leatherbacks in those waters had never been scientifically proven.

By working closely with local volunteers and seeking to build trust among communities whose interests are not always aligned, Martin and her colleagues make time for careful relationship. But this time carries consequences—academic productivity, status, peer recognition are all put at risk (see also Campbell 2005). For the fishers, however, breaking professional codes by being involved in voluntary conservation work is to risk suspicion, social exclusion, even death (Delgado and Nichols 2005:99). For both sets of partners, taking time involves falling out of the complex, but also enfolding, rhythms that bind communities together. But the same risk is not shared by everyone, and the greater risk cannot always be paid back or balanced out. As Martin and James (2005) write, in relation to the fishers they work with, "There is no way to 'repay' the cultural risk entailed in this kind of action" (115n.1).

Discussing the violence entwined with care in conservation, van Dooren (2014a) writes that it is always important to ask, "What am I really caring for, why, and at what cost to whom?" Likewise, Sharma (2014) reminds us to ask, "What new forms of vulnerability are necessitated by the production of temporal novelties" (150)? What were those bones I worried over, sitting on the carpet

in a faraway Sydney? How many other lives were entangled with them while I sat there, intoxicated by the way they seemed to hail me alone?

Monday, August 4, 2014

4:21 p.m.

The writing that started with such anxiety, after being put off for too long, is nearing completion. Layers of deadlines for conferences and seminars, drafts and redrafts, comments and criticisms have worked it all into a kind of coherence. Throughout it all, leatherbacks have surfaced in unexpected places, opening up shared worlds in which the calculability of time is disrupted, its seemingly implacable forward movement turned on its head and admonishments to work faster, be more consistent, and be more focused are not able to provide the time needed to solve the problems at hand. Rather than connecting with "present temporalities, localities, and relationalities," the time given by leatherbacks has rendered each of them unfamiliar.

Sifting through news items reporting on others' encounters traces a similar sense of estrangement. Stories of sightings, rescues, and nestings—all accompanied by astonishment that such a creature should appear *here*. There were the "completely baffled" experts trying to work out how a dog walker could find fresh leatherback eggs on a beach on Jersey, one of the Channel Islands (BBC 2013). And wildlife watchers off the coast of Cornwall talking about the "enormous privilege" of seeing one so close to land (Lester 2013). A turtle has even been sighted hauling up on the beach in England's Blackpool (Cooke 2010). Closer to my old home in Australia, so far removed (or so I thought) from leatherback haunts, a dead turtle, probably killed by a boat strike, had

drifted ashore near Byron Bay, and it was "believed to be the first time in 17 years this breed of turtle has been seen on the East Coast" (Kinninment 2013). Another was seen alive in Melbourne's Port Philip Bay (Florance 2014). Sharing my confusion were reporters in Balatan in the Philippines who wondered why an animal "only seen in the Atlantic waters in Europe" would be found tangled in local fishing gear (Sales 2013).

To encounter a leatherback, then, might actually mean having one's sense of place and time disoriented. As Martin attests, "You really feel like you're being blessed by the primeval, you know, this is an animal who has been around for 150 million years—since the T. rex was on Earth, leatherbacks have been with us—it's such a privilege to see that and have that sense of being tied into a world that is so much older than you are, and so much bigger, and just more mysterious" (quoted in CBC 2014). Envoys from the last great extinction event, a leatherback encounter may offer a moment that bones cannot touch, a moment that squawks and shuffles and captivates.

But my ticking clock won't give up easily. It's now 11:28 P.M., and I'm on the brink of falling back into the untimeliness that started all of this. There are so many tangles, knots, and threads that I'm not sure which ones I should track down, tidy up, or cut away.

I need some fresh air. So I quietly unlock the front door and step outside. The street lights give everything an orange glow, and I can hear faint sounds of traffic on the roads. The Water of Leith is close by, and I start to follow it along as it runs through Edinburgh's suburbs. Along and along in the cool darkness. When I get to Inverleith Park, I leave the river and follow the roads straight down to Granton Harbour, and here I stop, looking out over the water.

I look for them; and, don't see any yet. But I might.

Leatherbacks have been here recently.[13]

While I wait I pull out the clock's bones from my pockets.

It's time to let them go,

so I lay them carefully on the surface of the water.

For a moment they just float there,

but, after a little while,

they start to grow into each other, stretching flesh and sprouting wings

before heaving up out of the water and soaring lazily out to sea.

NOTES

1. Although see also Kevin Birth's (2014) critique of the way the metaphor of the clock has led to misunderstandings of how these body "clocks" work.

2. See, for example, specifically "Weekday Calculator—What Day Is This Date?" http://www.timeand date.com/date/weekday.html; and http://www.moonpage.com/index.html.

3. Research also suggests that the hatchlings do their own forms of synchronizing, calling to one another while still within their shells in order to coordinate their crawl to the ocean (Ferrara et al. 2014).

4. For information, see NOAA Fisheries, "TurtleWatch," National Oceanic and Atmospheric Administration, http://www.pifsc.noaa.gov/eod/turtlewatch.php.

5. Since I wrote this essay, the Hawaiian TurtleWatch mapping tool has been extended to cover leatherback interactions as well (Howell et al. 2015).

6. PTT stands for Platform Transmitter Terminals, which are used with the Argos tracking and monitoring system. For a discussion of the system's development, see Benson (2012).

7. For information, see "Intra-action: Multispecies Becomings in the Anthropocene" [exhibition at the conference of the Australian Animal Studies Group, University of Sydney, July 8–10, 2013], http://intraactionart.com/.

8. This metaphor is inspired by Deborah Bird Rose's (2012) interest in "add[ing] flesh to the relatively abstracted analysis of kinds of time and patterns that connect" (128).

9. I'm thinking here of Birth's (2014) use of the term "triangulation," where time is reckoned by "relating the intersection of different timing or cyclical phenomena," similar to the "navigational practice of locating one's position in space by reference to three or more known locations" (318).

10. For a more recent overview, see Gibbons and Richardson (2013).

11. More recent literature questions this, suggesting that while there have been increases in localized blooms, there is insufficient research to tell whether there are global trends toward population increase (Condon et al. 2013).

12. For a critique of the use of these sorts of temporal moves in scientific research, see Schrader (2012).

13. For a map of the sightings of leatherbacks around the British Isles, see "Grid Map for Dermochelys coriacea (Vandelli, 1761) [Leathery Turtle]," NBN Gateway, https://data.nbn.org.uk/Taxa/NBNSYS0000188646/Grid_Map.

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Margaret Barnaby, *Sanguine Moon*, with two ʻalalā (*Corvus hawaiiensis*) on a loulu palm. (Woodblock print. © Margaret Barnaby)